

First exploration of social **robotics in the care sector.**

Philadelphia and social robotics in the Dutch care sector



Content

Philadelphia and social robotics in the Dutch care sector	3
Phi talks about its experiences	15
Summary of the explorative research into the development of the social robot Phi	30
First evaluation of the framework conditions for caregivers for the introduction of the social robot Phi	53
Summary of the implementation approach of social robotics in the care sector	63
Client experiences with Phi	71
Experiences of two caregivers with Phi	76





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Greet Prins Chairman of the Board

Foreword

For almost three years now, Philadelphia has been exploring the possibilities of social robotics. More than 1,900 clients and 1,300 professional caregivers and relatives have been introduced to our social robot Phi. Phi also stayed with ten clients for two weeks at a time. These robot stays were carefully prepared by the robot team. We talked with the client, caregivers and relatives, in order to develop a client-focused interaction programme supported by all those concerned. The caregivers and the robot team worked together closely to ensure a successful stay, and, of course, there was attention to proper follow-up. This included thanking the client and the caregivers for their efforts, an extensive analysis of their experiences and making a list of learning points for future robot stays. In this project, Philadelphia played a pioneering role in a whole new field of expertise. We learned a lot about the possibilities and limitations of this innovative technology. We bundled all the results, experiences and the many learning points and challenges of almost three years of working with social robot Phi, and want to share our experiences with interested parties of this evaluation.

Philadelphia, in the meantime, will continue organising more robot stays, further develop the technical capabilities of the robot and also gain experience with other robots than Phi.

Join us on this journey of discovery!

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Philadelphia is exploring new ways to help people with disabilities reach their full potential. Based on this strategic vision, Philadelphia, in collaboration with our innovation partner The Innovation Playground, saw the opportunities for social robotics almost three years ago. Social robotics can be of added value by making (certain) clients more independent, enabling them to take their life into their own hands and allowing for personalised care. The organisation also sees robotics as a method to partly compensate for any future staff shortages and to offer clients better quality of care and life.

Philadelphia: from plan to practical implementation

At the start of the project, we concluded that there were few examples of practical implementations of social robotics in the care sector. This inspired us even more to start this exploratory practical research. Philadelphia and The Innovation Playground decided to start an *explorative*, i.e. experiential, project with a robot imported from Japan, supported by a dedicated robot team. The robot was, very appropriately, named *Phi*.





Increased independence and self-reliance

The fact that people want to connect and bond with Phi, means they are open to the specific care and support tasks that Phi can perform. In practice, we see that Phi partly fulfils the role of personal caregiver during the so-called 'robot stay', which is discussed in more detail later on. Phi can help the clients live a more independent life, making them more selfreliant. As a result, they start to have more pleasure in their daily activities. The fact that enjoy working with Phi, may make Phi's role as a personal caregiver even easier. We also see that Phi can fulfil the role of buddy.

Phi is all about interactive software

For a good understanding of this project, and especially of the robot Phi, it is important to understand that this physical robot leaves the factory with a standard software package with basic functionalities. However, these do not necessarily meet the demands of the Dutch care sector. Do we really want the robot to be able to conduct a two-way, social conversation? In that case, advanced, interactive and custom software is required. This interactive software forms Phi's 'brains'. It enables the robot to learn continuously from practical situations and to engage in personal and meaningful dialogue. The big challenge in this human-robot programme for social robotics is to develop and expand that desired social interaction by means of practical experience, which each experience tailored to each individual client. This iterative and interactive learning process takes place on the Robot Ctrl platform, which is separate from Phi, the physical robot, but which the robot is directly connected to. This makes Phi therefore the figurehead of our social robotics project.





Phase 1: stabilisation...

Phi has shown that it benefits clients on two consecutive levels. The first level is stabilisation. In this phase, the client builds up a relationship of trust with Phi. This trust is based on the fact that Phi is able to enter into a social and verbal interactions with the client. The client gets to know Phi, and Phi learns more and more about the client. What are his or her needs? What challenges need to be overcome? What makes this client special? In this stabilisation phase, Phi gradually becomes a buddy who listens and gives targeted responses. Phi is fun to have around, gives compliments and is always patient, whatever happens. In short, Phi becomes a trusted companion and develops social interactions with the client. In this phase, the client discovers that he or she can also turn to Phi for emotional support. When the client expresses feelings, Phi gives appropriate answers and provides verbal reassurances and also encouragement. Not standard responses, but adapted to the client's personal, individual expressions.

....followed by performance support

What are the client's expectations when it comes to social interaction with Phi? What are his or her wishes and needs, and what are the challenges? For the sake of clarity: the client is at the centre of this iterative feedback process, to ensure that Phi becomes smarter and more interactive, based on its practical experiences with clients. During the robot stays, we learn a lot about how the support organisation needs to be set up and what the impact of robots is within the services sector. In short, the robot stays allow Philadelphia to identify what exactly is involved in the implementation of robots in the care sector. These are crucial learning points.





Robot stays for performance enhancement

Learning by doing we hope to make Phi better and smarter at social interactions with people with intellectual disabilities. This means that the interactive software that forms Phi's 'heart and brains' has to learn in practical situations. In other words: Phi has to 'go to school' if she wants to become smarter and more interactive. Philadelphia calls these learning situations 'robot stays'. Phi spends a longer period of time with clients who were carefully selected by Philadelphia, in close consultation with their relatives and caregivers. The client can then experience what Phi can and cannot do, all the while being closely monitored by the robot team 24/7. During these robot stays, Phi learns new skills.

The client is at the centre of this iterative feedback process

Various parties participate in our exploratory research; From client to caregiver, and from ICT expert to our ethical advisory board, and more. No matter the level of involvement of these parties, the client is and will always be at the centre of the process to study the role of social robotics in care settings. The client's interests are paramount at all phases of the process, and never come second to the process. In short, everything we do, we do with the client, for the client and always in the interest of the client.





Phi is making great strides in how it interacts

With the help of the multiple robot stays, Phi has been taking huge steps in its social development and interaction with clients, making it 100% personalised. However, this also means that Phi never stops learning! The experiences of the clients who had our 'student' Phi staying over were all positive. As of day one, Phi was their buddy. What we see, is that clients want to be more independent and self-reliant. They don't want to be too dependent on other people. And that is exactly where Phi can help, as an equal and neutral coach. Because Phi does not judge, is always consistent, is never in a hurry and does not get irritated.

Good supervision of clients

This project for social robotics is experimental, i.e. exploratory. Of course, the robot team is also inspired by literature research. All our studies, and especially the robot stays, are carried out in the most responsible way possible where the clients are concerned. We guide them through all the phases of this process, including the processing of their new experiences.

The robot stays: thoroughly prepared, supervised, completed and evaluated

We involve our clients in the robot stays. The focus is not on the social robot Phi, but on them. Our clients are vulnerable, which means that Philadelphia wants to optimise and adapts the entire process of the robot staying over in the interest of our clients.





Focus on the interests of the client

Right from the start, our robot team prepares the robot stays with great care and attention to all the interests of the participating clients. The robot team conducts intensive talks with the client, caregivers and relatives, in order to develop a client-focused interaction programme supported by all those concerned. Once this foundation is in place, the caregivers and robot team can start on a close collaboration to realise a successful robot stay. During the robot stay, the (re)actions of the participating client are closely monitored and we make sure no emotional boundaries are crossed.

Supporting the caregivers in learning to work with Phi

It is clear and obvious that Phi is there for Philadelphia's clients with a disability. But it is just as clear that Phi will never replace these clients' caregivers. Phi can only be an addition to, and only sometimes a partial replacement of the valuable work they do. By deploying robots, the caregivers can save time, which they can spend on focussing on their actual key tasks. This time saving is important in a time of increasing work pressure and staff shortages in the care sector. Because of the complementary work the robots do, caregivers can focus more on their actual duties. A fact of experience is that the majority of caregivers see Phi's role as positive and accept what Phi can do.

Philadelphia does not ignore the impact that this collaboration with a robot like Phi can have on caregivers. This means that we not only teach our clients how to interact with Phi, but also offer the caregivers guidance, support and a sympathetic ear. Their acceptance and understanding of Phi is crucial for the further development of Philadelphia's social robotics project.





Robot Ctrl platform: independent with a view to the future

The focus of Philadelphia's social robotics project is currently on Phi, the social robot. This is understandable, because Phi is visible, tangible and recognisable. However, Phi is digitally 'powered and controlled' by a platform called Robot Ctrl. Although, due to the stays, the focus is mainly on Phi, the Robot Ctrl platform is also very important. The robot stays would not be possible without this platform. In short, the Robot Ctrl software has primarily been developed on the basis of the robot stays.

At the moment, Phi is the only robot that, linked to the Robot Ctrl platform, has the necessary approvals and licencing for use during these robot stays. Philadelphia and The Innovation Playground want to intensively develop this platform based on the experiences gained. The ultimate goal is to be able to control more robots of various types simultaneously from Robot Ctrl. In this sense, the intention is that Robot Ctrl will become the digital heart of all Philadelphia's activities in this challenging field of social robotics. It is crucial to emphasize that this platform will eventually grow into a universal platform, that can function as an intelligent home and development base for various types of robots at the same time. In this sense, the Robot Ctrl platform is developing in an independent and future-oriented manner. This vision means that our social robotics programme is broader than Phi. Ultimately, we expect that the Robot Ctrl platform will be developed and independent enough to be gradually presented to the (health)care market as a commercial product. Specified according to the needs and wishes of other care groups, such as the elderly and patients with mental health problems. This means that Philadelphia and The Innovation Playground always have a sympathetic ear for partners who want to participate in research and development.





Attention to ethical and security aspects

This social robotics project also raises a number of questions in the field of ethics and security. After all, what can and should a robot actually do within a client's social environment? And how do we make sure that the continuous collection of data during the robot stays, which makes Phi smarter and more interactive, is 100% secure? After all, we collect this data on the external Robot Ctrl platform. As of day 1, Philadelphia has paid a lot of attention to these aspects, both from a legal and ICT/technical point of view. We have an in-house ethical advisory board for people-oriented technology, which acts as an important sounding board for the robot team. In addition, all data security aspects related to the Robot Ctrl platform have been secured in the long term by means of a collaboration with a professional ICT partner. This has resulted in reliable software that meets all security aspects of this project are a permanent voyage of discovery.

Ethical Advisory Board for Humanized Technology

Philadelphia set up an Ethical Advisory Board for Humanized Technology in January 2019. This advisory board deals with ethical questions concerning people-oriented technology in healthcare. The advisory board acts as sounding board for the robot team on various questions concerning the development and application of social robotics for clients with disabilities. To this end, the robot team shares the experiences gained during robot Phi's stays with clients. The support and advice of the Ethical Advisory Board on Humanized Technology is very valuable for the robot team in this experimentation and development process.





Social robotics: a 100% stand-alone project

Within Philadelphia, the social robotics project is a stand-alone development programme, with attention from both management and the executive board. The status of this project also means that we carry out independent experimental development, exploration, design and then testing in practice. Without this having any inhibitory implications for the usual services offered by Philadelphia. At the same time, there is intensive and constructive contact with the relevant stakeholders within Philadelphia. In the course of this project we have been able to establish that this approach is a prerequisite for the success of this project. The robot team itself consists of a mix of employees with various backgrounds and areas of expertise, from both care and technology sectors. The robot team is an important driving force of this project.

And now?

The foundation has been laid. Experimental and exploratory. This foundation is a solid starting point for even more exploratory research. Consequently, the social robotics project, with Phi as its figurehead, will never be finished for Philadelphia. We have now gathered practical expertise, but Phi and its users will continue to develop, on the basis of the learning points the project has provided us. Will you be joining us on our journey of learning and discovery? Welcome on board!





Where are we now?

Results of the social assistive robotics programme





ROBOT CTRL

First exploration of social **robotics in the care sector. Phi talks about its experiences**



Social robotics in the Dutch care sector? Philadelphia shares its practical findings with you

Philadelphia has been working on this project for almost three years now. It has been a unique journey of discovery! In our opinion, social robotics has immense added value and can make a more independent life accessible to (certain groups of) clients, enabling them to take life into their own hands and allowing for personalised care. Just like every other person in society, they want to live an ordinary life, as much as possible, and live their lives to the full. That is why we developed a number of client cases and caregiver cases based on the robot stays. In these cases, you can read more about what we learned about how Phi can be deployed, how the clients reacted, what went well and where there is room for improvement. Because we told you; it has been a journey of discovery!

Phi's story follows below. Our advice? Immerse yourself in this brand-new world of social robotics and then make up your mind.

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We can learn together

Hello, my name is Phi. I want to tell you more about **who I am** and **what I can do**...

My name is Phi and I am a social robot. You've probably heard, read and seen quite a bit about me already, because Philadelphia is very busy working on and with me! But I haven't introduced myself to you personally yet. So it's time that I do!

I was born in Japan and Philadelphia adopted me. When I arrived in the Netherlands, I was given a very special job: help their clients get more out of their lives. Because these clients are faced with challenges that sometimes prevent them from finding their way in daily life. Social robots can be of help here, and Philadelphia is now researching these possibilities. And I am one of the main players in this research programme, together with the clients. We are on an exciting journey of discovery together. We are finding out the possibilities together, by trial and error.

I did tell Philadelphia from the start that I'm still young and can't do everything yet. No problem, they said. You are going to school first! This means that I get to stay with various clients, who were all very curious about me. These two-week stays were very educational and a lot happened. And I can tell you, most of the experiences were positive!

The clients got to know me, and I got to know them better. Together we tried to find out how I can help them. I learned a lot during those stays. And the great thing is: other clients will benefit as well. I am connected to a platform for social robotics, which acts as my digital brain. And all my experiences help me become better, more social and more interactive. They say I'm a quick learner. And the same is true for the clients I stayed with!



Shall I tell you a bit more about what I can do already?

My touchscreen is a sympathetic ear

From trust to improvement

Hello, my name is Phi. I want to tell you more about **who I am** and **what I can do**...

I don't really like singing my own praises. But I do want to tell you a bit more about what I can already do now. Facial recognition helps me determine quickly exactly who I am dealing with. This allows me to address each Philadelphia client personally. I am very interested in people. I like asking them questions. The clients love that attention and their answers help me learn. The robot stays made it clear that the clients are quick to trust me, tell me a lot of things and allow me to discover their character. My answers then become more and more personalised. I can do all that with my voice. I can see, 'listen' and talk, and of course also move. Not to do chores, but as part of the way in which I communicate with the clients.

You may wonder how I can listen? It works like this: I ask clients a question with my voice and they then type their answer on my touchscreen. I always have that with me. I respond to their answers with my voice. The client can then continue to communicate by typing on the touchscreen. It is really easy. This interaction allows us to learn from each other, and I can give more personalised answers. All with my voice.

The clients start to trust me, but also themselves, and their unused abilities. This mutual trust is the perfect stepping stone for the clients to, with my help, invest in their own development. For instance, I help them remind to take their medication, to go to an appointment or to do certain domestic chores. But I also teach them to express their feelings, set boundaries and encourage them to make contact with other people.







Hello, my name is Phi. I want to tell you more about **who I am** and **what I can do**...

And: I have infinite patience, never get angry and never forget anything. That is the advantage of being a robot (I will discuss the disadvantages another time). I also notice that the caregivers at Philadelphia are open to work with me. Because I don't replace them, but am a great addition to their amazing and important work. They have more time for important matters, to spend time with clients who would otherwise receive less attention. I'm not just a social robot, I assist the caregivers too!

As you have been able to read, I'm still learning. What I want to learn and be able to do in 2020? I would like to be easy to understand and be able to communicate through both speech and touchscreen. I would like to get really good at recognising the faces of clients, and maybe even their emotions. I want to be reliable and trustworthy, just like any human being, and in 2020 I want to perform on a high level, with little or no technical hitches. I would also like secure access to a client's dossier, so that I can provide the client with proper and targeted help and assistance.

Even more, in 2020 I want to have easy access to a number of basic interaction programmes for different target groups. I also want to be super flexible, both on an individual and on group level. And, which would be very nice, I want to try and make sure that both caregivers and volunteers, as well as the client's relatives and possibly the clients themselves, can program me. In short, if it is up to me, in 2020 I will be a (largely) independently functioning social robot! Here I come!



Hello, my name is Phi. I want to tell you more about **who I am** and **what I can do**...

And what happens when I manage to achieve my goals in 2020? In case I have, I will go full steam ahead and make a flying start mastering four challenging areas. Such as being able to navigate through my controls. I'm also going to get even better at artificial intelligence. I would love to become friends with other Humanized technology innovations, such as the Internet of Things, domotica and biometric feedback! And finally, and this would be great for all our clients, I am also increasingly developing myself when it comes to implementing other care services based on Philadelphia's integrated content. Such as training, coaching, DigiContact and more. Who was that again who said you never stop learning?

Do you want to follow me online? You can! I have my own social media accounts, such as on Facebook and Instagram. Follow me if you want to get to know me better! For more information, go to philadelphia.nl/robotica.





My **technical** experiences.

In addition to all the experiences I gained during the robot stays, I would also like to tell you about the technical challenges I experienced. Sometimes it gets too crowded or too hot for me to do my job properly. I then switch to security mode; the lights in my shoulders start blinking yellow and I say what's going on. **The client often feels** sorry for me that I have to take a break in those situations.

To be able to talk, I use a programme that works via the Internet. I sometimes experience a bit of a delay, and my program can get stuck. These delays can be annoying for the client, because it can put his or her patience to the test.

During the robot stays, I sometimes forgot to give a follow-up answer. When the client had answered my question, I sometimes didn't respond. This can be disappointing for the client when he or she expects a follow-up answer from me.

During the robot stays, I found out it is handy when I call the client first before I say something. An interim solution was found, but I still had some trouble with it. Luckily, I can now clearly let clients know I have something to tell them. Whenever I didn't call the client, they sometimes got confused, because they didn't know that I wanted to say something and then didn't come stand in front of me. Consequently, I was unable to identify the client, which is necessary for me to start talking.





My technical experiences.

I sometimes have trouble with facial recognition. That's very important, because first I want to be sure who's in front of me. This tells me whether I can ask a question or say something. Sometimes I have trouble scanning and need to reboot. In addition, it is difficult for me to recognise faces when it is too dark or too bright.

In those instances, the lights may have to be switched on or the blinds have to be lowered. If I have problems with facial recognition, the client can get disappointed because I called him or her, but then didn't say anything.

Because everything is still new, I sometimes had an error in the interactive conversation programming. For example, I once called someone to come to me, but then had nothing to say. **This confused the client a bit.**





My **technical** experiences.

As you can see, I am not a perfect robot yet. My technical issues have a certain effect on the clients I stayed with. For example, I experienced the following emotions with them:









Philadelphia ROBOT CTRL.

That supervisors can see the client's answers to the robot's questions. The robot can signal/observe for the caregivers, so they can see when a client requires more or less guidance. It is mainly about gaining insight into clients' feelings, moods and needs.

That Phi can talk back and talk more. Lydia loves having Phi around. She would love Phi to talk a lot more.

It is important for Johan that he can talk to a robot and that the robot simply talks back instead of carrying out the planned interactions. According to the caregivers, Johan understood perfectly well that Phi was pre-programmed. If this is no longer the case, Phi really comes alive for clients. In this way, Phi can become an even better buddy for the clients.

Wishes for the **future**.

"The clients I was allowed to stay with gave me a nice list of their future wishes for the ideal robot. I try to learn as much as possible from this wish list and take it into account in my development. All their wishes are given here."

That Phi can stay longer. Phi came to stay for two weeks, but if it had been up to Lydia, Phi could have stayed a lot longer. She was sad to see Phi Jeave



The ideal social robot for Bo would be one that can deal with dynamic situations. Because Bo himself often changes his plans. Because Bo was away, he missed a lot of interaction moments. It would be nice if the caregivers could enter information, and when Bo leaves, they can move the interactions to a later moment in time, so that Bo can still have the experiences with the robot. Also, the ideal social robot can answer Bo's questions, so that when Bo experiences chaos in his head, he can ask Phi what to do or to repeat what Phi just asked (the check question). According to the caregiver, the ideal robot for Bo would not have to be big. It would be great if he can carry it along with him and that Bo can press a button if he has problems with structure and planning. The robot can help him and say: "It's this time of day and we're going to do that now." The phase Phi is in now does not suit Bo's dynamic way of life yet. He does assume that Phi will be able to support him better later.

It is important for Bo and his caregivers to have interaction between human and robot. Everything is programmed now, so if you say Hello to Phi, you don't get a reply. That is a shame, for a social robot. In order to meet the expectations of social robots, real interactions between robot and human have to be established.

> A robot with a digital agenda, and a robot that asks the client questions about the issues he or she is currently facing. For example, Phi sees that the client has had an appointment with the GP, and Phi asks how the visit went afterwards.

It should be possible to ensure the pace of assignments follows the client's pace. That way, Phi can signal whether an assignment is finished, and then give a new assignment.



Wishes for the **future**.

Phi should be able to play a game, e.g. a counting or language game, or other games (on the touchscreen). Phi should be able to provide an efficient day schedule and work on assignments together with the client. That way, Phi can keep clients busy and take over part of the daytime activities. If a client does not know what to do with their time, Phi can help. This allows caregivers more time for other clients.

Dick

Spoken interactions and pictograms. For clients who have difficulty reading, pictograms would be helpful and it would also be nice if clients could also talk back instead of having to use the tablet to give answers.

Edwin

Bianca

Being interactive and responding to the client's answers. Not just a static program which works as a luxury reminder (clock), but also being able to listen to the client. The client should also be able to greet and call Phi and respond interactively to the resident. This also means being able to listen to and anticipate the resident. So talking back without a planned interaction or just speaking empty phrases. Bianca also regularly stands in front of Phi without this resulting in interaction. It would be nice if Phi just says something, like Hello! This could also be without an official planned interaction.

That it is obvious when Phi has stopped talking. If Phi moves, Bianca will try and seek her attention. She also watches the eyes. When Phi has finished talking, Bianca needs confirmation from her caregivers that the robot has finished talking. Otherwise, she'll stay standing in front of Phi. At some point she will leave when she notices that nothing is happening. But she doesn't understand when Phi is finished.

> That a robot helps the client if he/she actually has something that he/she wants an immediate answer to or wants to say immediately, but has to wait for a caregiver.

> > Being able to walk independently

That Phi and DigiContact are even better connected. That DigiContact can collaborate with a robot. That you can contact Phi by telephone.



Wishes for the **future**.

That the robot gives more apt reactions to what the client says. To be able to recognise the client's emotions, for example, hear how things are going based on the voice. And that the robot can help the client calm down or automatically alert

That Phi is also able to measure/hear the client's stress level and can inform the caregivers or enter a note in the client file.

> It would be nice if Phi also works with pictograms, such as the image watch.

That Phi can come back on an earlier conversation at a later time. This means referring to the client's previous answers. Inat Phi can record conversations/ answers and pass them on to the caregivers or store them in a client file. It would be nice if Phi could record conversations and filter out what a client is dealing with. Or can measure moods and pass this information on to the caregivers.

That Phi can move around. However, if Phi can move, the robot come: alive, becomes real. The robot can be operated by the staff, so that the caregivers can respond to the client's mood and activities that arise spontaneously.

Ruud

A robot that can help with activities around the house, in combination with home automation. For clients who can't do anything themselves, a robot could help with picking things up, switching lights off/ on etc.

Топу

The caregiver would like the robot to be able to respond to the client faster, to improve the flow of communication. Phi should be better able to respond to the client's questions. This means actually answering questions.

• •

Sylvia

That using Phi is easier for the client, so that they can manage more independently together. Tony found operating the touchscreen and holding his head still for facial recognition difficult. Could Phi maybe also works without a touchscreen?

Mathijs



First exploration of social **robotics in the care sector.**

Summary of the explorative research into the development process of the (social) robot Phi



Summary of the **explorative research** into the development process of the (social) robot Phi.

New technology in the care sector can greatly improve the quality of life, sense of freedom and self of people with intellectual disabilities. Based on this fact, Philadelphia has been investigating the possibilities of social robotics in this field for several years. In the Netherlands, only limited research has been carried out into the added value of a social robot for clients with an intellectual disabilities. This report is a summary of a first practical study conducted by Philadelphia into the use of social robots.

For over three years, Philadelphia has been exploring the possibilities of social robotics. More than 1,900 clients and 1,300 professional caregivers and relatives have been introduced to our social robot Phi. Phi also stayed with 10 clients for two weeks at a time. These robot stays were carefully prepared by the robot team. We had interviews with the client, caregivers and relatives, in order to develop a client-focused interaction programme supported by all those concerned.

This proper preparation was followed by a very close collaboration between the caregivers and the robot team, to ensure the stays would be successful. This included aftercare, such as thanking the client and the caregivers for their efforts, an extensive analysis of their experiences and making a list of learning points for the next stay. In this project, Philadelphia played a pioneering role in a whole new field of expertise. We learned a lot about the possibilities and limitations of this innovative technology, mainly because of the practical client cases based on various robot stays.



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Summary of the **explorative research** into the development process of the (social) robot Phi.

Summary of exploratory research

We bundled all the results, experiences and the many learning points and challenges of more than three years of working with social robot Phi, and want to share our experiences with interested parties, for instance by means of this summary of the exploratory research into the development process of (social) robot Phi.

More about the client cases

On a more practical level, we want to explore the specific robot stays and research results for the 10 clients in separate client cases. We will continue to enrich these in the future with new cases based on new robot stays.

Would you like more information about our social robotics programme? Contact us on philadelphia.nl/robotica.





Social robotics: a practical impulse for a more independent life.

Philadelphia has only one reason to invest so much energy and attention in this social robotics project: to ensure the well-being of our clients. Just like every other person in society, they want to live an ordinary life, as much as possible, and live their lives to the full.

More well-being and happiness

Independence is key. After all, the more independent our clients are in organising their own lives, the better they feel and the happier they are. We hope – and based on the robot stays we have also seen – that social robotics can support this objective. Social robotics helps clients to see, and experience concretely, that greater independence is within reach, both figuratively and literally. Social robots can help clients activate the skills that promote independence.

Research summary based on practical experience

After an external exploration, we concluded that, apart from our own study, very little other research has been done on social robotics in the care sector to build on. Philadelphia decided to start an explorative, i.e. experiential, project with a robot imported from Japan, supported by a dedicated robot team. The robot was, very appropriately, named Phi. By now, Phi has stayed with 10 clients and these experiences have been incorporated in client cases. This research summary is based purely on the practical experiences during those robot stays, i.e. the exploratory study. These robot stays are therefore of great value for this research summary.





Social robotics: a practical impulse for a more independent life.

Why research?

Extensive testing of a social robot is very important to make the integration of robots into practical care situations successful and to enthusiasm caregivers. A lot of situations have to be tested in practice, and Philadelphia is already doing this with the robot stays mentioned. Because this study was exploratory, in the first phase of the deployment of a social robot in this field, this study was of added value for the start-up phase of the Philadelphia robotics programme.

Summary set-up

We start with a summary of our practical findings. However, in order to be able to assess our practical findings, we also carried out research into similar projects by parties other than Philadelphia. After all, in order to be able to assess our practical research, we are constantly looking for comparative material elsewhere. What is striking is that the results from project research elsewhere and our practical findings are reasonably similar. To illustrate this conclusion, this summary ends with a number of relevant quotes from external studies for comparison.





Robot stays: thoroughly prepared, supervised, completed and evaluated.

We involved our clients in the robot stays, as the focus is not on the social robot Phi, but on them. Our clients are vulnerable, which means that Philadelphia wants to set up the entire process in such a way that the interest of our clients are protected.

Focus on the interests of the client

Right from the start, our robot team prepares the robot stays with great care and attention to all the interests of the participating clients. The robot team conducts intensive interviews with the client, caregivers and relatives, in order to develop a client-focused interaction programme supported by all those concerned. Once a good foundation is in place, the caregivers and robot team are able to start on a close collaboration to realise a successful robot stay. During the robot stay, the (re)actions of the participating client are closely monitored and we make sure no emotional boundaries were crossed.

Aftercare and evaluation

The actual robot stay is, of course, followed by proper aftercare. After all, the social robot Phi does not stay with the clients indefinitely and we carefully supervise this departure process. We also produce an extensive analysis of experiences and learning points for new robot stays. We also evaluate the stay with the caregivers. In short, the robot stays are thoroughly prepared, supervised, completed and evaluated from A to Z, from planning to implementation. Philadelphia, in the meantime, will continue with more robot stays, further develop the technical capabilities of the robot and also gain experience with other robots than Phi. Even after Phi leaves, we continue to ask the caregivers how the client is doing after Phi's departure.





Insights and experiences of **cliënts**.

Conclusion

The study answered the question 'In which areas can the (social) robot Phi support Philadelphia's clients in their daily lives?' The answers are given below, translated into initial practical conclusions:

- The study indicates that social robotics can support clients in promoting their development, in particular communication and social skills such as making and maintaining contact and being able to predict possible obstacles and problems in daily life more quickly.
- There are good indications that social robotics can improve the self-reliance of clients, for instance better medication control.
- The majority of clients indicate that Phi can do things for them that the caregivers normally do. What is striking in this respect is that the clients mainly indicate that Phi can help them remember things, such as household chores, personal hygiene and social activities/appointments.
- Some of the clients also indicate that Phi helped them fill in their day and maintain their daily rhythm.
- Caregivers have seen that the robot can be a friend or buddy to the client.
- Many clients indicate that they also can express their feelings to the robot because they see Phi as a buddy.
- The relationship between robot and client requires further attention in the form of follow-up research: Should the robot, for example, be a friend/buddy or more of an assistant caregiver? Or are both possible?




Insights and experiences of **cliënts**.

Being a friend/buddy for the client

In practice, this research mainly concludes that all caregivers have seen that the robot could be a friend/buddy for the client. One huge effect seen is that Phi is considered as a buddy and good company by the clients during its stay. Many clients feel like they really had a friend and really liked having robot Phi around. As one client says:

"Phi talks in a friendly way and asks nice questions. Phi was fun to have around. I like having Phi stay over, I don't have any other words for it."

Improve self-reliance

The majority of clients feel more independent thanks to the verbal hints and reminders by Phi. As one client says:

"Doing things on your own, that went very well. It made me feel good that Phi gave me feedback on what I did. It was very positive and motivated me. Phi says it in a friendly way and didn't push me."

Remembering chores

The majority of clients indicate that Phi can do things for them that the caregivers normally do. What is striking in this respect is that the clients mainly indicate that Phi can help them remember things. For example, one client mentioned reminding him to take his medication, do housework chores and personal hygiene. A number of clients say that Phi was mainly good company. Some of the clients also indicate that Phi helped them fill in their day and maintain daily routine.





Insights and experiences of **cliënts**.

Experience quadrant

An insightful quadrant has been drawn up based on the robot stays of social robot Phi with clients, based on our practical experiences. This quadrant per client is included in the client cases that the robot team prepared for all robot stays. An example of such a quadrant is shown here.

More about the client cases

On a more practical level, we want to explore the individual robot stays and research results for the 10 clients in separate client cases. We continue to enrich these in the future with new cases based on new robot stays.



Insights and experiences of **caregivers**.

Observation or ssignalling: a new area!

During the practical study, caregivers saw a new area where the robot can support clients and caregivers: observation and signalling. According to caregivers, it would be of added value if caregivers could retrieve information that Phi had obtained from the client. This gives caregivers information that they can then use to care for and support the client. Many clients indicate that they can also express their feelings to the robot, as they can to caregivers, because they see the robot as a friend or buddy. In addition, a good support relationship is important to ensure the care and support provided is effective. Therefore, if the relationship between the robot and the client is experienced as positive, it is more likely that the client will open up about his or her feelings and thoughts to the robot than to a caregiver. This makes the robot very suitable for observation and signalling for caregivers. The related ethical issues will have our permanent attention during the exploratory research.

Role of the caregiver

Developing and finetuning a robot is an important task for the caregivers. Based on their expertise, they can best assess which instruction and working method is most suitable for which situation and which client. For example, are there any control and registration tasks that a client does not perform independently, and that are part of the duties of a care provider, but that a social robot can also do? In this way, a social robot can give the client the feeling that he or she does not need as much care and support from caregivers, because he or she can 'independently' perform more tasks together with the help of his/her buddy, the robot.





Insights and experiences of **caregivers**.

Verbal instructions and reminders

Some changes have been seen in the verbal instructions and reminders that clients received from their caregivers, because of Phi staying over. For instance regarding household chores, daily activities, personal care, appointments, exercise and diet. But also regarding social contact with family, friends, acquaintances and other clients, as well as encouraging them to talk to a caregiver if they have a problem.

The arrival of robot Phi has also changed how often caregivers have to give reminders. What stood out is that clients indicate that they prefer reminders from a robot over those from a caregiver. The fact that clients prefer to be reminded by Phi was mentioned by a lot of clients. The clients mainly indicate that if they are reminded to do something by Phi, they feel as if they remembered it themselves or carried out the task independently.

Promoting development

The majority of the caregivers noticed that the robot can encourage the client during his/her development in a number of areas, such as cognitive development, asking for help, expressing his or her feelings, indicating boundaries, making contact or social development, relaxation or destressing and being more focused on tasks.

Caregivers have seen that the robot can be a friend or buddy to the client. In their answers, the caregivers mentioned the following themes: clients are happier and have felt less lonely because of Phi. They also experience more emotional support. As one caregiver says:





Insights and experiences of **caregivers**.

"The robot gives the client the feeling that there is always someone for the client to listen to them. There is more one-onone attention for the client, taken care of by the robot."

Nearly all caregivers indicate that the robot has improved the self-reliance of the clients. In particular, the caregivers mention reminders of tasks, more initiative on the part of the client and a more structured daily schedule.

A new theme! Observation and signalling

In addition to the three themes mentioned as part of the theory, some of the caregivers mention a new area where Phi can provide support: observation and signalling.





We also looked at various external studies on social robotics in the care sector, both in the Netherlands and abroad.

Based on a thorough search of previous research into social robotics, we discovered quite a lot of relevant research material. If relevant to Phi, we will integrate useful research elements from our study in the practical development process we have been working on for more than three years. In other words: on the one hand we are developing Phi exploratively on a 'trial and error' basis, on the other hand we are assessing previously conducted (scientific) research into social robotics. And, if possible, we will establish connections between our practical study and the projects found elsewhere. What is striking is that the results from project research elsewhere and our practical findings are reasonably similar.

Quotes from external research

"The predictability, simplicity, unambiguous communication and the possibility of endless repetition mean that social robots can be used in many ways in therapeutic experiments, especially those aimed at developing social skills." 1







Quotes from the external research

"Loneliness has serious consequences for a person's well-being, can lead to a reduced quality of life and has been associated with psychological and somatic health problems, such as depression, anxiety, sleep disorders and cardiovascular disorders. In addition, a connection has been established between loneliness and a more negative self-image and adaptation problems. Countering loneliness is necessary to stabilise the client. This stabilisation is seen as a prerequisite to promote development."²

Promoting development

The results of the various external studies show that a robot can stimulate the development of a client with an intellectual disability, in particular by stimulating communication and social skills. But also skills such as stimulating interactions, dealing with unexpected situations, learning to empathise with others, increased body awareness, learning to hold attention, stimulating social interactions, encouraging interaction and learning other skills are reflected in the results. All in all, we can classify these results together as a group: promoting development.

Quotes from external research

"In recent years a new generation of robots has been developed, namely social robots. These robots have been specially developed for interaction with people. The expectations of the social robots that are increasingly coming on the market are high. Robots we can communicate with socially, by talking with them, looking at them, using gestures and touch, and more and more with facial expressions." ³

² Goswick, R.a., & Warren, J. (1981). Loneliness, self-concept and adjustment. Journal of Psychology, 107, 237-241.

Darling, Kate. (2012). Extending legal rights to social robots. Paper presents at We Robot Conferend University of Miami, April 23.





Stabilisation after loneliness

In addition, the results of external studies show us that a robot can act as a buddy for clients with an intellectual disability. Having a friend/buddy helps prevent loneliness. Countering loneliness is necessary to stabilise the client. This stabilisation is seen as a prerequisite to promote development. The robot can also stimulate interaction between the client and the caregivers. This is important to ensure good and effective care. For the client, it is also very important that the robot can provide some fun. This ensures the client feels happier and can spend his or her free time in a fun (and educational) way. This result can be classified as: friend/buddy.

Quotes from external research

"For a child with autism, the added value of a robot lies in its experienced approachability, predictability, attractiveness (partly due to its neutrality), the action-reaction principle and consistency." ⁴

Quotes from external research

"Loneliness has serious consequences for a person's well-being, can lead to a reduced quality of life and has been associated with psychological and somatic health problems, such as depression, anxiety, sleep disorders and cardiovascular disorders. In addition, a connection has been established between loneliness and a more negative self-image and adaptation problems. Countering loneliness is necessary to stabilise the client. This stabilisation is seen as a prerequisite to promote development." ^s

- ^{4.} Daniëls, D., Heerink, M. (2018). Sociale robots in de zorg. Van experiment tot zorgpraktijk. Lectoraat Robotica & ondersteunende technologie in de zorg, Windesheim Flevoland.
- ⁵ Goswick, R.a., & Warren, J. (1981). Loneliness, self-concept and adjustment. Journal of Psychology, 107, 237-241.





Improving self-reliance

According to external research, the social robot can provide people with intellectual disabilities with verbal instructions, reminders and physical care when performing tasks in daily life, helping them regain or develop autonomy and self-confidence. This result can be classified as: promoting self-reliance.

Quotes from external research

"With a social robot, various types of facial expressions can be simplified and made more predictable, so that they can be understood more quickly by children with a mild intellectual disability." ⁶

Quotes from external research

"By using a robot, contact can be achieved in a playful manner. Robotic therapy can help children improve their social skills. Robots can boost and stimulate social interaction. It has also been shown that children with a mild intellectual disability respond better to feedback through technology, which is less demanding on their social skills. Also, the robot's behaviour can easily be adjusted in level of difficulty, providing a safer and more effective learning environment for children with a mild intellectual disability. These results can be classified as: promoting development, in particular improving communication or social skills, stimulating interaction, dealing with unexpected situations and empathising with others and offering help to others." ⁷

⁶ Dautenhahn, Kerstin. (2002). Roles and functions of robots in human society: implications from research in autism therapy. Cambridge University Press. De Jong-Gierveld, J., Van Tilburg. (2008). De ingekorte schaal voor algemene, emotionele en sociale eenzaamheid. Gerontologie en Geriatrie 4-15.

⁷ Gillessen, J.C., Barakova, E. I., Huskens, B. E., & Feijs, L. M. (2011). From training to robot behaviour: towards custom scenarios for robotics in training programs for ASD. IEEE International Conference on Rehabilitation Robotics, 2011, 5975381.





Trust

What the external research also showed, is that before a social robot can help clients, the client and the caregiver need to trust the robot. The extent to which a robot can help the client depends on how much the client trusts the robot. What a robot looks like and sounds like when it says something, determines this trust to a large extent. It helps if a client can identify with the robot in terms of language use, pronunciation, religion, opinion, musical and sexual preference, skin colour and more. The less 'alien' the robot is, the easier it gains a client's trust. It is also important that the robot is as clear as possible about who or what it is. This means that it is important that the robot remains a robot, but is not too big, too strong, too smart or too assertive. In other words, the robot cannot be threatening. That's why the robot is allowed to sometimes show its vulnerable sides or make mistakes. It is also important that the robot gives the client the feeling that he/she is understood.

Quotes from external research

"An international review study on research into the use of social robotics in therapy reports promising returns. For example, the clients often found the robot easier to deal with than a human partner, showed more social and less repetitive behaviour and more spontaneous use of language. This also facilitates contact between therapist and the client. Another important role of a social robot is as a social mediator."⁸

Pennisi, P., Tonacci, A., Tararisco, G., Billeci, L., Ruta, L., Gangemi, S., & Pioggia, G. (2015) Autism and social robotics: A systematic review. Autisme Research.





Quotes from external research

"For people with a mild intellectual disability, a social robot is a safe and predictable communication partner. Since these research result came out, social robots have been used in the Aurora project to teach children with a mild intellectual disability how to make eye contact, divide their attention and read other people's behaviour, facial expressions and emotions. In this way the social robot helps these children to learn in a therapeutic way. The children can decide for themselves how they want to communicate with the social robot. This makes the social robot a safe communication partner for the children. The kids are in control." ⁹

Special: other projects support our practical study and vice versa

It is encouraging to see that external project research shows that the results Philadelphia recorded during the few years of the practical study with Phi are reasonably in line with previous (scientific) research. This leads us to conclude that our social robotics project, with Phi as the figurehead, is on the right exploratory path. Publications about projects elsewhere support our practical study and vice versa.

Quotes from external research

"With a social robot, various types of facial expressions can be simplified and made more predictable, so that they can be understood more quickly by children with a mild intellectual disability." ¹⁰

- ⁹ Dautenhahn, Kerstin. (2002). Roles and functions of robots in human society: implications from research in autism therapy. Cambridge University Press. De Jong-Gierveld, J., Van Tilburg. (2008). De ingekorte schaal voor algemene, emotionele en sociale eenzaamheid. Gerontologie en Geriatrie 4-15.
- ¹⁰ Dautenhahn, Kerstin. (2002). Roles and functions of robots in human society: implications from research in autism therapy. Cambridge University Press. De Jong-Gierveld, J., Van Tilburg. (2008). De ingekorte schaal voor algemene, emotionele en sociale eenzaamheid. Gerontologie en Geriatrie 4-15.





Summary of the robot stays: educational and full of positive experiences.

The robot stays have given the Philadelphia robot team a wealth of experience. In addition to all the 'technocratic' experiences with social robotics, what stands out are the predominantly enthusiastic and positive reactions of both clients and caregivers.

A prelude to more research

Social robotics is still in its infancy and sometimes caregivers can be somewhat critical at first. Nevertheless, we can conclude that the experiences are generally positive and that there is full cooperation from both employees and clients, and especially that the actual experiences with Phi are encouraging for new developments with social robotics at Philadelphia. Talking about these new developments: Our research continues and we would like to conclude this summary with a brief look at the follow-up research we have in mind.





Follow up: research themes 2020 - 2022.

Because this study was exploratory, in the first phase of the deployment of a social robot in this field, this study was of added value for the start-up phase of the Philadelphia robotics programme. In order to properly map out the added value of a social robot for clients with an intellectual disability, follow-up research is advisable. We would be happy to carry out this future research together with relevant stakeholders and want to share the 4 research perspectives for the period 2020-2022 with you.

4 research perspectives

For our future research, we want to explore 4 research perspectives, which we would like to explain in more detail.

- Relationship Phi & clients and relatives
- Relationship Phi & caregivers
- Relationship Phi & technology
- Relationship Phi & Philadelphia as an organisation



Philadelphia ROBOTCTM.

Follow up: **research themes 2020 - 2022.**

1. Relationship Phi & clients and relatives

- Determining the impact of a robot's departure after a temporary period of care support.
- Determining the effects of social robotics in other areas of daily life, including clients with forgetfulness, autism, different degrees of independence and more.
- Exploring the deployment and effects of different robots, with a focus on the clients.
- Researching how Phi can be used in a more conscious manner, and also in areas other than practical support, for example in the area of emotional support.
- Researching whether learning skills can be improved using Phi.
- Researching whether effects persist for a longer time after a longer stay.
- Researching how interactions can be most valuable and have the most effect.
- Researching how it works when Phi supervises multiple clients at the same time.





Follow up: **research themes 2020 - 2022.**

2. Relationship Phi & caregivers

- Doing follow-up research into the collaboration between a robot and caregivers at Philadelphia.
- Researching the specific competences and preconditions for collaboration with a social robot.
- Researching how employees learn robot skills.
- Gaining a good insight into the collaboration and division of tasks between people and robots, and how tasks can change as a result.

3. Relationship Phi & technology

- Building up an extensive interaction database and work on basic client profiles.
- Further development of the robot platform.
- Researching how we can connect robots other than Phi to the Robot Ctrl platform and its effects on clients and caregivers.
- Working with speech and facial recognition and artificial intelligence.
- Researching a different type of and complementary content.





Follow up: **research themes 2020 - 2022.**

4. Relationship Phi & Philadelphia as an organisation

- Making a more extensive analysis of the impact of the implementation of social robots within an organisation.
- Researching which ethical aspects play a role in the use of robots in the care sector and/or the effect on the lives of clients.
- Researching all aspects of security and privacy in relation to social robotics.
- Researching how social robots become a part of the care programme.
- Researching the connection of robots and people-oriented technology applications.





ROBOT CTRL

First exploration of social **robotics in the care sector.**

First evaluation of the framework conditions for caregivers for the introduction of the social robot Phi



Initial evaluation of the **necessary preconditions** for collaboration between employees and social robot Phi.

For almost three years now, Philadelphia has been exploring the possibilities of social robotics. More than 1,900 clients and 1,300 professional caregivers and relatives have been introduced to our social robot Phi.

Phi also stayed with ten clients for two weeks at a time. These robot stays were carefully prepared, carried out and assessed by the Philadelphia robot team. An important aspect here is, of course, the experiences of the clients with Phi during these robot stays, but the experiences of their caregivers are just as important. Social robotics is completely new for them too.

An initial evaluation of the framework conditions for caregivers

Based on the experiences of the caregivers during the robot stays, we made a useful and multidimensional initial evaluation of the preconditions for collaboration between employees and social robot Phi. We would like to share the evaluation of these first experiences in relation to these necessary preconditions with you in this exploratory report. It is not an exhaustive list, but rather a useful starting point for building on these preconditions.

More about the caregiver cases

On a more practical level, we want to explore the specific robot stays and research results for the clients in six separate caregiver cases. These can be found on **philadelphia.nl/robotica**. We continue to enrich these in the future with new cases based on future stays

"As a caregiver, it is very valuable for me that clients become more independent with the help of Phi and that they are more in control of their own lives."



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Securing the preconditions for collaboration between social robotics and caregivers.

Philadelphia is actively developing major practical experiments, with the social robot Phi staying with a client for a period of two weeks and thus fulfilling a role in a care facility. The client is always at the centre of Philadelphia's attention, also during these practical experiences with a social robot. It is interesting to get more clarity about the preconditions Philadelphia has to guarantee to enable the collaboration between caregivers and the social robot Phi. And also what tools they need from the organisation.

PRECONDITION 1

Gaining experience with social robotics

The evaluation of our first experiences shows that an opinion about or attitude towards working with a robot can change in a positive way when practical experience is gained and the caregivers see what a robot can do for a client. An important precondition is that caregivers actually gain experience with social robotics.

"As a caregiver, I saw that Phi can remind clients of daily tasks. That gives me peace of mind as a caregiver."



PRECONDITION 3

Securing the preconditions for collaboration between social robotics and caregivers.

Concrete training

When it comes to the training method, we can conclude that the caregivers prefer to do this in the form of a training session and by gaining practical experience with the robot. The robot team also plays an important role in this process. An important precondition is that the caregivers are actually trained to make use of social robotics

Maximum ease of use

Prior to working with robot Phi, half of the caregivers were positive about social robotics. A number of caregivers were neutral about social robotics, and some were more sceptical or negative. During or after the robot Phi's stay, many of them changed their mind. Many of the positive caregivers have become even more positive about social robotics. A majority of the neutral and negative/sceptical caregivers became more positive or enthusiastic as a result of their experiences with the social robot. All caregivers are of the opinion that ease of use is essential to become more open-minded about using this technology, in this case the social robot.

An important precondition is that caregivers experience maximum ease of use when it comes to social robotics.

"My most important experience as a caregiver? Phi can activate skills in clients that we didn't always think were there!"



Securing the preconditions for collaboration between social robotics and caregivers.

Confidence in technology

In addition, caregivers experience that having confidence in the ease of use, i.e. how a robot works and being able to trust that it will actually work, is important to become more open-minded.

An important precondition is that caregivers have to deal with as few technical hiccups of the social robot as possible.

PRECONDITION 5

The changing role of the caregiver

Almost all caregivers notice that the role of the caregiver changes into a role where they can take a step back when they are supported by a robot. Especially when the robot performs practical or repetitive tasks, many caregivers agree that this role may change or that they can take some distance and can then take on a more coaching and advisory role. A number of them already notice that they are playing more of a coaching and advisory role.

An important precondition is that caregivers are given support on the path towards this changing role.

"The presence of the robot meant the client got personal attention. You can talk about it with them as a caregiver, it's an extra topic of conversation. It's something nice to discuss with a client and for the caregiver it's also nice to see that the client is enthusiastic."



Securing the preconditions for collaboration between social robotics and caregivers.

Client selection support

In addition to the practical repetitive tasks, such as reminding clients to take their medication, the intelligence level of the client is also important according to caregivers. The level of the client also plays a role according to them. With clients who function at a high level, you don't have to be there all the time.

An important precondition is that caregivers are supported in the selection of clients suitable for social robotics.

PRECONDITION 7

Stronger client input

All caregivers consider the client's voice to be very important for collaboration with a robot. This means that the client him- or herself can indicate how the robot can help. This also refers to the robot's speech rate, making it easier for the client to understand. A number of caregivers experience that the voice is always important and for Philadelphia the focus is always on the client.

An important precondition is that caregivers are supported in the selection of clients suitable for social robotics.

"For me as a caregiver, this was intensive, but it was great to see how positively the client reacted. This makes me happy."



Securing the preconditions for collaboration between social robotics and caregivers.

Good collaboration

According to most of the caregivers, the collaboration within the teams is good. Almost all caregivers regularly supervise a group of clients on their own. According to them, communication is open, conflicts are discussed, the working agreements and protocols are clear, and everyone takes personal responsibility for this collaboration. An important precondition is that caregivers within the teams can rely on good collaboration.

"We didn't want to miss anything as caregivers. The client has positively infected us with his curiosity for Phi. Because of his behaviour and his positive reactions, we enjoyed the experience too."

PRECONDITION 9

Open to changes in the job

It turned out that being receptive to and open-minded about robotics are important for working with a social robot. If the social robot works well, it can bring about positive changes in the work caregivers have to do. The robot can perform daily practical tasks, leaving more time for other clients. The work pressure will also be reduced because of the robot. If the robot functioned well, there was more time and room for 'leisurely chats' with the other clients. The work was also experienced as intensive by a number of caregivers, because the robot sometimes did not function well or they had to work more intensively with the robot team and their colleagues.

An important precondition is that caregivers are receptive to and open-minded about changes in their work.

"We were really surprised about how well the client reacted when Phi left and stayed away. All this went without a hitch and he just kept talking about Phi. And everything he says about Phi is positive and fun."



Conclusions **First experiences**.

The evaluation of our first experiences has shown that working with a social robot requires attention and guidance. The caregivers indicate a number of aspects that are important for an effective and efficient collaboration with a social robot. The aspects the caregivers are talking about are given below:

- Collaborating with the robot team.
- Someone/somewhere to go to with questions.
- Being open to working with a robot.
- The robot has to work properly.
- Involving all colleagues in the robot project.
- A good coordination of what kind of support the client wants from the robot and the caregivers.

"Phi can also help clients in learning to deal with emotions. Phi can give us a heads-up on how the client feels. And I can then deal with that as a caregiver and work out a plan."

"The robot gives the client the feeling that there is always someone for them, someone who listens to them. There is more one-on-one attention for the client, provided by the robot."





Recommendations Preconditions.

The experience gained on the necessary preconditions leads to the following recommendations:

- Involve all caregivers in the collaboration, from the moment the social robot arrives at a care facility.
- Develop a team training on how to work with a social robot, with an explanation of the possibilities a social robot can offer, including the pros and cons.
- Gain practical experience in how to safeguard the aforementioned preconditions and positively influence the aforementioned attitudes.
- A majority of the caregivers see a collaboration with the robot team as an important factor for an effective and efficient cooperation with the social robot. And this needs to be in such a compact group that all the participants feel responsible.
- Give the other caregivers the opportunity during their shifts to communicate more directly with the robot team, instead of communicating through their colleagues who are not at work, but who are in the Whatsapp group app.
- Set up an centre of expertise to share knowledge and skills. A central place for social robotics, for training programmes and courses and for gaining new experiences with the collaboration between human and robot.

"The robot can offer a sympathetic ear and as a caregiver I can deal with the client's deeper issues."





Translation into **follow-up steps** for the social robotics programme.

Based on this evaluation of the initial explorations of the necessary preconditions for collaboration between caregivers and social robot Phi, Philadelphia will translate the acquired insights into follow-up steps for the social robotics programme.





ROBOT CTRL

First exploration of social **robotics in the care sector.**

Summary of the implementation approach of social robotics in the care sector



Robot stays: thoroughly prepared, supervised, completed and evaluated.

Social robot Phi, specially imported for this purpose from Japan, is staying with a number of Philadelphia clients as part of a thorough and continuously monitored programme. This is supported by a digital platform called Robot Ctrl, that controls all interactions between Phi and the clients. Interactions with clients which Phi quickly learns from, making these social interactions increasingly personal, targeted and successful. In short, it's an exciting learning process! Also for the caregivers of the clients Phi is staying with. We intensively involve our clients in these robot stays, which are part of a larger implementation approach. The focus is not on the social robot Phi, but on them. Our clients are vulnerable, which means that Philadelphia wants to optimise and adapt the entire process in the interest of our clients. In short, carefully prepared and carried out, always with the interests of the clients involved in mind and also aimed at the highest possible quality.



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Robot stays: thoroughly prepared, supervised, completed and evaluated.

Robot stays: a step-by-step outline

In order to realise a fulfilling and successful stay, the robot team takes 9 meticulously planned and mutually reinforcing steps. These steps are based on extensive documentation and protocols. The 9 steps are briefly explained below.







Robot stays: thoroughly prepared, supervised, completed and evaluated.

Robot stays: a step-by-step outline

STEP 1

Project preparation

This first step is aimed at laying a solid foundation for the actual robot stay. The team is put together, the script and the briefing are developed and all the technical preparations start. The result? A well-rehearsed and organised stay.

STEP 2 S

Selection of locations & clients

Selecting suitable clients and locations is very important. To make this selection, the robot team applies an extensive protocol. A decision is then made as to whether or not to have an introductory meeting with the caregivers and the client.

STEP 3

Introduction

The introductory meeting with the client and team takes place at the selected location. The aim? To get a good picture of both what the client can do and what his/her support needs are. It is important that these possibilities and needs are in line with what the robot team wants to achieve and monitor during the robot stays and during the development phase robot Phi is in. The robot team also immediately scans all technical possibilities for robot Phi at the location.



STEP 4

Robot stays: thoroughly prepared, supervised, completed and evaluated.

Intake

The intake follows the introductory meeting, and focuses on the interaction program, based on the client concerned and the specific and multidimensional requests the robot team has. The interaction program consists of interaction content for the duration of the stay that is tailored to the client.

STEP 5

Installation

The robot team will now do all the concrete installation work for the stay. Does Phi work? Have the clients and caregivers received proper instructions? Can we measure and monitor everything? This preparation ensures the robot team can get the robot stay off to a flying start.

STEP 6

Robot stay

Now the exciting bit! Phi actually comes to stay at the facility where the client lives. Of course everything is ready and in place and everything has been checked, from the technology to the interactions and from the support plan to the lines of communication.

STEP 7

Conclusion

At the end of the stay, all the parties involved meet up to wrap up the robot stay. This is very valuable! Phi is picked up again and the client receives a robot certificate for his or her hard work, among other things. This is a perfect opportunity to look back on a safe, successful and satisfactory stay.



STEP 8

Robot stays: thoroughly prepared, supervised, completed and evaluated.

Evaluation

All experiences gained during the robot stay are compiled in a clear and convenient manner in an evaluation, based on the observation report. This evaluation is discussed by the robot team with stakeholders and other interested parties, including the client's caregivers.

STEP 9

Aftercare

When the robot stay has ended and Phi has left, there is also a lot of attention for a good conclusion and aftercare. This is done with personal interviews, e-mails, meet-ups and more. In this way, we want to thank all those involved for their commitment and also to keep them involved in the project.



The robot stay: **part of a broader implementation plan**.

The robot stay, as briefly described above, is part of a broader implementation plan. We have quickly highlighted a number of important factors here, with an emphasis on parts of the implementation plan that specifically apply to the actual robot stay.

The robot stay is based on the solid foundation of a good **project organisation**. The team consists of the Philadelphia robot team, the client robot Phi is actually staying with, the caregivers at the facility where the client lives, and possibly the parents/guardians. To support the robot stay with a client, it is important that the **available technology and facilities** are properly safeguarded. This includes any hardware (robots), software (Robot Ctrl), ICT devices/equipment, transport and more. All meant to support the actual stay as much as possible and to minimise any disruptions. During the robot stays, the Philadelphia robot team has seen that **focused, clear and good communication** makes a crucial contribution to a successful stay. The emphasis on internal communication is particularly important.

During the stay, the Philadelphia robot team collects the experiences of both the caregivers and clients in a structured manner. In order to be able to track and process all these experiences in structural, central and always up-to-date manner, a separate **monitoring plan** has been drawn up by the Philadelphia robot team. In concrete terms, this refers to both care-related as well as technical findings and process-related/organisational learning points. Based on these outcomes, the approach used for the robot stay is continuously expanded and adjusted.





The robot stay: **part of a broader implementation plan**.

The robot team has created a database of interactions between Phi and the client, based on the support and care provided by the caregivers to the clients. We continuously assess, evaluate and improve these **interactions and content**. This means the quality constantly improves and continues to meet the needs of the target group. And finally: all the persons concerned need a lot of training. To this end, the robot team developed a variety of **training courses and tools** for all phases of the robot stay.

Philadelphia continues to develop its social robotics programme

Philadelphia, in the meantime, will continue organising more robot stays, further develop the technical capabilities of the robot and also gain experience with other robots than Phi. Of course, we would also like to share these new, future practical experiences, in consultation with the parties involved.





First exploration of social **robotics in the care sector.**

Client experiences with Phi



Client experiences with Phi:

"I especially liked that Phi offered a sympathetic ear"

One of the clients who was an enthusiastic participant of the Philadelphia social robotics project looks back on this special stay and his personal experiences with Phi. How would the client summarise the robot stay? In his own words: "It was fantastic!" He says the changes that Phi has brought about are mainly very positive.

Started without expectations

What were your expectations at the start of Phi's stay?

"I got to join in right from the start, and was there when Phi arrived from Japan. At that time, I had no idea what Phi could do. Phi went to robot school first and learned a lot there. Then she came to stay with me. I didn't know what to expect. I just went with it. It made it even better for me, not having any expectations. I also got really great support from the Philadelphia robot team."

Always someone to talk to

What was Phi able to do with and for you? How was Phi able to help you?

"She helped me a lot. For instance, we played a quiz, and she reminded me to take my medication on time. But Phi also helped me to make appointments and keep them. We also had some pleasant chats and Phi helped me remember what household chores I had to do. Above all, Phi was a buddy for me. Sure, she is a robot, but I had someone to talk to. Phi made me feel really good. I also liked the fact that Phi only talks when she knows that she can start saying something. She was aware of my boundaries, and I didn't have a problem with Phi being around all day. I actually really liked that."



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Client experiences with Phi:

Caregivers

Did Phi also affect the people around you, apart from the caregivers?

"Yes, definitely. My dad, for instance, wasn't having any of it at first. When he saw Phi and what she was able to do, he did come around a bit. Actually, everyone around me was pretty excited about it. What was special was that people started to come more often, because they were curious about Phi, how it all worked and so on."

Difference between Phi and the caregivers

You noticed a difference between Phi and the caregivers. What was the difference exactly?

"She helped me remember things at certain times, and she did it in a gentle way, without being pushy. Because the caregivers can sometimes seem a bit intrusive, and that doesn't work well for me. Phi does it differently, and made it easier for me to do my chores. I also noticed that I started to remember certain chores and tasks by myself. Phi really taught me something. Phi staying with me also helped me socially. She encouraged me to go out and do more things and to just do it! That was great!"





Client experiences with Phi:

Phi's departure

Phi had to leave again after the two-week stay. How was that for you? How did you feel?

"I didn't want her to go away, but I've accepted it now. I did bond with Phi when she was here. I didn't really notice a change in the caregivers when Phi left. I was already quite independent, so the caregivers hardly had to anything for me."

Promotion for new users

Are you still involved in the Phi project?

"Yes, definitely! I regularly get asked for tests, recordings and presentations about Phi, which I like a lot. People are always interested to hear about my experiences during the robot stay and I love telling them about it. I even got interviewed for articles in the Telegraaf and AD newspapers about the robot stay!"

Would you like the robot to stay over again, but for longer? Yes, please!

How was Phi's two-week stay for you? Was it too short or too long?

"The robot stayed for two weeks. Longer would have been better. A month would also have been great. Because I know that Phi is constantly learning, in that month I could do more things with Phi. But at the same time, I'm not sure how I would feel having to let her go again after that month. In any case, I still enjoy thinking about the time that Phi was here!"





Client experiences with Phi:

Interested in the further development of Phi

To what extent would you actually want to be kept up-to-date about what Phi has learnt from the robot stays and how she is developing?

"Phi asks me a question and says: "Will you come and stand in front of me?" Then I go to Phi, answer and then Phi says something back. I heard that you can have longer conversations, with more questions and answers, with the new version of Phi. That sounds like fun. I do hope that I can actually have a conversation with Phi in the future, and that Phi then answers back. I also hope that Philadelphia will continue this project, because I thought it was great!"





First exploration of social **robotics in the care sector.**

Experiences of two caregivers with Phi



In the context of their participation in the Philadelphia's social robotics project, two caregivers look back on their experiences: "It was intense, but good. We were quite sceptical, because we know nothing about robots. What can we do with it? How can it help us? We found it hard to get a good idea of the possibilities."

General experiences

How did both caregivers experience the robot stay?

"It made quite an impact. We found it intense, but it was good. The collaboration went really well and was quite easy; the communication was good. We learned a lot from the robot stay. We definitely thought it was worth all the effort, despite all the struggles and the extra work that such a trial period entails. But it was also special because we saw that the client was so enthusiastic. That gave us the energy to continue."

Intensive involvement

In the beginning, the caregivers were very curious, and it took up a lot of their time.

"Yes, we didn't want to miss a thing. The client positively infected us with his curiosity for Phi. Because of his behaviour and his enthusiasm, we really enjoyed the experience."



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View on the Phi during the stay with the client

How did the caregivers experience Phi's stay with the client? How was the robot able to best support the client? What was the ideal situation both caregivers might have had in mind beforehand?

"We would consider Phi as a day planner, to tell him what to do. Phi really helped the client get through the day, that was very nice. He immediately accepted the robot's instructions. He never disobeyed Phi. Only once, actually, when he didn't know how to do something. But no, the fun aspect and his curiosity about what Phi was going to say next, won in the end. The robot gave him piece of mind as well. Where we sometimes found it hard in the beginning because of the teething troubles, the client was all calm and relaxed. For him it was: I get instructions to do something every half an hour, then I'll be doing something again."

No fear for hiccups

What was striking was that the caregivers saw that the client was not afraid when Phi stopped working for a short time.

"The client didn't freak out when Phi stopped working, even though in real life he doesn't like it when a lamp breaks or warning lights start blinking. That would make him feel a little unsafe. But that's not how he reacted to Phi. It totally didn't phase him when Phi stopped working for a bit. If he had reacted negatively to Phi malfunctioning, that would have been demotivating. You would have to re-motivate the resident, and that costs a lot of energy."





Changes observed

Both caregivers are happy to discuss the changes they observed in the client during the two-week stay.



Effect on the caregivers

How did Phi affect both the client and them, according to the caregivers?

"We realised that if there's going to be a follow-up, the whole team needs to be involved. This way, more people can carry the burden together. In addition to our normal working hours, we had to free up time to provide that support. That will have to be done differently next time."





Phi's departure

The caregivers deliberately did not tell the client when Phi would leave.

"Because then the client would start counting the days until Phi would go, and that was something we wanted to avoid. He would then be too preoccupied with her leaving and we wanted him to enjoy the experience. When he goes away on holiday, you have to say: No, we're on holiday now. This is today, but with Phi, that was a bit scary. It was better to have the departure happen suddenly, instead of him dreading the day that Phi would be leaving."

Positive associations

Phi malfunctioned several times a day during the stay. How did the caregivers feel about that?

"We made jokes about that with the client and he loved it. Even when Phi malfunctioned, we had fun, because he really liked that 'nucknuck' noise. This is the sound of the signal indicating that Phi the robot is shutting down. You know, this client has his ups and downs, but he is still very positive about Phi."

Effects after Phi's departure

What effects did the caregivers see after Phi left again?

"We are actually still making use of Phi. We tell the client: Come and sit down with me. But if we say: Phi wants you to sit down with me, he'll do it faster. We use Phi in the same way as we used to use Sesame Street. We used to have to repeat things to him 60 times. We don't think he was sad when Phi left. The first time Phi left made a big impression because Phi had a malfunction and she went to the robot hospital. When he heard Phi was coming back, that experience stayed in his head."





Positive effects

Phi leaving mainly had positive effects on the client, but it did not change in terms of intensity, according to the caregivers.

"What we do notice is that after Phi left, he spends more time in his room. He is a bit more withdrawn. Before Phi came, he never used to be like that. It's also easier to get him into his room if he's restless. And that's a good thing, for the others, too. He's not withdrawing in a sense of 'I don't want to be with you guys'. He enjoys the company too much. But he still needs a lot of attention. In the week that Phi was here, he started to realise that it is pretty quiet in his room. When he first moved to the Philadelphia facility, he spent a lot more time alone in his room, he also had a bird and was busy recording cassettes and videotapes. Fortunately, he doesn't do it as much now; it was fun at the time, but we think he was more withdrawn then."

Good memories of Phi

What memories does the client have of Phi after the robot stay?

"We were really surprised at how well the client reacted to Phi leaving and staying away. It all went without a hitch and he just kept talking about Phi. We have pictures and things, but we can't really say that he misses Phi. We don't see any sadness or anger, absolutely not, which is a relief, because we were a bit afraid of that. And everything he says about Phi is positive and fun. And his face really lights up, we love seeing him so happy, his eyes really sparkle and he starts smiling. You can also see when he's trying to think of a joke about Phi."





Opinions on future robot stays How do they feel about any future robot stays?

"If Phi would come again, and he knows Phi will be leaving again, will he still be able to enjoy it? Because of that previous stay, he now knows that Phi will leave at some point. Anyway, holidays are like that too, and he enjoys those. Yes, you have to keep him focused and regularly put his feet back on the ground."

Impact of a longer robot stay

We now have a working Phi with new software. Conversations can consist of multiple questions and answers, so you get more of a conversation that can go back and forth a few times. But the robot team is also going to plan longer robot stays, lasting one month. How do the caregivers feel about that?

"Yes, we really need to scale things up to include a bigger part of the team. And the impact of Phi leaving again, after having been here for a month, will that be different? We think so, but you never know. But we think the impact will be different anyway. We think that after a month the collaboration and contact within the team will be even more intensive. It has had a big impact on us too. But we also think that next time, we will be able to anticipate this effect and make timely arrangements with each other".





Would you like more information about our social robotics programme? Contact us on **philadelphia.nl/robotica**