DRs 6.4, 6.8, 6.12: Y4 Dissemination Report

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The present report describes the work carried out during the last project year regarding PAL's Dissemination and Communication activities. It is the summary of three different WP6 Deliverables: Deliverable 6.4 "Website y4", Deliverable 6.8 "Publications and proceedings report y4" and Deliverable 6.12 "Dissemination events promoted y4"

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List of acronyms:

ICT   Information Communication Technology
Y1   Year 1
Y2   Year 2
Y3   Year 3
Y4   Year 4
NA   not available (or not necessary)
PIC   Person in Charge
T1DM   Type 1 Diabetes Mellitus
WP6   Work Package 6

1. Executive Summary

This report is intended to be a summary of the work carried out during the last project year in the context of PAL's Dissemination and Valorisation work package (WP6). The goal of the project dissemination is to increase awareness about PAL's innovative role in supporting children with Type 1 Diabetes Mellitus (T1DM) and its ability to generate new ICT healthcare models, tuning the messages to be conveyed on the public to which they are directed. To reach WP6 main objectives, a defined set of tasks has been undertaken during the project's lifetime by the Consortium, according to specific dissemination channels (for more details please see the *Y1 Dissemination Report*). Here we re-propose the tasks list:

1. Manage the sharing of knowledge among the PAL partners (Task 6.1, 6.6);
2. Build and raise awareness on the project outside the Consortium, both on-line (Task 6.1, 6.7) and off-line, via active participation in social media, public and on site events (Task 6.3) for the project lifetime and beyond;
3. Produce appropriate communication material on the project (Task 6.1. 6.2, 6.3, 6.4 ,6.5);
4. Disseminate knowledge, methodology, results and lessons learned in relevant Journals, Conferences and Workshops (Task 6.4);
5. Organize demonstrations for healthcare professionals, technology players and industries (Task 6.2);
6. Determine the health and economic impact of the PAL's solutions use for the project's stakeholders - e.g.: young patients and their families and healthcare professionals (Task 6.8).

In order to tangibly measure the impact of the described work-plan the Dissemination Indicators identified at the beginning of the project have been monitored over time and reported in order to update the present document so that they can provide an overlook of the progresses made in WP6. The current *Y4 Dissemination Report* aims at embracing the last release of three different documents: Deliverable 6.4 "Website Y4", Deliverable 6.8 "Publications and proceedings report Y4" and Deliverable 6.12 "Dissemination events promoted Y4". This choice was made to give a more organic view of the work accomplished in the current time frame.

The Report is organized as follows: *Section 2* recaps the PAL Dissemination strategy; *Section 3* summarizes the results achieved in the last project year according the project roadmap; *Section 4* recaps the on-line dissemination channels chosen for the PAL project and updates the stats about them; *Section 5* reports an overlook of the project-related publications; *Section 6* recaps the events organized or attended to disseminate PAL's researches; *Section 7* describes in details the coordinated *Final event* held the 6th of February 2019 in Italy and the Netherlands, *Section 8* summarizes the results achieved in communication and dissemination compared to the expected Impact; *Section 9* describes the official

project's dissemination material; *Section 10* ends the report with a track of the partners' internal meetings and communication tools.

Two Annexes have been added to provide a summary of the project lifecycle activities:

- ANNEX 1 -SUMMARY OF PAL DISSEMINATION EVENTS includes all initiatives and events that the Consortium attended/promoted in order to increase the project awareness and raise interest towards PAL's fields of research and objectives among different types of audiences.
- ANNEX 2 – SUMMARY OF PAL PUBLICATIONS AND PROCEEDINGS summarise all PAL project publications of the last four years, divided by typology and by year, excluded Journals & Book that have been inserted in the previous chapter.

2. The role of Dissemination in PAL

The main purpose of WP 6 is to effectively disseminate to third parties (during the lifespan and also after the end of the project) PAL's existence, research objectives, technologies developed and used, as long as the obtained results and impacts. To this extent, a precise Dissemination strategy has been defined and key steps are summarised in the following section.

The PAL Dissemination strategy
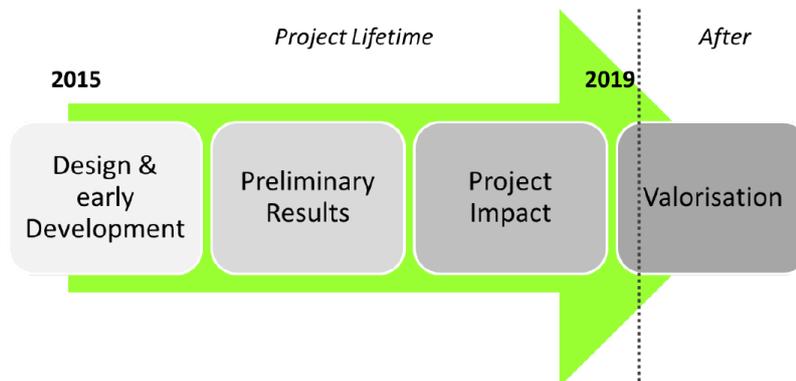

Figure 1: The PAL project Dissemination time line.

As shown in Figure 1, and reported in the previous deliverables, the plan for the PAL Dissemination has been designed, at the beginning of the project, to be articulated in four main stages (for an extensive description of each stage, please refer to Paragraph 2.1 of the *Y1 Dissemination Report*):

- Stage 1 - Design and early Development

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- Stage 2 - Preliminary Results
- Stage 3 - Project Impact
- Stage 4 - Valorisation

The work carried out in year 4 (Y4), falls under the scope of the *Project Impact and Valorisation* steps. Efforts have been spent in order to communicate among both the scientific community and the wider public PAL technical advancements and results obtained, in order to create a fertile soil to attract potential investors for a fruitful exploitation of PAL, not only in the technical sphere, but also in the healthcare-related one, including the medical, psychological and educational perspectives.

3. Tasks, objectives, results

Y4 work plan

During the fourth PAL year, the awareness on PAL aims and expectations previously established has been strengthen through a proper and trusted communication of the project's improvements and key results. To this extent, the main fields of intervention for the Y4 Dissemination activities were:

- *The project website has been restructured* with the main purposes of: *(i)* facilitating the communication, dissemination and exploitation of PAL outcomes, *(ii)* to extend the project's network and *(iii)* to communicate scientific results. With this in mind, the website has gained a new layout and organisation, to present information targeting different audiences (see Paragraph "PAL project official website");
- *The social media communication*, which serve as a complementary dissemination and communication channel in addition to the project website and aims to drive the online traffic to it, *has been reinforced*. To this extent, we worked to increase the number of posts, the participation to specific social groups and to engage the targeted audience (see Paragraph "The Social Network channels");
- *The creation and distribution of valuable and consistent content in the blog posts*, with the aim of attracting and retaining the audience;
- *Organising a coordinated PAL Final event, "Pal 4 Future Health"*, with some clear objectives in mind: (*i*) sharing the results obtained and lessons learned to a wider audience than researchers; (*ii*) defining the health and economic impact of PAL in healthcare and among technological and industrial actors; (*iii*) building and raising awareness on the project, *(iv)* disseminate knowledge, results, insights and methodology developed and applied during the project (see Section 7)
- *Organising or participating to educational workshops for students of all ages*, from the primary school till the university, discussing different topics and project's implications such as the ethical and the psychological ones;

- *Studying a project valorization roadmap*, both in general terms and focused on the single Consortium partner's perspectives (please refer to Deliverable 6.14 "PAL system impact valorization and future perspectives").

In the following parts of the current Dissemination Report, the main activities carried out to tackle these objectives and the related achievements are reported, based on their nature and main aim.

4. The PAL Online Dissemination

PAL is strongly committed to communicating and promoting project activities and outcomes to all the stakeholders, as their involvement is essential to the success of the project. All dissemination activities are designed to deliver the right messages to the right target audience. The *online dissemination* is targeting different stakeholders with the help of proper channels and the release of pertinent messages. We address mainly:

- The *Academic audience* through the PAL website, journals and conferences publications, workshops about project's goals, researches, advancements and achievements;
- The *General public* through the PAL website, its social media, Press Releases, news and dedicated in-person events with open discussions and demonstrations;
- The possible *Industrial and Commercial partners* through the PAL website, social media, Press Releases, news, exhibitions, call for ideas, all aiming at presenting the project key results.

For a better understanding, please see the paragraph "Home page relooking & content review", where it is exemplified what it is needed to speak to different audiences through the same media channel.

The project online dissemination campaign brought a good number of contacts and raised spontaneous awareness and interest in PAL, both from the General Public side and the Academic one. The same trend proposes again in the fourth year, confirming that, as for the previous years, the Communication Strategy built up by the Consortium could be considered effective.

In the current time frame, the Consortium kept updated the channels targeted for the purpose of dissemination, which are:

- the PAL official website and blog.
- the PAL social networks (i.e.: Twitter, Facebook, Instagram and Youtube).

The Consortium also maintained the distinction among the different types of information to be updated in the online channels available: *(i)* Institutional info about the project and the participants via PAL official project website; *(ii)* Structured formal news as blog posts; *(iii)* Flash news and formal updates such as

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pictures or references to other projects in the official project website and in the proper social media channel; *(iv)* News and informal updates about the project or ludic news by the PAL social networks. Please, for more details on the rationale behind this choice, refer to the *Y1 Dissemination Report*.

PAL project official website

The official website of the project (Figure 2) is available at the following address: http://www.pal4u.eu/, and it has been regularly updated with events, publications, results and news about trough the project lifetime.

The overall structure of the website has not changed in the years and it is articulated around the following main sections:

- *Home*: the home page of the web site (Figure 2), providing all the PAL most important information at a glance;

- *Project*: provides a general overview of the project, in terms of objectives, concept and approach, ambition and impact. It includes also a Consortium and Partners description and the experiments results (Figure 3);

- *Publications*: this area contains the list of all papers, a tag cloud, search filters and publications' information, e.g.: the abstracts, authors, links, BibTeX, tags (Figure 4);

- *Deliverables*: it contains all public deliverables approved (Figure 5);

- *In the News*: this area contains the Press review from traditional media like TV, Radio and magazines (Figure 6);

- *PAL Blog*: this is the area where articles and relevant announcements about the project are provided in more informal view, often providing the researchers' point of view.
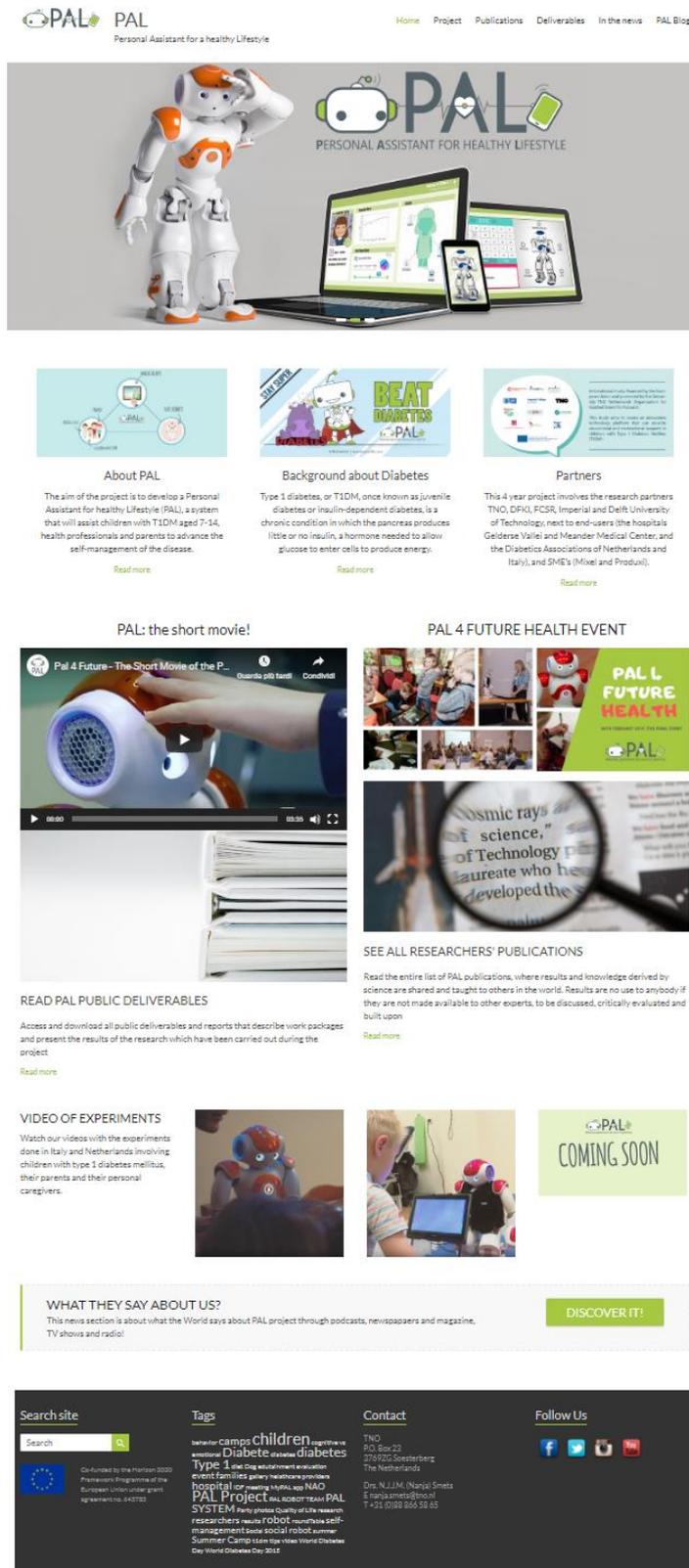
Figure 2: PAL website Home Page

Content review

All pages have been reviewed in the last year for the following reasons and with the following adjustments:

- to increase consistency the primary colour, normally used on buttons, links, highlighted text and keywords, has been set on the Green-PAL (Hex colour code: #A5C840);

- to favour readability all texts have been formatted, keywords are now bold, coloured or highlighted in some way, sentences have been shortened and different font sizes and types have been adopted;

- to catch the readers' eyes, the copy has been enriched with images, schemes and direct links.

See as example the Project Description in the *About* page (Figure 3)

Figure 3: Project area - About PAL

Figure 4: Publications page

Figure 5: Deliverables page

Figure 6: In the News page

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Home page relooking & content review

The *Home page* has been restructured in favour of a "catchier look" and a more intuitive navigation; to better address different audiences and increase their interest and engagement (Figure 7).

Using sidebars and featured contents the *Home page* is now audience-proof (Figure 8), this means that when readers come across the PAL website they immediately understand where to go to find something of their interest. As example, Researchers can directly access publications and deliverables by clicking on relative images or titles. The General Public can enjoy the gallery, videos or connect with PAL through the social media buttons; potential Commercial Partners can discover more about the results and the project in the *About section*.
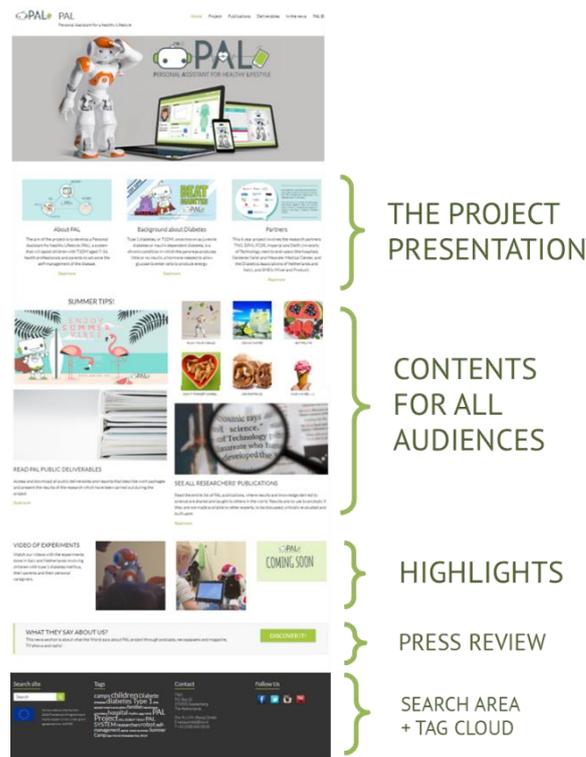
Figure 7: The home page sections are audience-oriented.

Figure 8: The new home page structure includes contents for all our Audiences.

Visual review

The website visual has been enriched with a lot of images and, to maintain interest on a high level, these have been changed periodically. E.g.: the banner PAL heroes have been updated in occasion or festivities and recurrences, such as the Christmas and the World Diabetes Day (Figure 9).
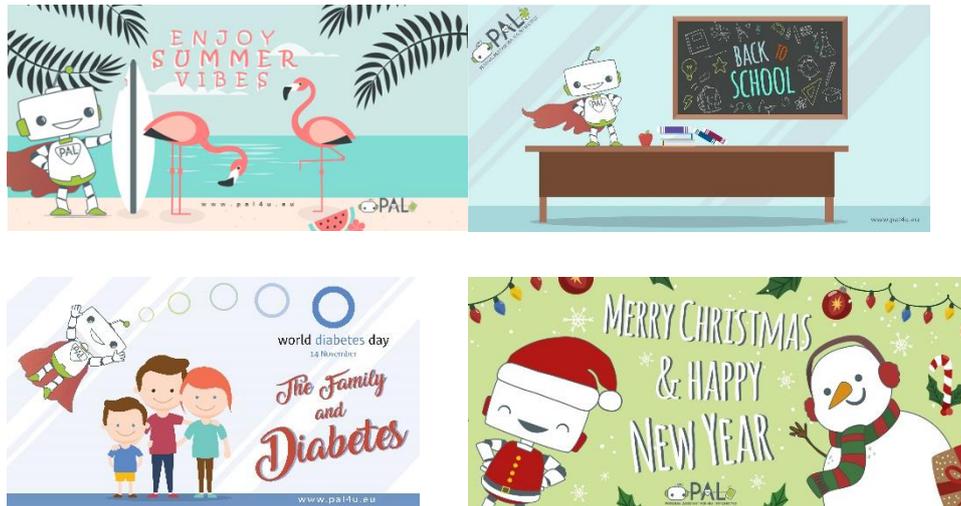
Figure 9: Some examples of PAL Banner Heroes.

New pages and new contents

Three pages has been re-framed as needing a complete new look:

- *Meet the Team* page
- *Experimental Video* landing pages
- *PAL blog*

The meet the team page (Figure 10) has been created from zero to acknowledge all researchers involved in the project; their data have been previously collected with the help of an excel file named "MentionMe" (Figure 11), together with their social media profiles and the consent/dissent to tag them.

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Figure 10: Meet the Team Page (http://www.pal4u.eu/project/team/)

Figure 11: MentionMe file excel overview*.

(* The file has been blurred to protect personal data of researchers that did not allow their mention).

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The Experimental Video landing pages now include a title, a descriptive text containing information about the experimentations' aim and process, the families involved and a conclusion. (Figure 12). Please note that, at the time being (February 2019), the third cycle video page is a work in progress, waiting for the video production.
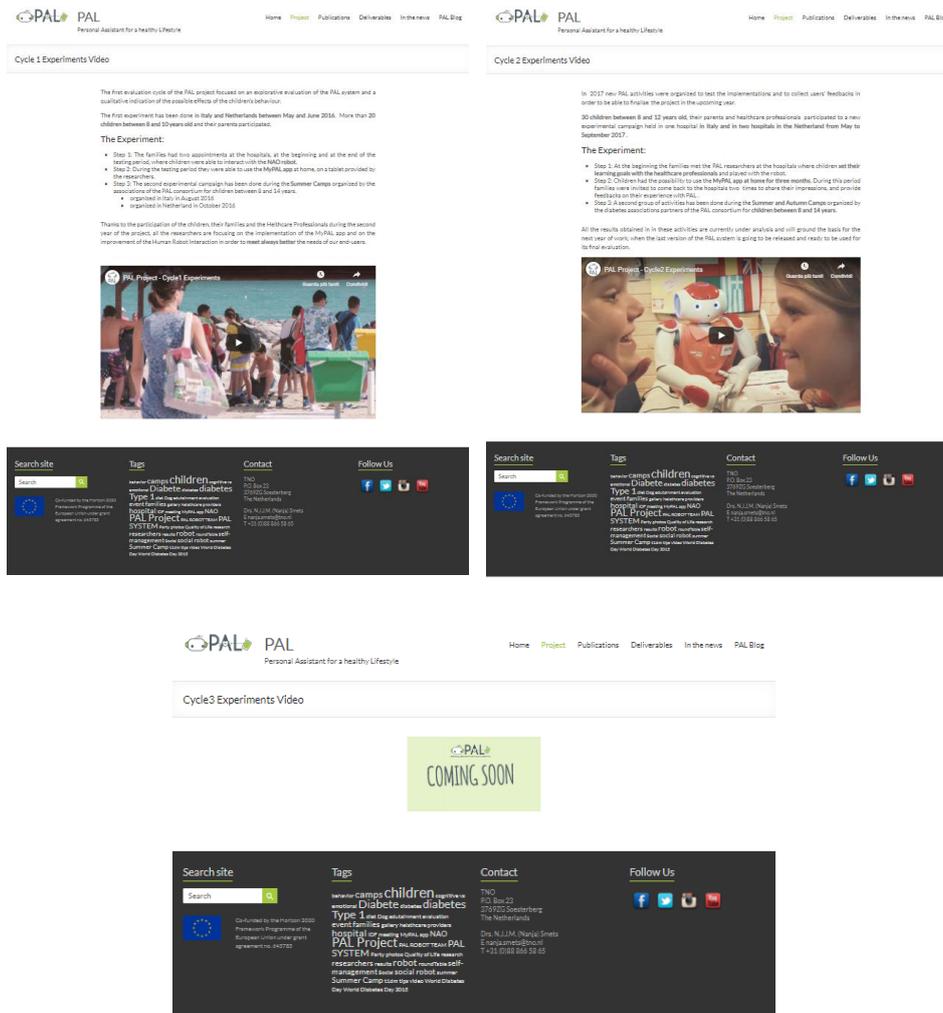
Figure 12: Cycle Experiments Video pages

The PAL Blog (Figure 13) is like a press area, containing all news coming from researchers and the communication manager dealing with the project. To increase the interest of all readership, this page has been reorganized in two columns to include on the right one all Social media feeds from Twitter, Facebook and Instagram.

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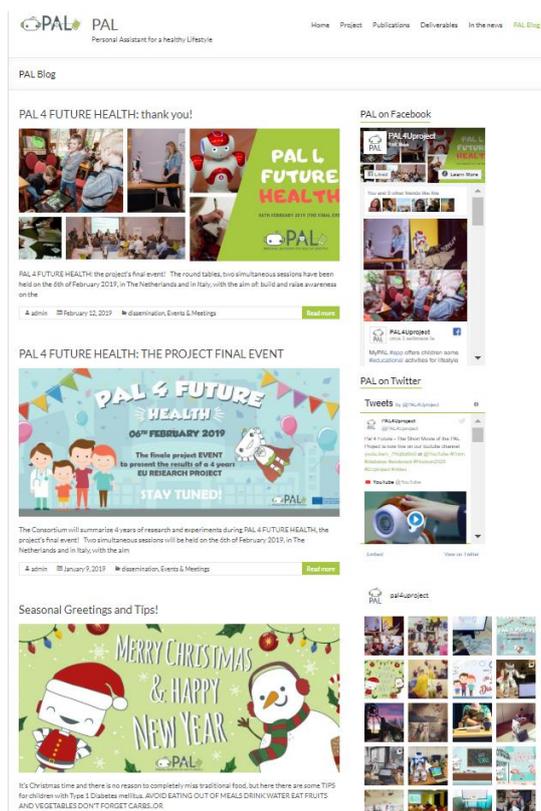
Figure 13: PAL blog page

To conclude, in this last year there have been many increases on both the activities' and results' sides:

- 59% of total visitors are from Y4,

- +251% is the average session duration increase (2 minutes and half), this means that the interest of readerships increased together with contents appeal,

Table 1 summarizes the website metrics obtained directly by Google Analytics, covering the entire activity of the four project years, while in the graphics in Figure 14 report only the last year data.

WEBSITE	Y4	Y3	Y2	Y1	TOTAL
	feb/2018-feb/2019	feb/2017-feb/2018	feb/2016-feb/2017	feb2015-feb/2016	
New Visitors	1.461	52	701	242	**2.456**
Average Session Duration	00:02:24	00:00:41	00:00:56	00:00:24	
Number of Blog Post	10	4	2	4	**20**
Number of articles "In the	18	14	4	2	**18**

News"
(incremental)

Table 1: Website Metrics*

New Visitor   **Returning Visitor**

Visitors, sessions & duration

Utenti
1.461

Pagine/sessione
2,61

Durata sessione media
00:02:24

Visitors Spoken language

Visitors gender

67,2% Female - 32,8% Male

		1.461
		% del totale: 100,00% (1.461)
1.	en-us	846 (57,91%)
2.	it-it	202 (13,83%)
3.	en-gb	125 (8,56%)
4.	de-de	42 (2,87%)
5.	fr-fr	30 (2,05%)
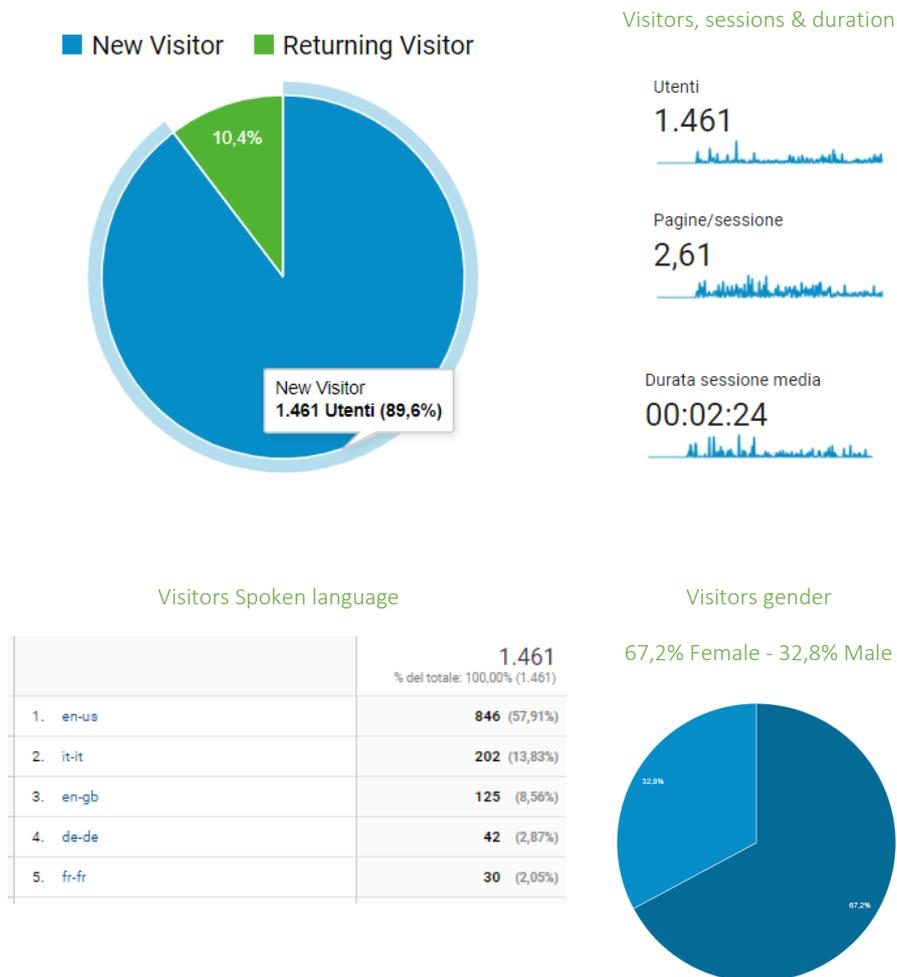
Figure 14: Google Analytics Graphics*

*All metrics are up to date 20th February 2019

The Social Network channels

Social media have been used as additional dissemination channels on the basis of the following evidence: nowadays people, especially the younger ones, are continuously searching for innovative ways of communicating electronically to fit their needs[1] and social networks are currently motivating new forms of social interaction, dialogue, exchange and collaboration among the users[2].

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[1] Maeve Duggan, Dana Page, Senior Communications Manager, Dana Page, and Senior Communications Manager. Maeve Duggan. (August), 2015.

[2] Mayank J. Trivedi Meghna J. Vyas. Role of social networking tool in dissemination of information at SMT.HANSA METHA library. e-Library Science Research Journal, 2(9), 2014.

During the fourth year of the project we introduced the social content calendar (Figure 15), an excel file to manage an integrated communication, favour the correct use of hash tags and tag partners and researchers.

Figure 15: Social Calendar (abstract)

Social media dissemination has been done through the following channels:

- Facebook
- Twitter
- Instagram
- YouTube

Through these tools the Consortium created a community of people interested in the development of PAL, not strictly scientific, but also involving the real end-users of the project solutions, such as Healthcare Professionals, families and children with T1DM, schools and most commonly, General Public. Through these social media, the Consortium disseminated contents about T1DM and project steps or achievement as frequently as possible and with a friendly approach. They also share contents from other sources (validated by the PAL Scientific Reviewer or Healthcare professionals), in order to keep people updated and engaged (see Figure 16).

In the following paragraphs are reported the details of each PAL social network.

Figure 16: An overview of some Posts.

Facebook

The nickname of the PAL Facebook account is *@PAL4Uproject* and it is visible at the following link https://www.facebook.com/PAL4Uproject/ (Figure 17).

The page is managed by FCSR researchers, but everyone can share news or related links on the page's notice board. Via Facebook, updates are shared on the project activities and T1DM related initiatives (both organized by the project partners or international events attended by PAL researchers - e.g.: World Diabetes Day related initiatives-) through pics, videos and interactive links, reaching both the General and the Academic Public.

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Figure 17: Facebook Page

Statistics for Facebook, concerning the interactions, coverage of the posts, the number of likes, etc. have been obtained directly by the Facebook Analytics tool available on the page and reported in Table 2.

Indicators	Y4 results	Increase respect to Y3
Number of post in Y4	84	47%
Number of Followers	183	14%
Average Coverage	317	17%
Total interactions on posts	691	
Average interactions per post	8	

Table 2: Facebook metrics*

Average age of followers
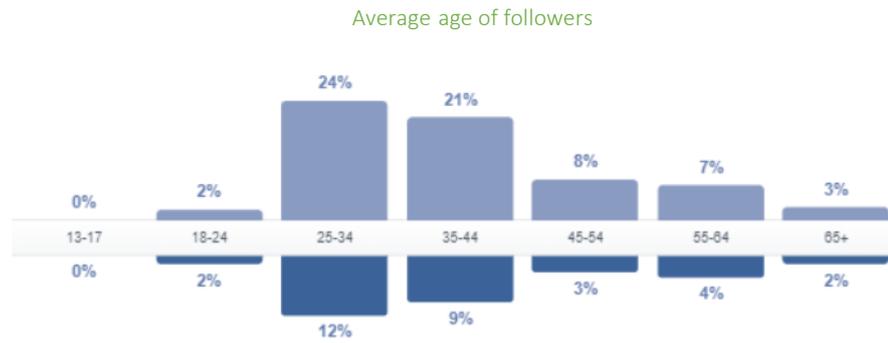
Geography of followers

Paese	Persone che ...
Italia	93
Paesi Bassi	40
Stati Uniti d'America	8
Germania	5
Belgio	3

Gender of followers

Donne

■ 66%
Persone che seguono la tua Pagina

Uomini

■ 33%
Persone che seguono la tua Pagina
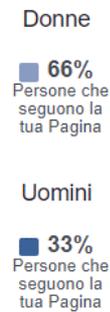
Figure 18: Facebook Metrics*

*All metrics are up to date 20th February 2019

Twitter

The PAL Twitter user name is *@PAL4Uproject* visible at the URL https://twitter.com/PAL4Uproject (Figure 19). Twitter messages are designed to be as contextualized as possible with links to interesting papers, websites, blogs, videos, pictures and other news. It is targeted for a young and active public, which is interested to have a flow of constantly up to date insights and, on this basis, is willing to learn more about the project researches (in our case, for example: researchers investigating on similar fields, healthcare institutions, young people with T1DM, parents, etc).

Figure 19: PAL Twitter profile

In the following, a summary of the Y4 achievements:

- +83% of new followers (corresponding to 64 people),

- +143% number of tweets in a year,

- +85% of all tweet visualizations in one year respect the previous year.

Table 3 summarizes the current Twitter metrics obtained directly by the Twitter Analytics, covering the entire activity of PAL in the four years.

TWITTER	Y4	Y3	Y2	Y1	TOTAL
	feb/2018-feb/2019	feb/2017-feb/2018	feb/2016-feb/2017	feb2015-feb/2016	
Tweets	34	14	85	86	**219**
Visualizations	27.323	14.755	NA	NA	
New Followers	64	35	36	49	**184**

Table 3: Twitter Metrics*

*All metrics are up to date 20th February 2019

Instagram

The PAL Instagram user name is *PAL4Uproject* visible at the URL https://www.instagram.com/pal4uproject/ (Figure 20). The focus of this social network is strictly visual, based on the use of images and hash-tags that are characterizing the project, to raise the interest of the public, especially the younger one, who are the main users of the service (mainly teens with T1DM).

Here below the summary of Y4 achievements:

- +56% of followers,

- +73% number of posts released in a year,

- +194% of total likes of the post of year 4,

- +69% of average likes for year 4 posts.
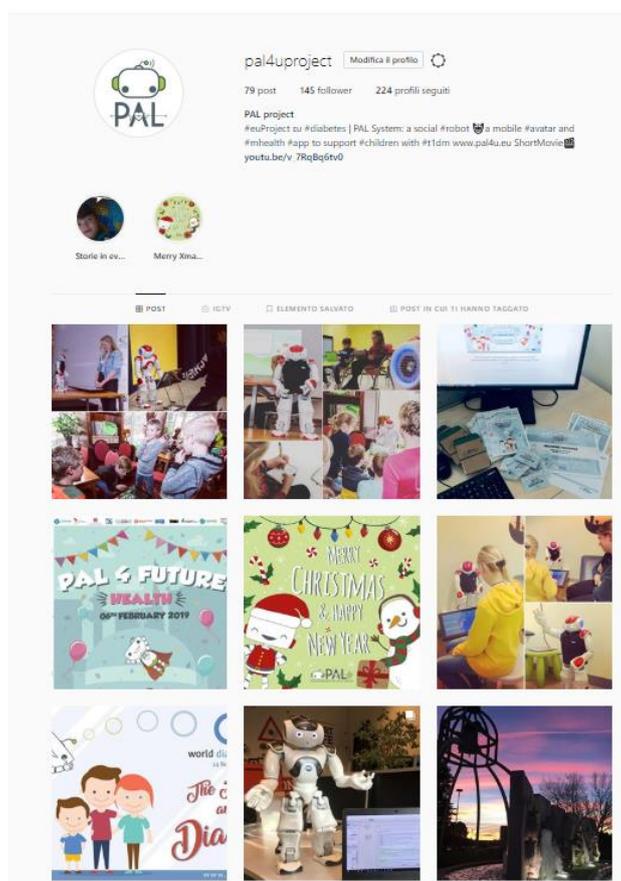
Figure 20: PAL Instagram profile

Table 4 reports with all metrics about the entire period of 4 years of Instagram activity. Instagram's stats were extracted by using the software Gabstats (www.gabstats.com/).

INSTAGRAM	Y4	Y3	Y2	Y1	TOTAL
	feb/2018-feb/2019	feb/2017-feb/2018	feb/2016-feb/2017	feb2015-feb/2016	
Total posts	19	11	20	30	**80**
Total likes	408	139	117	208	**872**
Average likes per post	22	13	6	7	
Total comments	23	0	3	8	
Average comments per post	2	0	1	1	
Followers	145	93	36	31	

Table 4: Instagram Metrics*
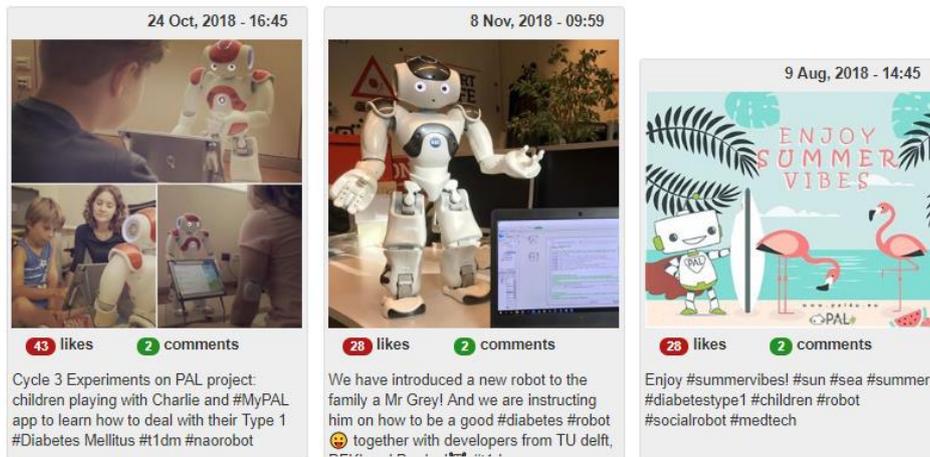
Figure 21: Best Posts in 4 years*
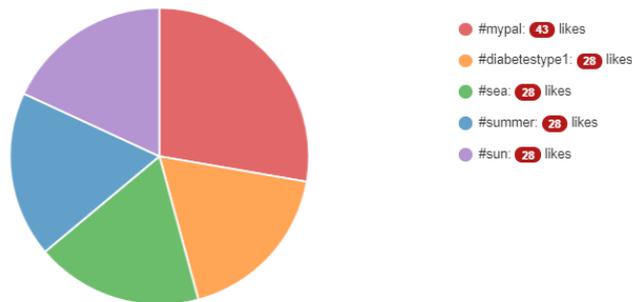
Figure 22: Best 5 hashtags of year 4 by average likes*

*All metrics are up to date 20th February 2019

YouTube

The YouTube page of the PAL project, available with the nickname *PAL4u project*. This channel is meant to collect all the project-related videos. So far there are 7 videos (see Figure 23) with a total views of 1550:

- the Pal4Future video realized for the final event,
- a Victory Dance video realized during the last Hackathon,
- 2 videos regarding the Cycle 1 & 2 Experiments, (waiting for the production of the 3rd cycle),
- 3 videos about the Summer Camps carried out during the past years.

Figure 23: PAL Youtube Channel

5. Publications

15 Deliverables are visible in the PAL website page *Deliverables* (http://www.pal4u.eu/home/deliverables/); they have also been stored on Zenodo repository (https://zenodo.org/).

In the Publications section of the PAL website (http://www.pal4u.eu/home/publications/), all the PAL related publications and proceedings of the last four years can be found. They are reported and divided by typology.

Here follows the list and the description of the ones released in the fourth year. For the previous years' publications please look at the *Dissemination Report Y1*, *Dissemination Report Y2* and *Dissemination Report Y3*.

Journals & Books

During the fourth year of the project the Consortium published articles in relevant research journals, as well as via publications in local Italian and Dutch newspapers. In the following, the publications related to this section are listed:

• Sinoo, C., van der Pal, S., Henkemans, O. A. B., Keizer, A., Bierman, B. P., Looije, R., & Neerincx, M. A. *Friendship with a robot: Children's perception of similarity between a robot's physical and virtual embodiment that supports diabetes self-managem*ent. Published in Patient Education and Counseling

(Volume 101, Issue 7, July 2018, Pages 1248-1255). https://www.ncbi.nlm.nih.gov/pubmed/29548599

• M. Sarabia, N. Young, K. Canavan, T. Edginton, Y. Demiris, MP Vizcaychipi, Assistive Robotic Technology to Combat Social Isolation in Acute Hospital Settings, International Journal of Social Robotics, 10:5 pp 607 - 620, Nov 2018. https://link.springer.com/article/10.1007/s12369-017-0421-z

- A. Cully, Y. Demiris, Online Knowledge Level Tracking with Data-Driven Student Models and Collaborative Filtering. IEEE Transactions on Knowledge and Data Engineering – TO APPEAR

- Neerincx, M. et al, Socio-Cognitive Engineering of a Robotic Partner for Child's Diabetes Self-Management. Frontiers Robotics and AI – SUBMITTED

Conferences

During the fourth project year, the PAL Consortium produced the following publications, related to papers that have been presented during international conferences/congresses. In the following the paper's details are listed together with their abstracts:

• **Hierarchical Behavioral Repertoires with Unsupervised Descriptors** - A. Cully, Y. Demiris. *Enabling artificial agents to automatically learn complex, versatile and high-performing behaviors is a long-lasting challenge. This paper presents a step in this direction with hierarchical behavioral repertoires that stack several behavioral repertoires to generate sophisticated behaviors. Each repertoire of this architecture uses the lower repertoires to create complex behaviors as sequences of simpler ones, while only the lowest repertoire directly controls the agent's movements. This paper also introduces a novel approach to automatically define behavioral descriptors thanks to an unsupervised neural network that organizes the produced high-level behaviors. The experiments show that the proposed architecture enables a robot to learn how to draw digits in an unsupervised manner after having learned to draw lines and arcs. Compared to traditional behavioral repertoires, the proposed architecture reduces the dimensionality of the optimization problems by orders of magnitude and provides behaviors with a twice better fitness. More importantly, it enables the transfer of knowledge between robots: a hierarchical repertoire evolved for a robotic arm to draw digits can be transferred to a humanoid robot by simply changing the lowest layer of the hierarchy. This enables the humanoid to draw digits although it has never been trained for this task.*

This paper was presented during The Genetic and Evolutionary Computation Conference at (GECCO 2018) in Kyoto, Japan, on the 15-19 July 2018.

• **Using Perceptual and Cognitive Explanations for Enhanced Human-Agent Team Performance** - Neerincx, M. A., van der Waa, J., Kaptein, F., & van

Diggelen, J. *Most explainable AI (XAI) research projects focus on well-delineated topics, such as interpretability of machine learning outcomes, knowledge sharing in a multi-agent system or human trust in agent's performance. For the development of explanations in human-agent teams, a more integrative approach is needed. This paper proposes a perceptual-cognitive explanation (PeCoX) framework for the development of explanations that address both the perceptual and cognitive foundations of an agent's behavior, distinguishing between explanation generation, communication and reception. It is a generic framework (i.e., the core is domain-agnostic and the perceptual layer is model-agnostic), and being developed and tested in the domains of transport, health-care and defense. The perceptual level entails the provision of an Intuitive Confidence Measure and the identification of the "foil" in a contrastive explanation. The cognitive level entails the selection of the beliefs, goals and emotions for explanations. Ontology Design Patterns are being constructed for the reasoning and communication, whereas Interaction Design Patterns are being constructed for the shaping of the multimodal communication. First results show (1) positive effects on human's understanding of the perceptual and cognitive foundation of agent's behavior, and (2) the need for harmonizing the explanations to the context and human's information processing capabilities.*

This paper was presented during the International Conference on Engineering Psychology and Cognitive Ergonomics in Las Vegas, Nevada, US, on the 15-20 July 2018.

• **RT-GENE: Real-Time Eye Gaze Estimation in Natural Environments** - T.Fischer, H. J. Chang, Y. Demiris. *In this work, we consider the problem of robust gaze estimation in natural environments. Large camera-to-subject distances and high variations in head pose and eye gaze angles are common in such environments. This leads to two main shortfalls in state-of-the-art methods for gaze estimation: hindered ground truth gaze annotation and diminished gaze estimation accuracy as image resolution decreases with distance. We first record a novel dataset of varied gaze and head pose images in a natural environment, addressing the issue of ground truth annotation by measuring head pose using a motion capture system and eye gaze using mobile eyetracking glasses. We apply semantic image inpainting to the area covered by the glasses to bridge the gap between training and testing images by removing the obtrusiveness of the glasses. We also present a new real-time algorithm involving appearance-based deep convolutional neural networks with increased capacity to cope with the diverse images in the new dataset. Experiments with this network architecture are conducted on a number of diverse eye-gaze datasets including our own, and in cross dataset evaluations. We demonstrate state-of-the-art performance in terms of estimation accuracy in all experiments, and the architecture performs well even on lower resolution images.*

This paper was presented during the European Conference on Computer Vision (ECCV 2018) in Munich, Germany, on the 8-14 September 2018.

• **Inferring Human Knowledgeability from Eye Gaze in Mobile Learning Environments** - O. Celiktutan and Y. Demiris. *What people look at during a visual task reflects an interplay between ocular motor functions and cognitive processes. In this paper, we study the links between eye gaze and cognitive states to investigate whether eye gaze reveal information about an individual's knowledgeability. We focus on a mobile learning scenario where a user and a virtual agent play a quiz game using a hand-held mobile device. To the best of our knowledge, this is the first attempt to predict user's knowledgeability from eye gaze using a noninvasive eye tracking method on mobile devices: we perform gaze estimation using front-facing camera of mobile devices in contrast to using specialised eye tracking devices. First, we define a set of eye movement features that are discriminative for inferring user's knowledgeability. Next, we train a model to predict users' knowledgeability in the course of responding to a question. We obtain a classification performance of 59.1% achieving human performance, using eye movement features only, which has implications for (1) adapting behaviours of the virtual agent to user's needs (e.g., virtual agent can give hints); (2) personalising quiz questions to the user's perceived knowledgeability.*

This paper was presented on The European Conference on Computer Vision (ECCV) Workshops, Munich, Germany, 8-14 September 2018.

• **How do children with diabetes evaluate the usability of a personal robot study supporting self-management at camp?** Sylvia van der Pal, Olivier Blanson Henkemans, Willeke van Vught, Bert Bierman, Mark Neerincx. *<u>Background and aims:</u> The PAL project' (EU H2020) develops in co-creation with the end users, a robot sys-tem supporting self-management in children (7-14y) with Type 1 Diabetes Mellitus (T1DM). The PAL-system consists of a pre-programmed robot buddy (NAO), which children meet in the hospital!, and it's virtual avatar, with whom children interact through a MyPAL-app, at home. The PAL-system is developed in three yearly cycles in the Netherlands and Italy, each consisting of a feasibly test, at diabetes camps, and an experiment at local hospitals. This abstract discusses the feasibility test in the third development cycle in the Netherlands (fall 2017), aiming at obtaining children opinions on the PAL-system's usability. <u>Methods:</u> During a four-day diabetes camp in the Netherlands, 22 children with T1DM participated in robot activities. Their opinions were surveyed through instruction cards, top 10 activity cards, gamification choice cards and the System Usability Scale (SUS) questionnaire. The activity cards were pilot tested during a diabetes 'Kidz& Ko' family event. Results were compared to those of the camp during the previous year 2. <u>Results:</u> The children appreciated the activities with the physical robot most. However, on average, they rated the usability of the MyPAL-app higher (SUS score above 75) than children at the previous year's camp (score below 70). Also, they perceived the robot and its avatar more as the same actor. They would appreciate new features motivating them to use the app. These opinions were translated to a requirements baseline for the PAL-system. <u>Conclusions:</u> The requirements elicited from this test were valuable to further develop of the PAL-system, including new gamification features, i.e., rewards system, high score list, personalization of the MyPAL-app*

look& feel. With these improvements, we anticipate higher levels of usability and use in the final experiment, in comparison to previous cycles.

This papaer was presented at European Pediatric Psychology Conferece in Ghent 2018, 20-21 September.

• **Usability of the PAL Objectives Dashboard for Children's Diabetes Self-Management Education** - R. Peters, E. Oleari, F. Sardu, M. Neerincx. *Children will only benefit from educational technologies and eCoaches when they understand the long-term consequences and are (intrinsically) motivated to use these support systems. This paper presents an Objective Dashboard that integrates educational achievements, goals and tasks with gamification features (such as challenges, scores and rewards) to advance the interests and engagements of children with type 1 diabetes when using the Personal Assistant for a healthy Lifestyle (PAL) system. By linking in-app activities (e.g., play a quiz or keep a diary) to relevant educational achievements, and to skills and knowledge required in daily life, we aim to increase intrinsic motivation and thereby usage. We designed a dashboard displaying personalised achievements, learning goals and tasks in the domain of diabetes self-management education. We used common user interface design patterns such as layering, colouring, and iconic presentation to organise complex information and reinforce the relations between concepts. Subsequently, we conducted a usability evaluation with twelve children, on the basis of which we refined our design. We found that, colouring and layering were to some extent effective, however, iconic representations were insufficient. Therefore, we recommend to provide short, descriptive labels at any time.*

This paper was presented during the 5th International Conference on e-Society, e-Learning and e-Technologies (ICSLT 2019) in Vienna, Austria, on the 10-12 January 2019.

• **VOnDA: A Framework for Ontology-Based Dialogue Managemen**t - Kiefer, B., Welker, A., Biwer, C. We present VOnDA, a framework to implement the dialogue management functionality in dialogue systems. Although domain-independent, VOnDA is tailored towards dialogue systems with a focus on social communication, which implies the need of a long-term memory and high user adaptivity. For these systems, which are used in health environments or elderly care, margin of error is very low and control over the dialogue process is of topmost importance. The same holds for commercial applications, where customer trust is at risk. VOnDA's specification and memory layer relies upon (extended) RDF/OWL 1 , which provides a universal and uniform representation, and facilitates interoperability with external data sources, e.g., from physical sensors.

The paper has been presented during the Tenth International Workshop on Spoken Dialogue Systems Technology (IWSDS) 2019 in Siracusa, Italy, on the 24-26 April 2019.

• **"Sharing is caring": designing a value-sensitive mhealth platform for sharing type 1 diabetes management within families** – Oleari, E., Pozzi, C., Sardu, F., Sacchitelli, F., Sanchini, V., Sanna, A. Within a mobile-technology enhanced educational framework, this study investigates needs and expectations of children (aged 8-14) with type 1 diabetes, and their parents, to define the functionalities of PAL Inform, a web-based monitoring module. The aim is to design it as a tool for parents to be informed on the educational progresses, as well on diabetes-related data, of their children without violating their values (privacy, trust, autonomy). Through a set of co-design activities, carried out with 39 children and 45 parents, it was possible to define which kind of information parents would monitor and children (especially pre-adolescents), in turn, would share, without compromising family dynamics: i.e. glycaemic values and trends, insulin doses, carbohydrates intake, generic emotional status, educational progresses on diabetes-related knowledge. Leveraging on these insights, a set of functional requirements was elicited for the future monitoring module implementation.

The paper will be presented during the 11th International Conference on e-Health in Porto, Portugal, on 17 - 19 July 2019.

6. PAL Dissemination events

During the fourth year of the project, the Consortium participated to several events in order to promote awareness and raise interest towards PAL's aims and results. Partners attended and held various events, symposium and seminars dealing with many topics, like Project presentations and Robot demonstration, educational lessons to pupils of 6-12 years old with the support of the MyPal app and NAO robot about healthy lifestyle habits, ethical and psychological implications discussed with high schools and university calls, collaborations on the theme of gamification in university laboratories.

Here follows a list of Dissemination events in Table 5. In the next paragraphs the attended Workshops and Invited Lectures are highlighted and described.

Event	Promoter	Where	When	Audience	Partner
Social robots in diabetes mellitus type 1; 4TU research meet symposium	Technical University Eindhoven	Eindhoven, NL	25/01/2018	General public, doctors, children with T1DM and their families	ZGV

DRItti a VOI 2018	OSR and DRI (Diabetes Research Institute, Milan)	Milan	10/03/2018	General public, doctors, children with T1DM and their families	FCSR SOS70
VoeDNet meeting	VoeDNet (association for dietitians)	Almere, NL	13/03/2018	Dieticians	TNO
Settimana della Scienza	FCSR and OSR and DRI	Lesmo	30/05/2018	Children age 6 -10 y.o.	FCSR
Digital assembly 2018	European Commission	Sofia, Bulgaria	25/06/18-26/06/18	more than 1,000 stakeholders and high-level policymakers	TNO
Applied AI/data science congress	TNO	Den haag, NL	27/09/2018	Researchers and companies interested in AI and data science	TNO
GET TO KNOW TNO	TNO	Delft, NL	12/10/2018	Students	TNO
Applied AI hackathon	TNO	Utrecht, NL	06/11/2018	Students	TNO
Philips World Usability Day	Philips	Eindhoven, NL	08/11/2018	Students, researchers and implementers	TNO
What's next Innovation Congress	Ministry of Justice and Security	Rotterdam, NL	20/11/18-21/11/18	Innovators	TNO
CLIN29	SIKS	Groningen, NL	31/01/2019	Students	TNO

Innovation 4 health	TNO	Rotterdam, NL	14/02/2019	People interested in Life Sciences and Health	TNO
EADV symposium	TNO Meander MC	Nieuwegein NL	14/03/2019	Healthcare professionals Working with diabetic patients	TNO Meander MC
Human robot in pediatric diabetes	Regional Health Insurance companies	Netherlands	29/03/2019	insurance companies	ZGV
the 17th Congress of the European Society for Developmental Perinatal and Pediatric Pharmacology		Basel, Switzerland	28-30/05/2019	Pediatricians	TNO

Table 5: List of the Events attended during which the Consortium presented the project

Workshops

During the fourth year of the project the PAL Consortium attended some workshops in order to disseminate the project implementations and results. In the following, articles presented in the corresponding events are reported, highlighting the type of public reached in these occasions.

• The workshop "**Robots for Assisted Living**" co-organised by Imperial College London, at the IEEE IROS (Intelligent Robots and Systems) conference, in Madrid, Spain, October 5th, 2018. Organizers: Sylvain Calinon (Idiap Research Institute, Switzerland), Sanja Dogramadzi (University of the West of England, UK), Carme Torras (CSIC-UPC, Spain), Tomohiro Shibata (Kyushu Institute of Technology, Japan), Yiannis Demiris (Imperial College London, UK) https://www.idiap.ch/workshop/iros2018/

AIMS: This workshop aims at bringing together persons working in the field of assistive robotics for healthcare and daily living, with the goal of discussing ongoing challenges, research directions, requirements and applications in this rapidly growing field. Robotics for assisted living spans a wide range of robotics expertise, including (physical) human-robot interaction, safety, verbal and nonverbal communication, interfaces, adaptive and compliant control, learning and adaptation for personalized assistance, analysis and recognition of daily living activities.

AUDIENCE: Robot industries, healthcare institutions, technological centers, research programs, professional associations, political forums, and the society at large are nowadays aware of the importance of developing assistive robotics technologies.

   • The workshop "***A social robot that motivates and learns children to manage diabetes, harmonized to child's present objectives, states and behaviors***" held by TNO and TUD researchers at the RO-MAN conference 2018, the 27th IEEE International Conference on Robot and Human Interactive Communication, Nanjing, China in the 27-31 August 2018.

Scope: This leading forum on Robot and Human Interactive Communication covers the state-of-the-art innovative results and the latest developments in a wide range of topics. This year's theme is "Social Intelligence in Interactive Robots". The conference will look at the impact of friendly, open, ecological and useful cognitive robots in practical & real-life applications in healthcare, industry, edutainment, and more, in the context of coexistence and cooperation. The workshops, tutorials, and industrial sessions (Tai'an) will provide an opportunity to participants from academia and industry to focus on specific and prospective topics. https://www.ieee-ras.org/component/rseventspro/event/1263-ro-man-2018-ieee-international-conference-on-robot-and-human-interactive-communication

   • The workshop "***What could go wrong?!***" held at the HRI 2018, The 13th Annual ACM/IEEE International Conference on Human Robot Interaction, Chicago, USA, the 5th March 2018. It was organised by TUD researchers and based on the paper publication "*The Challenges of Evaluating Child-Robot Interaction with Questionnaires*" – M. Ligthart, R. Peters. In this paper we reflect on the use of questionnaires as an evaluation tool in child-robot interaction research. We provide a case study containing eight user studies. While doing these user studies we ran into two major challenges: violations of the constructs used in questionnaires and a ceiling effect in the responses of the children. These issues are caused by a combination of factors such as, but not limited to, misinterpretations of questions, response biases, and the novelty effect. A first lesson learned is that a proper design of a questionnaire, and how questions are asked and answered, is essential. In this paper we discuss two questionnaire methods we have been developing that potentially could circumvent some of the issues. A second lesson learned is that user studies could benefit if they reflect the

long-term nature of the child-robot interaction. http://ii.tudelft.nl/what-could-go-wrong-workshop/

Invited Lectures

As well as Workshops, during the fourth year of the project, the Consortium participated to Invited Lectures in order to disseminate aims of the project and steps done:

 • *Course of Health Informatics at the San Raffaele University, Milan, Italy,5th April 2018*. The basis of social robotics and related discussions about ethics and psychological theories applied in PAL were presented to the psychology students by researchers of FCSR.

 • *Keynote at the Symposium "Internet of Things" Day in Rotterdam, NL, the 9th April 2018.* Researchers from TUD and TNO presented the project showing how integrating social robots into personal care and living environments: Examples of pediatric-diabetic care and elderly health care

 • *Course of Bioethics at the San Raffaele High School, Milan, Italy, 16th April 2018*. The project was introduced in the context of the course of bio-technology, a lesson and related discussion regarding the implication of HRI and CRI in the process of education and care to High school students by researchers of FCSR.

 • *OSR Diabetes Research Institute seminars: "New technologies in T1DM process of education and care", Milan, Italy, 25th May 2018*. In the context of the periodic seminars of the Diabetes Research Centre of OSR, PAL project aims, technologies and results obtained through the first two experimental cycles were discussed, as well as was given a brief overlook of the last experimental test campaign and potentialities to a public made of HCPs, medical doctors, researchers.

 • *Keynote at the IEEE International Conference on Intelligent Robots and Systems, Title "Personalisation in Assistive Robotics", Madrid 2nd Oct 2018.* Prof Yiannis Demiris (Imperial College London) presented the methodology and computational architectures required for personalising robot behaviours to individual users. Abstract: As humans and robots increasingly co-exist in home and rehabilitation settings for extended periods of time, it is crucial to account for the users' constantly evolving profiles and adapt the interaction to the personal characteristics of the individuals involved. I will describe our predictive computational architectures for enabling human robot interaction in joint tasks, and discuss the related computational problems, including user modelling, attention, perspective taking, prediction of forthcoming states, machine learning, explanation generation, and personalised shared autonomy. I will give examples from human robot collaboration experiments in diverse tasks, including robotic wheelchairs for disabled kids and adults, collaboration in musical tasks, activities

of daily living (for example dressing tasks), shared control for handheld robots, shared autonomy in driving, among others.

• *The correct nutrition event held at the Scuola Stoppani, Milan, Italy, 7th November 2018*. The project has been presented to 12 classes of pupils by researchers of FCSR, showing how the PAL robot educates elementary school children, talking about topics related to PAL as the importance of nutrition in all aspects of life: school, sport, home (especially snack).

• *Symposium "Trends in Behavior Change Technology" at the University Twente in Enschede, NL, the 14th November 2018.* Researchers from TUD and TNO presented the Robotic ePartners for Persistent Social Behaviour Change.

• *University laboratory "Giocare Guarire - La Gamification al servizio della conoscenza" ("Playing Healing – Gamification serving knowledge acquisition") at the IULM University of Milan, the 21st March 2019.* PAL researchers from FCSR will present the Project and assign to the students, divided in 8 groups, 4 Consumer Targets: Children with T1DM, Parents of children with T1DM, Associations supporting families of Children with T1DM and Pediatricians specialized in Diabetology to allow them to produce a market and a swot analysis, identify any exploitable result and develop a communication plans.

• *Guest speaker at the "eHealth and Innovations" – Wageningen University and Research, Wageningen, 8th March 2019. Gert Jan van der Burg Pediatrician at the Medical Information Innovation Consultant of Gelderse Vallei Hospital presented the PAL project at the University students.*

• *Keynote "Robotics for Healthcare of the future" – OSR Scientific Retreat, Baveno, 15th March 2019.* An overlook of the 4 years of PAL researches will be presented, focusing on the final results obtained and on the role of robotics in modern hospitals.

• *Invited Speaker at the "AI in Healthcare — AI in Action" public event, title: "Assistive Robotics and AI for Personalised Healthcare", London Mar 14, 2019*; Prof. Yiannis Demiris (Imperial College London) presented the computational architectures and machine learning algorithms used for personalising assistance to individual users, including examples from the PAL projects. Audience: healthcare professionals, AI specialists, and members of the general public (event open to everyone)

• *Invited speaker at the Workshop "End users needs if Social Robots: Ecosystem, Implications and Policies". Bucharest at the European Robotic Forum 2019, Bucharest 20-22/ 03 /2019..* The workshop aimed at presenting lessons learned from various EU, as well as industry projects, from the real deployment of social robots in different healthcare-related sectors. It envisioned to disseminate and identify the needs, R&D challenges and potential uses towards contributing

in B2B ecosystem of social robots. In this context, the PAL approach extorted in involving in the full-research loop the real end users was presented by FCSR.

7. The PAL Final Event

Wednesday February the 6th 2019, the PAL Consortium decided to organize a final event, simultaneously hosted in Italy and in the Netherlands, to share and discuss the results of PAL.

The event management started in July and consisted in four steps:

a. **Event definition:** some months before the event (6-12) the team settled event objectives, formula, budget, selected a date, a venue and the event name and people involved like speakers, presenters, moderators and audiences;
b. **Event Planning**: few months before (3-4) the event managers drafted the event and communication plans, as well as the logistics and defined for each activity a deadline;
c. **Roll out**: one or two months before the event, it was necessary to book and confirm location and services, such as catering, media, accommodation. The program was drafted, the press and participants were invited, and it was started to promote the event, manage registrations, produce all communication materials and gadget, brief the various speakers and collaborators, prepare presentations;
d. **Follow up**: this step took place after the event and consisted on a wrap up of all activities: payments, thank all guests, publish posts and galleries, reporting, evaluation and conclusions.

Event definition

Event Name: PAL 4 Future Health

Date: Wednesday February 6th 2019

Event objectives:

- share the results obtained and lessons learned to a wider audience than researchers,
- discuss the possible health and economic impact of PAL in healthcare and among technological and industrial actors,
- build and raise awareness on the project, disseminate knowledge, results, insights and methodology developed and applied during the project.

The event name definition required a creative brain storming and a mental map to defined a list of possible names: Pal Up Day, Pal4U Day, PAL Legacy,

Pal4fUture, Pal4Diabetes Day, Cheers4PAL, Together 4 PAL, PAL Effect. To involve all partners followed an internal Survey using a free tool Survey Monkey (https://it.surveymonkey.com/) to choose an option between the listed names or edit a new one. The winner was Pal4fUture with an additional connotation and here the final event name: "**PAL4Future HEALTH**".

The event formula was hybrid, merging a conference, a round table, a demo and a networking event. The event started with a project presentation done by FCSR and TNO researchers (respectively in the two locations), describing the methodology, expectations, preliminary results and final considerations. A part from the public, a round table of experts from different sectors was attending and engaged in an open discussion about PAL exploitation in pharma, ICT and health industries. Children and families, who had co-designed the system, were also present and had the chance to describe their experience, pros and cons of PAL and children interacted with the robot and the apps in the demo corners to show how the PAL System works. At the end of the day a networking moment allowed PAL Consortium members to warmly thank all participants.

Date and Venues: the 6th of February at *Dierenpark Amersfoort Barchman Wuytierslaan 224 – Amersfoort, The Netherlands* and *Ospedale San Raffaele Congress Center, Via Olgettina 60 – Milan, Italy*. After having defined the logistic of the event, a Generic English landing page for subscribers was created: http://www.pal4u.eu/events/en/ (Figure 24).
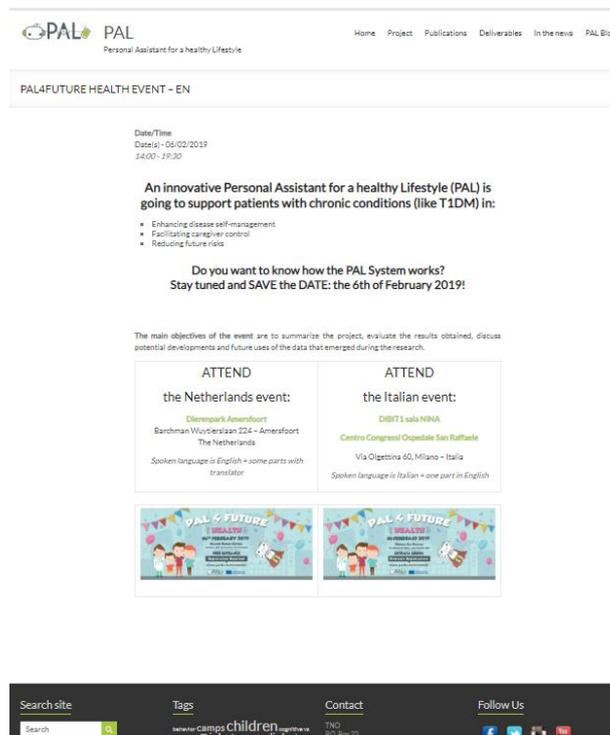
Figure 24: English Landing Page

Event audiences were various, due to the hybrid event formula. In fact, the conference-style presentations were mainly addressed to researchers, students, pediatricians, nurses, diabetes associations and families; the round table discussion was targeting start-uppers, business angels, pharma industry and media; demo corners and testimonials were of interest for all of them. For this reasons every project partner was expected to collect a list of speakers and attendees, who could be interested in attending the event.

Summarizing, we invited a total of 280 people: 180 in Italy and 200 in the Netherlands.

Event planning

The event plan

Since the organization has been separately managed in the Netherland, by TNO, and in Italy, by FCSR, the management of the event has been done with the help of a shared excel file "To do list" (see an abstract in Figure 25). In the file were listed all activities, the macro areas of pertinence, the Person in Charge (PIC), a sort of deadline expressed in months and the activities' status: in progress, done, NA (not available/ not necessary).

Stage	Task	PIC	Deadline	Remarks	Status
Planning	Event definition	All Partners	october	Set a date, objective and audiences	Done
Planning	Book location	Michela	november	3 proforma, a declaration Pay attention to possible location restrictions	Done
Planning	Budget plan	PM	november	Waiting final proforma by Achelois + Gadget	Done
Planning	Attendee mailing lists	All Partners	november	SS70/Pediatrician/Mixel	Done
Planning	Communication plan	Michela	november	Social media (all) + blog post + mailing	Done
Planning	Draft the Agenda	Michela	november	1.30 pm Registration / 2.00 pm welcome + intro / 2.15 pm Video introduction (?) / 2.30 pm Roundtable (2h) / 4.30 pm Demo corner setup + coffee break / 5.30 pm Parent/child testimonials (2/3) / 7.00 pm Aperitif	Done
Planning	Identify Guest speakers	Michela	november	1. Pharmacy/Insurance / 2. Public administration / 3. Technical / 4. Doctor / 5. Pal consortium representative / 6. Mediator	Done
Planning	Event communication materials	Michela	november		Done
Communication	Event page creation (web)	Michela	november		Done
Communication	Event page update (web)	Michela	november		Done
Communication	Email invitation	Michela	november		Done
Planning	Preparing the SAVE THE DATE	Michela	november	Draft, design, review and edit	Done
Planning	Chair for the day needed?	Michela	november	Location provide them	Done
Planning	First contact with guest speakers	Michela	november	waiting last names: Vodafone (Sanna) + ST (Mario) + Pediatra (Ele)	Done
Planning	Find Photographer & Video maker	Michela	november	Manuel Zullo + Marco Mura	Done
Planning	Finalize Program	Michela	november		Done
Planning	Draw up map of different rooms	Michela	november	not necessary	NA
Planning	Purchase technical equipment	Michela	november	Manuel 2 PC + Modem + Tappeto + ciabatte	Done
Planning	Purchase catering	Michela	november	Achelois will provide it - menu must be defined	Done
Planning	Information package	Michela	november		Done
Follow up	Gives away	Michela	november	define, budget, produce (Block notes + agenda/brochure)	Done
Communication	1st Post on Social media + web	Michela	december		Done
Communication	Sending SAVE THE DATE - I	Michela	december	waiting mailing lists + graphics + Location definition	Done
Communication	Press and journalist invitation	Michela	december	must identify all journals/magz interested and local newspapers	Done
Planning	Send list of hotels in case actual	Michela	december	not necessary	NA
Planning	Dinner in the evening with consortium member & speakers? If actual	Michela	december	not necessary	NA
Planning	Round table questions and agenda	Michela	december	Meeting with Mario e Elettra (24/01)	Done
Communication	Send Save the date - II	Michela	January		Done
Planning	Identify internal people needed	Michela	January		Done
Communication	Reminder invitation (1 week ahead)	Michela	January		Done
Communication	Preparation of name tags	Michela	January	Cavalieri da fare e stampare	Done
Roll out	Prepare brief	Michela	January	Brief for Speakers, moderators and partners	Done
Communication	Preparation of presentations	FCSR	January		Done
Tech	Preparation and building of stands	Mixel + Zullo	January	playgroud + NAO update	Done
Roll out	Welcome desk	Michela	January	Briefing on how to welcome guests to Engage Elena Massa + Alice Leporini	Done
Communication	Privacy policy and video/images right usage	Aurucci	January	Liberatorie + upload on Landing page	Done
Communication	Subscription form + Authorization creation/print	Michela	January	Design, print and assemble attendance register	Done
Tech	Make sure audio, projectors, writing boards & other materials are ready at site.	Mura+Zullo + Achelois	February	1st check Meeting 30/01	Done
Tech	Check set up meeting rooms	Mura+Zullo + Achelois	february	6th february	Done
Tech	WIFI for guests	Michela	february	Not stable	Done
Follow up	Thanks email	Michela	february	Personal email for speakers	Done
Communication	Design thanks email	Michela	february	Design a graphic email for all attendee	Done
Communication	Publish the event gallery & results	Michela	february	Post gallery on social media & web	Done

Figure 25: Event "To do List"

The Communication plan

The Communication plan was threefold:

- One for the institutional communication (in English)
- One targeting for the Netherlands event (in English)
- One targeting the Italian event (in Italian)

Institutional event communication – English language

The official communication, mainly online, was the same for both events and required a generic message in English. All banners declinations (Figure 26:), from the social media covers to social posts till the website banner heroes, have been linked to the blog page (Figure 27) or to the English website page.

Figure 26: Event Banner in English

PAL 4 FUTURE HEALTH: THE PROJECT FINAL EVENT

The Consortium will summarize 4 years of research and experiments during PAL 4 FUTURE HEALTH, the project's final event!

Two simultaneous sessions will be held on **the 6th of February 2019**, in The Netherlands and in Italy, with the aim of:

- build and raise awareness on the project, disseminate knowledge, results, insights and methodology developed and applied during the project
- share the results obtained and lessons learned to a wider audience than researchers
- determine the health and economic impact of PAL in healthcare and among technological and industrial actors

Researchers will present the results of a **4 years EU RESEARCH PROJECT** that developed a **Personal Assistant for a healthy Lifestyle (PAL), supporting CHILDREN with T1DM** aged 7-14, health care professionals and parents to advance child's disease self-management.

EXPERTS from **PHARMA, ICT, DIABETES** and Policy Makers will discuss in a **ROUND TABLE** about personalized **#eHealth** through **#edutainment, #SocialRobots,** Mobile Health App – **#mHealth, #CareCustomization** and Children **#self-monitoring.**

CHILDREN and FAMILIES, who have co-designed and tested the system, will describe their **EXPERIENCES** and explain how PAL could be integrated into their daily experience.

Some **demo corners** will be available for journalists and attendees to see how the PAL System works and they will have the chance to interact with a social robot, its mobile avatar in the App and see how monitoring has been made easier for parents and doctors through a mobile health application.

At the end of the day a networking moment and the aperitivo!

We strongly believe that the research in general and THE PAL SYSTEM in particular CAN IMPROVE THE QUALITY OF CARE!

To attend the event in The Netherlands apply here, to attend the Italian event apply here.

Figure 27: Event post on the Blog

To recruit targeted audiences we created the event page on Facebook and shared event posts on some Diabetic Facebook groups (such as Diabetes Community, Mamme e Diabete, Portale Diabete, Siedp), see Figures 28-31.
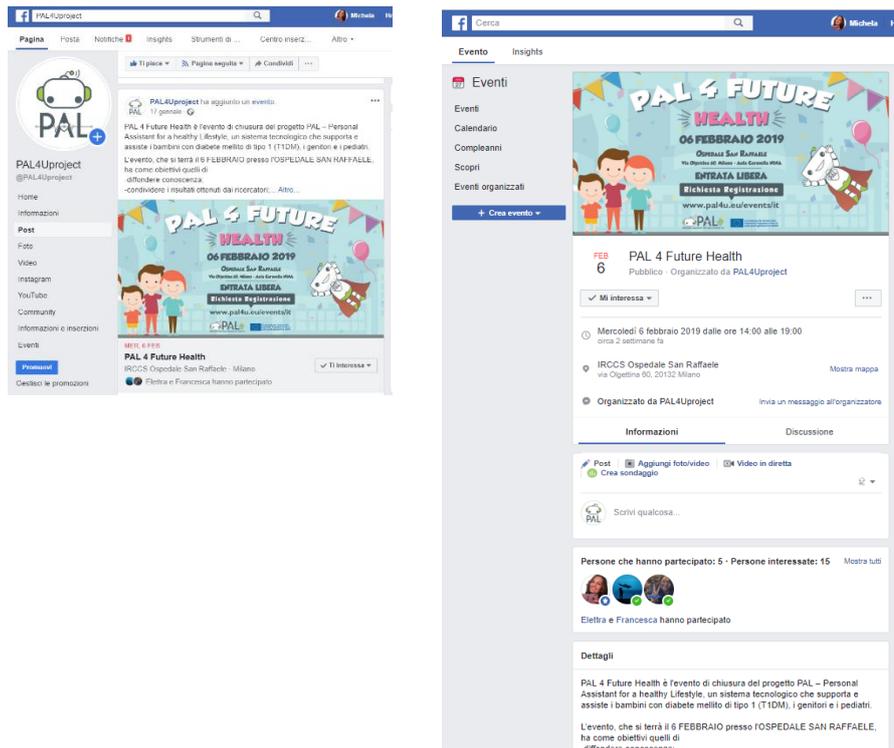
Figure 28: The Event page on Facebook
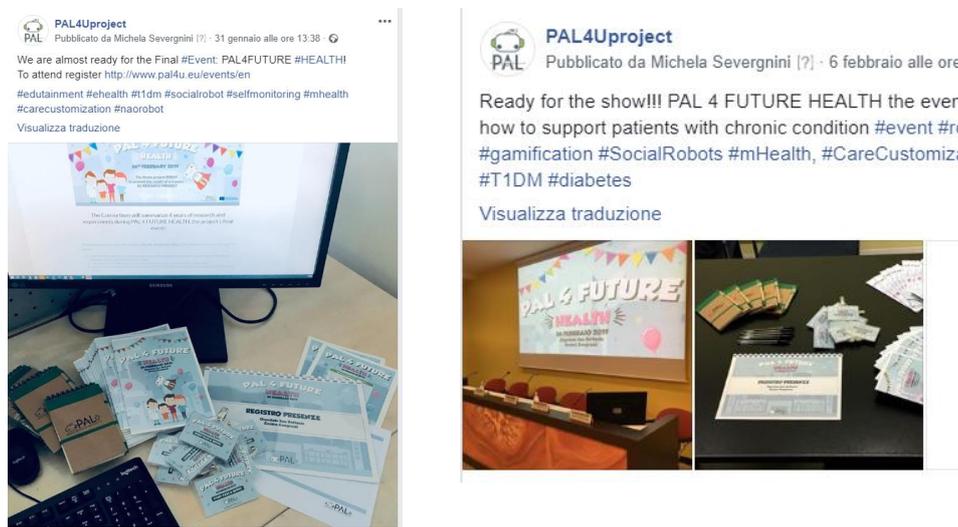
Figure 29: Facebook Event's posts

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Figure 30: Tweets
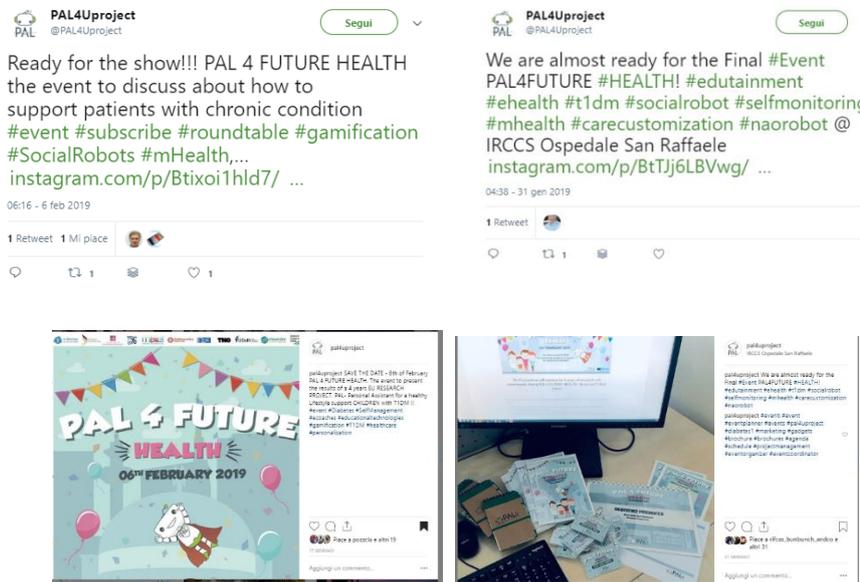
Figure 31: Instagram event news

The Pal4Future Video

The Consortium decided to realize an emotional video directly involving children with T1DM to present the project, its possible benefits and solutions, intrigue the audience about PAL and encourage them to deepen, and last but not least to sensitize about Research in general. For all these reasons, we decided to do the movie premiere of the final video at the Final event.

The video, entitled "PAL4Future", has been edited in two versions: an English version without subtitles for the large audience – and the Dutch event - and an English version with Italian subtitles for the Italian event (Figure 32: PAL4Future Video).

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After the event, the videos have been posted on the website homepage and on social media (Figure 33, Figure 34, Figure 35). Here some data about exposure and metrics*:

- *YouTube channel*: 47 Views (english Version) / 74 views (Sub. Ita version)
- *Instagram story:* 21 visualizations
- *Facebook:* Impression 571, Coverage 314, Shared 4 times, Interactions 9
- T*witter*: Coverage 762, Retweet 3, Interactions 26

*Updated to the 21st of February.

Figure 32: PAL4Future Video
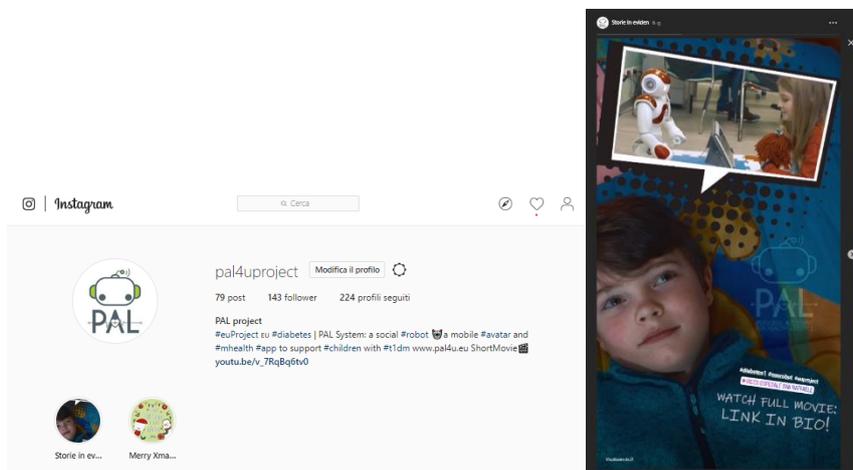
Figure 33: PAL4Future video on Instagram

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Figure 34: PAL4Future Video on Facebook

Figure 35: PAL4Future Video on Twitter

Local communications materials

The communication plan required the creation of two separated set of collaterals:

- **Landing pages** to manage subscriptions: The Netherlands landing page sits on the link http://www.pal4u.eu/events/nl/ and the Italian one at the following http://www.pal4u.eu/events/it/ (Figure 36)
- **Emailing invitation** to recruit target audiences: emails have been drafted with Mail chimp free tool (https://mailchimp.com/), invitations has been done in different tranches, 1st Save the date, 2nd save the date, a Reminder, a "thank you" email, (Figure 37 and Figure 38)
- **Signage** and material for an integrated communication has been realized based on the different needs, such as posters (Figure 39), event pass & buffet ticket (Figure 40), horizontal signage (Figure 42) and Speakers' knights (Figure 41)
- **Gadgets**: block notes (Figure 44), bags, the event program (Figure 43).

Figure 36: The Landing page

Figure 37: The Netherlands save the date emails

Figure 38: Italian Save the Date emails

Figure 39: Event poster

Figure 40: Event pass & Ticket buffet

Figure 41: Round table knights

Figure 42: Horizontal Signage A3 format

Figure 43: The program of the event (back and front) - A5 format closed

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Figure 44: Welcome & registration desk

Event roll out

The morning of the event we have done the last check and arrangements:

- Testing the video conference system for the live session between the Dutch and the Italian panel;
- Setting up the demo corners and check the robot performance;
- Preparing the welcome desk;
- Attach the signage;
- Briefing all people involved, like the official photographer, the video maker, the receptionists, moderator and the round table speakers.

The afternoon, the event started in both locations with an introduction to PAL, showing the final video, the project's preliminary results and a round table to discuss about the project exploitation. The preliminary results discussed were mainly focusing on the positive trend emerged during the last experimental campaign for the children who had the change to use PAL: *(i)* T1DM-related knowledge improvement trend and *(ii)* an improved perception of actuation of correct T1DM self-management behaviours (for more details, please see D1.5 "Design, ontology and evaluation of PAL prototype supporting shared child-caregiver responsibility").

Here follows a detailed description of the two events.

The Italian Event in detail:

The agenda:

14	Registration
14.30	Opening
	Welcome
	Project introduction & results
	Pal 4 Future Video
15.15	Roundtable
16.30	Videoconference in live session
16.45	Coffee break
17.00	Children & Parents testimonials
	Demo corner
18.30	Aperitif (Figure 45)

Figure 45: Buffet menu

The round table:

Title:

Pal: the evolution in the care customization. *The Revolution 4.0 in the health industry: how technologies will improve the health system, closer and closer to patients.*

Moderators:

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- Ing. Alberto Sanna, Director – Center of Advanced Technology of Wellness and Wellbeing - OSR
- Ing. Mario Fumagalli - Founder, Mixel Scarl

Members of the panel discussion:
- Patrizia Pappini, President of the patient's association "Sostegno70 Insieme ai ragazzi diabetici ONLUS"
- Marco Ferrera, Actuator Product Development Manager – STmicroelectronics
- Juliana Hysenbelli, Health & Wellness Sector Lead, Vodafone Italia
- Riccardo Bonfanti, Pediatric O.U – member of the Diabetes Research Institute - Ospedale San Raffaele
- Federico Serra, Government Affairs & External Relation Director - Novo Nordisk
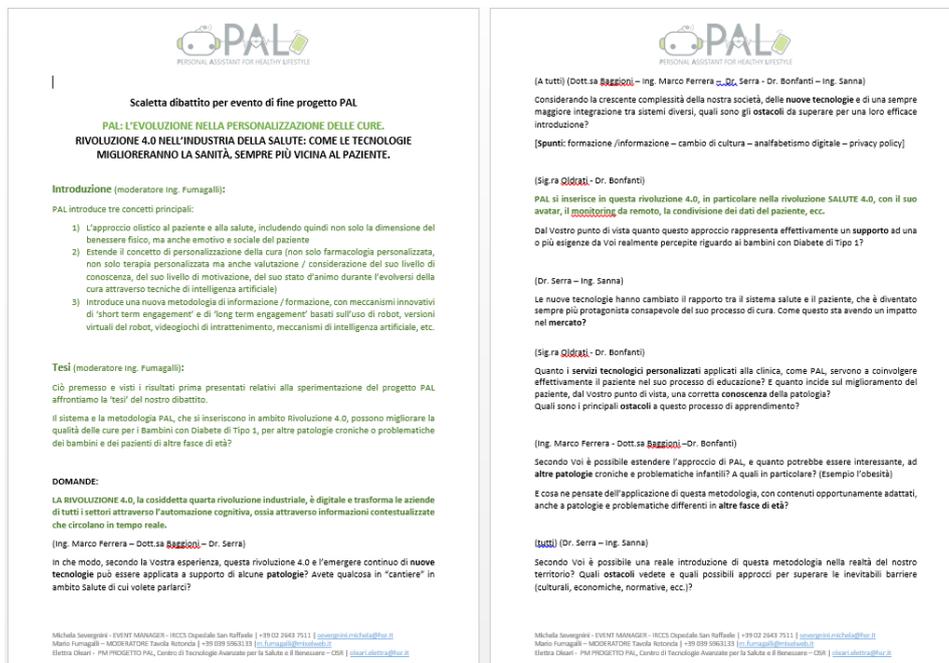
Figure 46: The panel session brief

A summary of the PANEL Session:

Starting from the presentation of the preliminary results emerged from the last project's experimental cycle, the moderator opened the Panel session reflecting on three key aspects of cardinal importance for PAL:

1. A *holistic approach to the patient* and his/her process of care, including not only the physical sphere, but also the emotional and social ones;
2. The concept of "*personalization of care*" is applied in this field of research to collateral aspects of a chronic disease, but nevertheless really important for its management, like the patient's education and self-confidence;

3. The introduction a *new educational approach*, with short/long-term engagement mechanisms leveraging on technological innovations like humanoids robots and mHealth app and games.

These points lead to the following question, which actually kicked off the debate: "*Can the PAL system and methodology, which are part of the 4.0 technological Revolution, improve the quality of care both for children /pre-adolescents with Type 1 Diabetes and for other chronic diseases and/or health-related problems of children and patients of other ages?*"

Firstly, the discussion was centred around the role of Artificial Intelligence (AI) in the Health sector, which is envisioned to be increasingly pervasive. The support of new AI-embedded technologies, is expected to allow doctors (or healthcare professionals in general) to return to being central where professional and human competences are required. And this is especially true in chronic diseases with a high social impact, like diabetes (both Type 1 and 2) and cardiovascular diseases. AI systems are designed to transform the way we think about the diagnosis and treatment of diseases and the benefits that can arise from their application are various and affecting patients, doctors and the health system in general. For example, they can support on different levels (e.g. disease 's treatments or education) who lives with chronic condition towards a life as normal as possible, or provide an additional level of clinical decision support, which can reduce errors in the delivery of care, and possibly having an impact on the public costs, reducing those of the health services. *[medical, pharma and ICT experts involved in the discussion]*

Focusing on PAL's research area and potentialities, it is evident that T1DM requires innovative educational approaches, which are able to communicate with children and adolescents which constitutes the 4.0 generations. The use of Robots, Avatars and in-app-games revealed to be effective in engaging children, in particular the PAL robotic agent, both embodied and physical, has been shown to be perceived as a friend, a play-mate by the children and could be exploited as "…a link between the child and the health professional, a support in the educational progress because it is at their level. (…) Children often fear that manifesting negative emotions can drive away those who care for them; with PAL children can express themselves freely because they do not feel judged." [cit. Patient's association representative]. Moreover, the preliminary results showed a positive trend in the T1DM-related knowledge and skills acquisition, which is particularly interesting from a medical point of view because they seems to provide: *(i)* a (effective) tool for supporting personalized patient's education and *(ii)* a tool for his/her evaluation and monitoring of progresses (i.e. the achievement of the therapeutic objective). In fact, it emerged that the more children use PAL the more they become aware of their chronical condition: the child using PAL not only improves what s/he "knows" (declarative knowledge) but also seems to increase the perception of the correct self-management behaviours the s/he "does" (procedural knowledge). This preliminary findings, obtained through a pilot study (for more details, please see D1.5), however, have to be strengthened through a

larger scale pilot. On this wake, the PAL approach and methodology was considered applicable in other contexts, like: *(i)* chronic diseases (e.g. asthma) and childhood health problems (e.g. obesity), *(ii)* health-conditions in adulthood or old age which require to acquire new notions and follow specific lifestyles habits (e.g. Type 2 Diabetes) *[medical, pharma and patient's association experts involved in the discussion]*.

To conclude, the main prerequisites needed to the adoption of PAL, and more generally of an AI-based health supportive technology, were put on the table, on the basis of the different personal points of view of the experts involved:

- Technological innovations, to be applied into the daily clinical practice, need that the HCPs are suitably trained to use them, but above all to be put in the conditions to be able to use technologies, and this implies an organizational re-structuring of the hospitals;
- Data protection has to guarantee high reliability, precision, safety and a clear and adequate treatment;
- The creation of a climate of trust through the transparency of information, like: the data source, the methods of data analysis, the level of data protection and the achievable results.

The demo corners:

Three demo corners were prepared:

- *MyPal App corner* showing how the PAL System works and simulate the first meeting at the Hospital, where the child with T1DM interact for the first time with the NAO robot and the System (Figure 47);
- *The Dance Corner* showing how to configure a dance through the tablet and see the humanoid robot performance (Figure 48);
- *The Games Corner* was meant to entertain children during the round table session; the programmers created a stand-alone version of the games "Break & Sort" and "Memory" and uploaded them on 15 tablets available for our little guests (Figure 49).

Figure 47: MyPal App Corner   Figure 48: Dance Corner   Figure 49: Games Corner

The Netherlands Event in detail:

The agenda:

13.30	Registration
14.00	Opening
14.20	PAL Video
14:25	PAL Demonstration
14.40	Keynote: The machine is a liar who always speaks the truth
15:00	Break
15.30	Panel Discussion
16:30	Live Connection with Hospital San Raffaele Italy
16:45	Wrap up and closure
17.15	Networking, drinks and bites

Live demo:

A live demo (Figure 50) was performed by Dr. Gert Jan van der Burg, a pediatrician at Gelderse Vallei Hospital, and Marjolein, an actual user of PAL: a twelve years old girl with T1DM, who participated in multiple PAL experiments. Marjolein showed some interactions with the robot and MyPAL application on the tablet.

Figure 50: Demo live

During playing a game with the NAO, the pediatrician commented 'She has put the game in easy mode, else it would go so quickly you would not be able to understand what is happening'. The NAO robot asked the child during the demonstration if she would like him to dance, someone in the audience replied abruptly: 'Dance? Yes we would like to see that!'

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A keynote:

Robert Jan Sips (CTO bij MyTomorrow) gave a keynote lecture, with the title '*The machine is a liar who always speaks the truth*'. Robert Jan enlightened the audience on the history, state-of-the-art and challenges in Artificial Intelligence (AI). The speaker managed to deliver an in-depth presentation in a lay-person language. The most notable quote from the keynote speaker was: "*AI is rational and humans are irrational. How teach AI about humans?*".

The Round Table:

Then the **panel discussion** took place with the following members in the panel:

- Robert Jan Sips, CTO at MyTomorrow
- Jon Pluyter Ph.D; Sr. Usability Engineer at Philips Design Healthcare
- Jeroen Crasborn; Senior Advisor Zorgstrategie at ZilverenKruis
- Dr. Gert Jan van der Burg, Pediatrician Ziekenhuis Gelderse Vallei
- Prof. dr. Nico L.U. van Meeteren; Executive Director and Secretary General, Top Sector Life Sciences & Health

There were five propositions, and the composition of the panel made for a good discussion with an interactive audience. Below we listed the proposition and some quotes we took from the audience/ board to indicate that is was a lively discussion:

1. *Children are <u>persuaded faster</u> by robots than by parents or health care professionals.*
   'This way a child gets an emotional bond with a robot, that is not ethical'
   'What is the difference in bonding with a doll? Children bond with objects either way. It is important to closely look at its function'
   'Interaction with a social robot has proven to stimulate to interaction with others.' 'Persuasion of a child through a robot depends on successful personalization. The robot has the means to get to know the child and personalize the interaction.'

2. *Each child should be allowed to make <u>his or her own choices</u> on when and how to use PAL, versus monitoring and controlling by parents and caregivers.*
   '*Ask the patient* has been the foundation of this project, that is one of the main successes of this project'

   'Here the situated application of PAL is important, for example the Netherlands versus Italy. A blended care solution, in which the system, the child and caregivers collaboration can offer a solution'.

3. *Robots and AI should always be able <u>to explain their behaviors</u>, versus, if they do what is required, it is just fine.*

'I would not be interested in an explanation if it works, but when it does not work!'

'Need for explanation from AI seems to correlate with need for explanation from your health care professional'.

'In the light of events with Facebook and other tech-giants, most importantly, the system needs to be transparent for the user.'

4. *PAL implementation is completely justified when it proves to advance children's self-care knowledge and subjective experiences, versus, it needs to show clear medical benefits.*
   'If you enhance self-care, that in itself is the advantage'

5. *Health insurances, versus, government, versus, industry should invest in preventive and quality-of-life technology (like PAL).*
   ''We should consider an transition to a health care system in which we mainly reward a healthy lifestyle or changing to a healthy lifestyle'

   'It is important that in this transition, all stakeholders (health insurance, government, industry, and patients) are involved.'

At the end a live connection was made with Italy, to share our mutual conclusions of the day. These were: results of the project are promising and for further implementation and enlarging its impact, it is important to validate the findings and work on a sustainable business model.

The children corner:

In the Netherlands, the event took place at the Amersfoort Zoo. During our official health program, the children who took part in the experiments, and their parents and siblings, could come by and say goodbye the robot Charlie by playing a quiz with Charlie, this time not about diabetes but about the Zoo (Figure 51). They could also play the PAL-games memory and break & sort one more time on a large tablet table with their siblings or with the other children. They could also walk around in the Zoo (location of the end event) and take home a small PAL back pack with a puzzle.

Figure 51: Children corners

Follow up

Thank all guests

The first planned step after the event was to thank all the guests that showed up with a generic "Thank you for attending" email (Figure 52); to avoid spamming them we incorporated in the message other useful information like the video of the event, a call to action "follow us" and the link to all project channels.

The round table speakers received individual "Thank you" emails with a personal touch, a personal message and some pictures of them at the event.
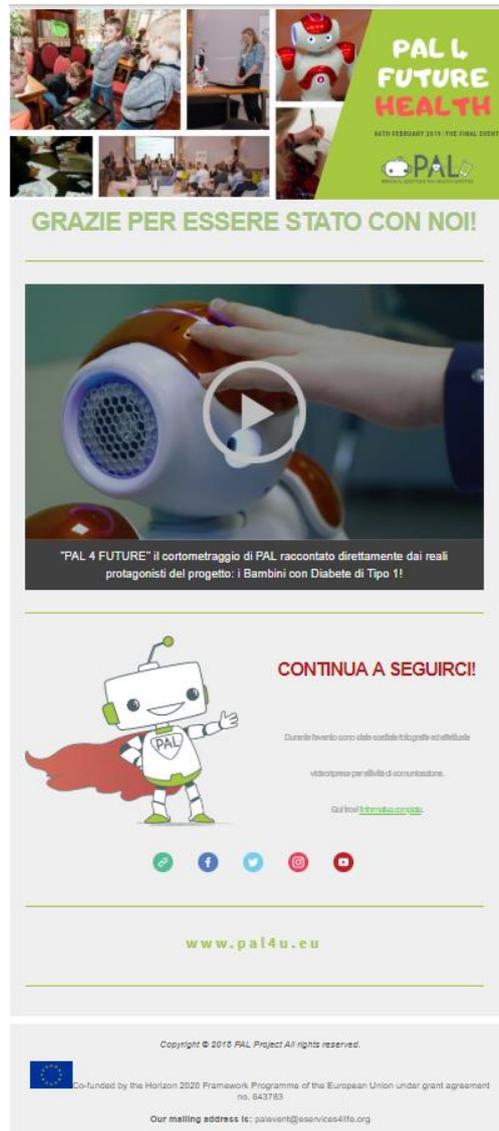
Figure 52: Thank you email

Follow up on Social media

The second planned was to post a gallery, a picture collage, videos and some notes on the website, the blog and social media (Figure 53). After the professional photographer and video maker have edited their own footages. Before posting pictures, we have asked all attendee to sign the attendance register and the General Data Protection Regulation and Informed Consents for the event communication.

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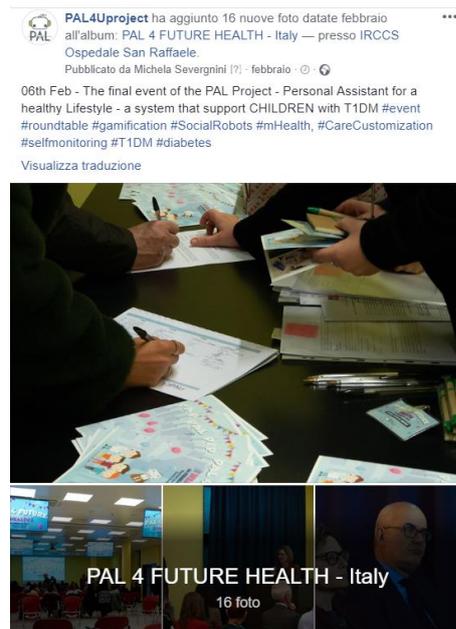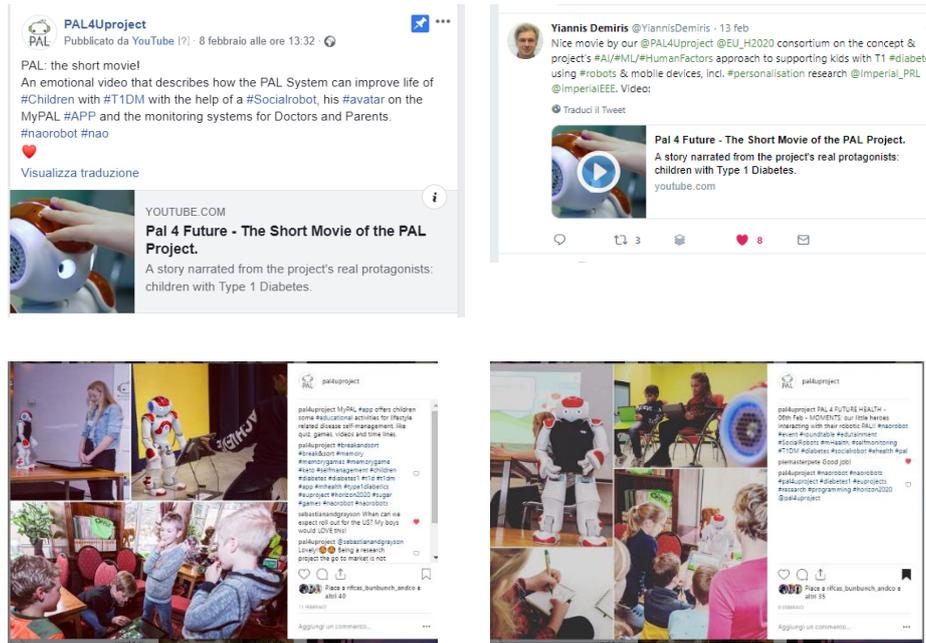
Figure 53: Social media follow up
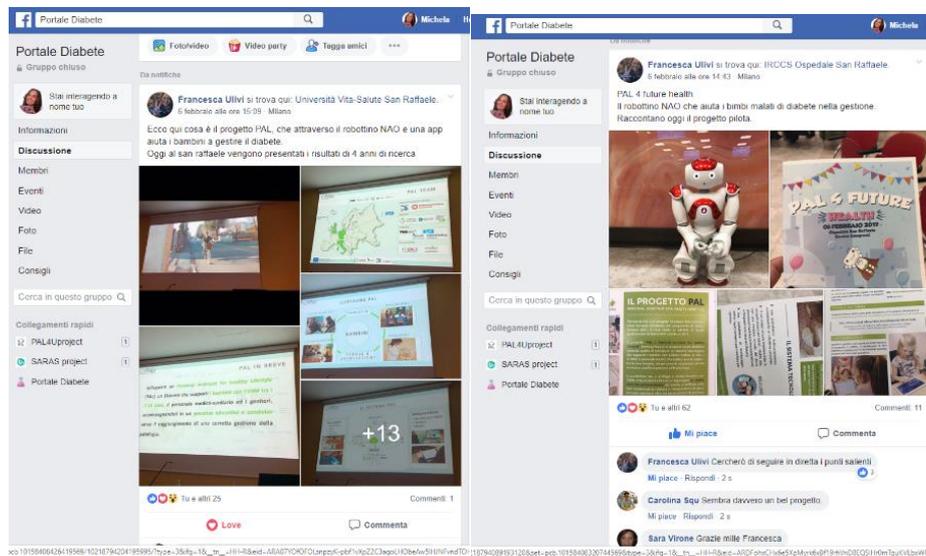
Figure 54: The Journalist's post on Portale Diabete

Close the book and report

Pay vendors, speakers, performers and other service providers, compare the final revenue and costs to the initial budget, collect all attendance data and write a report.

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The Italian numbers:

- 180 Invited
- 75 Expected
- 75 Subscribed (100%)
- 63 Attendee (84%)

Reading the numbers we can say that the event has been successful, we expected to have 75 people and we had a redemption of the 84%. Considering the drop out rates at free events[3] a 16% is a very good result.

The Netherlands numbers:

- 200 Invited
- 75 Expected
- 68 Subscribed (91%)
- 62 Attended (83%)

A lot of the expected guests subscribed to the event. As explained above, the drop out rate is 17% which is a very good result.

8. Impact, communication & dissemination results

As previously said, the goal of the project's dissemination is to increase the awareness of PAL's innovative role in supporting children with Diabetes and ability to generate new ICT healthcare models throughout the European region and among all involved parties.

2.1 Impact Indicators

In order to measure the impact of the PAL communication and dissemination, some indicators have been identified at the beginning of the project; here it follows a list with achieved results in 4 years of project.

PAL project web-site and social media measurement

The project website and social media allowed partners to provide a window onto the project for people outside of it, showing all the aspects of the research. The website acted also as a repository for the sharing and dissemination of publications, presentations, and multi-media documentation of the scientific results. In four years, the communication plan and activities through these media allowed the consortium to reach almost 3.000* people.

Here a detail of the audience numbers:

- 2.456 Unique visitors on the Website
- 184 Follower on Twitter

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[3] http://www.eventtribe.com/t/what-no-show-rate-do-you-expect-at-free-events/99

- 183 Followers on Facebook
- 145 followers on Instagram

*2.968 is the sum of all follower and visitors, but those numbers are higher since followers are coming and going (excluded the unique visitors of the website).

In terms of engagement those users interacted with the project posts at least 36.000 time. All details and split per media follows here:

- 32.860 Tweets' visualizations
- 872 Instagram total likes
- 1.550 Youtube total views
- *691 Facebook interactions

*Data are available only for the last project year.

Number of publications

The project's results have been communicated to the scientific community through journal and conference publications and presentations, alongside participation in special sessions and workshops in international conferences in all PAL relevant fields of research.

In four years the consortium released a total of 51 publications, in detail:
- 12 Journals & books
- 31 Conferences,
- 4 from workshops
- 4 are Master Thesis.

Based on the report *Horizon 2020 First Result*[4] the number of grants signed since the start of Horizon 2020 is 13.903, publications in peer-reviewed journals are 11.894 and open access articles published in peer-reviewed journals are 9.615, for a total publications on journals equal to 21.509, corresponding to 1,55 average publication per project.

Number of national and international events attended;

In 4 years, the consortium have been at a total of 123 events, not only in Europe but all over the globe (see Figure 55 and Table 6 - Attended/organized events data):
- 37 Attended events,
- 26 Conferences
- 22 the events Promoted for stakeholders,
- 15 workshops;
- 23 invited lectures.

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[4]

https://ec.europa.eu/programmes/horizon2020/sites/horizon2020/files/h2020_threeyearson_a4_horizontal_2018_web.pdf

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The below geographical map includes only Europe to grant a better readability of it and because Europe is the geographical focus of Horizon 2020; anyway all countries where events have been attended / organized are included in the following table for completeness.
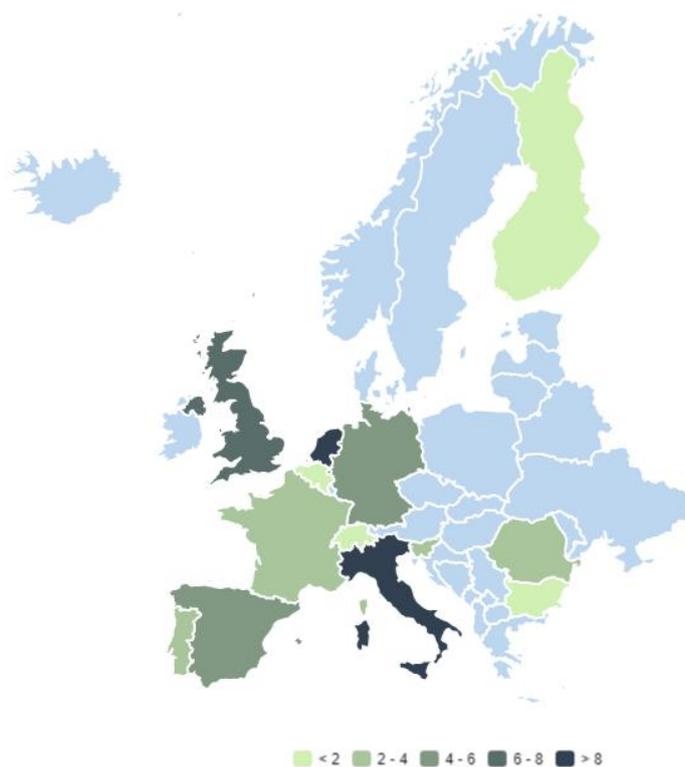
Figure 55 - A European Map of attended/organized events

EVENTs MAP	Italy	Netherlands	UK	Spain	Germany	Austria	France	Portugal	Romania	Slovenia	Cipro	Belgium	Bulgaria	Finland	Switzerland	Turky	USA	China	Japan	New Zealand	na	
Invited Lectures	6	6	3	2	1		1		1					1		1	1					23
Workshops	1	4		1		1	1		1	1	1						2	1			1	15
Conferences	3	2	4	2	3	2		2		0	1	1							1	1	4	26
Attended Events	5	27	1				1			1			1		1							37
Promoted Events	8	14																				22
TOTAL	23	53	8	5	4	3	3	2	2	2	2	1	1	1	1	1	3	1	1	1	5	123

Table 6 - Attended/organized events data

2.1 Qualitative results

The Consortium identified and included in the proposal, some target events and activities to spread awareness and interest on all the topics investigated in the project. In 4 year all topics listed in the proposal have been covered.

Here a list of them with some examples of events attended for each topic:

- **mHealth:** the paper ""Sharing is caring": designing a value-sensitive mhealth platform for sharing type 1 diabetes management within families" will be presented at the 11th International Conference on e-Health;
- **Persuasive Technology**: University laboratory "Giocare guarire - La Gamification al servizio della conoscenza"/"Playing healing – gamification serving the consciousness" at the IULM University of Milan (2019);
- **HRI -Human-Robot Interaction**: 11th ACM/IEEE International Conference on Human Robot Interaction (HRI 2016); Women in Artificial Intelligence WeTALK - Human-Robot Interaction (2017); 26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2017 and 2018);
- **Engineering**: Invited Talk about machine learning for Robotics and Human-Robot Interaction at the Research Seminar at Heuritech Data (2017); Conferences – IROS IEEE/RSJ international conference on Intelligent Robots and systems (2015 and 2018);
- **ICT & Robotics**: European Robotics Forum (2016 and 2019); Robot demonstration and flyers Companies/institutions interested in ICT for people with special needs at The Hugue (2015);
- **Health**: Project Presentation at "Philips" Koninklijke Philips N.V. for Industry, healthcare providers (2016);
- **Diabetes**: World Diabetes Day MMC (2015); DRI - Dritti a VOI events addressed to Clinicians and Researchers, families and stakeholders with T1DM (2016-17-18); Human robot in pediatric diabetes at the Regional Health Insurance companies (2019); European Pediatric Psychology Conference (2019);
- **Machine Learning**: The 5th International Conference on e-Society, e-Learning and e-Technologies (ICSLT 2019); Invited Talk about machine learning for Robotics and Human-Robot Interaction including a general description of the PAL project (2017).

PAL project official material

PAL logo

In Figure 56 the official logo. To maintain coherence since the beginning of the project the logo has not been changed, but different versions of the logo have been created in the fourth year for special needs (Figure 57 to Figure 59): squared / favicon /simplified are contracted form for social media, avatar profile use; the vertical and monochromatic version is necessary to ensure readability on coloured backgrounds. More details about the meaning of the components are written in the *Y1 Dissemination Report*.

Figure 56: The PAL project official logo

Figure 57: Simplified logo
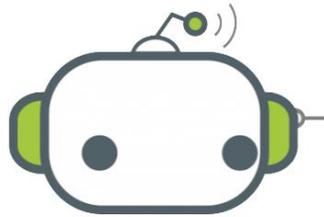
Figure 58: Favicon
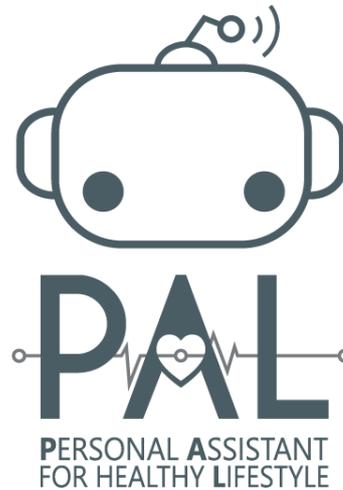
Figure 59: Vertical logo

PAL communication materials

The project brochure and poster represent an efficient communication instrument designed to be used in public demonstrations and other events, modulating the communication language and the graphical layout on the basis of the target public to be addressed. They did not change in the years because of their efficiency (see *DRs 6.1, 6.5, 6.9: Y1 Dissemination Report*).

During the fourth year of the project we did not print any collaterals, a part some posters and programs for the end event (see The PAL Final Event), and the A6 Block notes/backpack and puzzle in Figure 60, a gives away for the event's guests.

On the contrary, we realized many graphics for posts, like the e-cards for seasonal greeting and special moments, the same as the banner heroes and social pages covers (Figure 9), some picture collage and videos.

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Figure 60: Final event gadgets

9. Partner's exchange

As usual, the communication among project partners was held through day-to-day exchanges (i.e. mail exchange or Skype calls), the web based communication (e.g. SharePoint-based) and the project meetings.

Meetings

The following paragraph lists the project meetings organized in the fourth project year:

- *BPD workshop* in Leiden $15/16 - 02$-2018. The agenda was structured for discussing about:
  - Day 1:
    - Summary and evaluation of KERs
    - Business/ Lean canvals model, risk analysis, pestle analysis and legacy outcomes
  - Day 2:
    - Experiment
    - User interfaces
    - End event

- *BPD workshop 2* in Leiden 07-06-2018. The agenda was structured for discussing about:
  - Further characterisation of KERs and Lean Canvas

- *General Assembly meeting* in London 26-09-2018. The agenda was structured for discussing about:

        o   Management issues
        o   Status and plans – Core expected results of work packages
        o   BPD status
        o   Finalizing project
        o   Review meeting
        o   After PAL activities

- *Interim Review telco 20-11-2018.* The agenda covered presentations of all deliverables delivered in P3 up until that time.

- *End event* in Netherlands and Italy 06-02-2019. The agenda was structured to share and discuss the results of PAL with professionals.

The project SVN

Since the first year of the project, the Consortium still uses the open source Tortoise SVN program. This software allows to store documents securely, preventing the download by other people external to the project. Data secured in the SVN are categorized as:

• Descriptive forms for the Activities done during the project

• Data collected during the experiments

• Presentations realized for internal meetings and their minutes

• Papers and related presentations or posters

• Material useful for the realization and implementation of the PAL platform

• Meeting minutes

The project GitLab

 To facilitate the software development a GitLab was created on one of FCSR server's. GitLab is a specific source code control system and all the developers belonging to the Consortium to handle and develop the modules which are part of the PAL System. Specifically GitLab is based on a issue management to keep track of the bugs or enhancements. The milestones in this context are used when changes in one, or more than one modules, are required. For each feature change a new branch is created and after testing is merged with the master branch (the principal one) which is used by the production server in experiments (e.g. when children use the MyPAL app). The Consortium still uses this software.

The project Slack

To facilitate the day-to-day information exchange between the partners a Slack site was implemented since June 2016. Using this, individual persons among the Consortium can easily chat, and there are also so called channels for more generic messages.

However partners among the Consortium still uses other software to keep in touch, such as Skype and Google Hangouts for daily calls.

ANNEX 1 – SUMMARY OF PAL DISSEMINATION EVENTS

During the four years of the project, the Consortium participated to various initiatives and events in order to promote awareness and raise interest towards PAL's fields of research and objectives among different types of audience. In the following tables are summarised all Dissemination event.

1.1 Events' Summary

The consortium organized/attended a total of 135 events in four years: 37 are the Attended events, 26 the Conferences and 22 the events Promoted for stakeholders, 15 the workshops; Partners have been in 23 invited lectures and 12 are the total Journals and books/book chapters released.
For a better overview all events have been classified in six categories and divided by year of participation (see Figure 61 and Figure 62).

PAL EVENTS	2015	2016	2017	2018/2019
Events Attended	12	11	5	9
Events Promoted for Stakeholders	6	6	3	7
Conferences	4	7	7	8
Workshops	4	3	5	3
Invited Lectures	3	6	3	11
Journals & Books	0	5	3	4

Figure 61 - Data summarising all Dissemination events
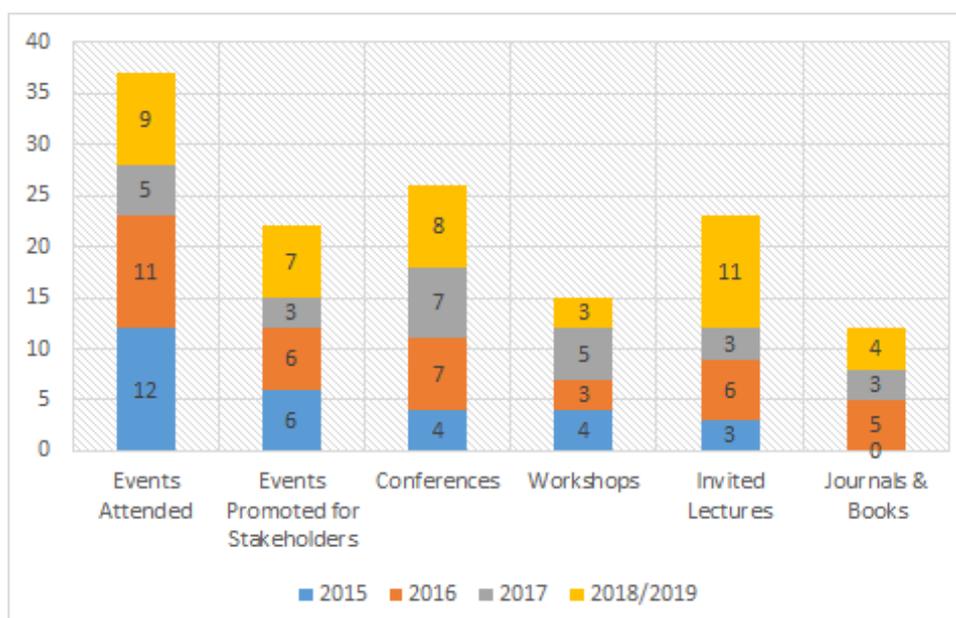
Figure 62 - Graphic summarising all Dissemination events

1.2 Events Attended

EVENT	PROMOTER	WHERE	WHEN	AUDIENCE	PARTNER	HOW IS THE PAL PROJECT PROMOTED
YEAR 1						
Week van de ondernemer	KvK (Chamber of Commerce)	Utrecht	14-16 Aprile 2015	Entrepeneurs of SMEs	TNO	Robot demonstration and flyers
RoboNed	Robot network Netherlands (RoboNed)	Veldhoven	04/ giu 15	Researchers and companies interested in robotics	TNO	Robot demonstration and flyers
Week van de ondernemer	KvK (Chamber of Commerce)	Groningen	10-11 giugno 2015	Entrepeneurs of SMEs	TNO	Robot demonstration and flyers
Week van de ondernemer	KvK (Chamber of Commerce)	Enschede	24-25 giugno 2015	Entrepeneurs of SMEs	TNO	Robot demonstration and flyers
Week van de ondernemer	KvK (Chamber of Commerce)	Eindhoven	23-24 agosto 2015	Entrepeneurs of SMEs	TNO	Robot demonstration and flyers
Technical creative lesson	Postiljon primary education	Soesterberg	02/ ott 15	Children aged 8-12	TNO	Robot demonstration and explanation
Technical creative lesson	Postiljon primary education	Soesterberg	09/ ott 15	Children aged 8-12	TNO	Robot demonstration and explanation
Bergamo Scienza 2015	Associazione BergamoScienza, scientific association	Bergamo	06/ ott 15	Schools	FCSR	Robot demonstration
Week van de ondernemer	KvK (Chamber of Commerce)	Rotterdam	14-15 Ottobre 2015	Entrepeneurs of SMEs	TNO	Robot demonstration and flyers
Vrouwelijke leiders in de zorg	Young Girls Community	Zeist	19/ nov 15	Female managers from care and cure institutes	TNO	Interview during plenary, 2 pages in magazine, demonstration and flyers

Reunion Diabetes camp DVN 2015 in the Netherlands	Diabtes Vereniging Nederland (DVN)	Leusden	25/ nov 15	Organizers and volunteers of DVN diabetes camps 2015	TNO, DVN, Meander MC	Presentation of results DVN diabetes camp 2015
Week van de ondernemer	KvK (Chamber of Commerce)	Amsterdam	25-26 Novembre 2015	Entrepeneurs of SMEs	TNO	Robot demonstration and flyers
YEAR 2						
Technical creative lesson	Postiljon primary education	Soesterberg	5/12 febbraio 2016	Children aged 8 to 12 y.o.	TNO	Robot Demonstration
European Robotics Forum	EU	Ljubjlana	21-23 Marzo 2016	Entrepeneurs, Researchers	FCSR	Project Presentation
Philips eHealth presentation	Philips	Eindhoven	03/ mag 16	Industry, healthcare providers	TNO	Project Presentation
Robots in de openbare ruimte	RWS	Rotterdam	17/ mag 16	Policymakers	TNO	Robot Demonstration
Dutch technology week	DTW	Eindhoven	28-29/05/2016	General public	TNO	Robot Demonstration
AI for diabetes workshop ECAI	ECAI	Den Haag	28/ ago 16	Scientific community	DUT + TNO + DFKI	Project Presentation
Festival #IoCondivido	Altroconsumo	Milan	24/ set 16	Children till 14 years old	FCSR	Robot Demonstration
Guestlecture OBS de Wereldwijzer	VHTO (STEM education)	Duiven	03/ ott 16	Primary school students	TNO	Robot Demonstration
Healthwise Conference	Centre of Expertise Healthwise of the University of Groningen	Groningen	04/ nov 16	scientific community and Industries	TNO + ZGV	Project Presentation

Round table Helping diabetic children by robots		Ede, NL	8/11/2016		TNO	Roundtable
Princess Victoria of Svezia visit	San Raffaele Hospital	Milan	17/ dic 16	Doctors, children and parents	FCSR	Robot Demonstration
YEAR 3						
Research Seminar at heuritech data	Heuritech Data	Paris	12/08/2017	Industries and scientific community	IMPC	Invited Talk about machine learning for Robotics and Human-Robot Interaction including a general description of the PAL project
Dutch eHealth Week	the Secretary General of the Dutch Ministery of Health	Netherlands	21/01/2017		ZGV	Live presentation Charlie + PAL at the official opening
Digital Health Outlook	UK Science and Innovation Network, Department for international trade Italy and OSR	Milan	20/03/2017	Industrial players, researchers	OSR, FCSR	Project presentation
KPMG rondetafel robotisering	KPMG	The Hague	21/ apr 17	Researchers, policy makers, business actors	TNO + Tu Delft	
Women in Artificial Intelligence WeTALK - Human-Robot Interaction	Women in Artificial Intelligence, Founders Factory	London	30/01/2018	General public, researchers, entrepreneurs	IMPC	Invited Talk about Human-Robot Interaction including a general description of the PAL project

YEAR 4						
VoeDNet meeting	VoeDNet (association for dietitians)	Almere, NL	13/03/2018	dieticians	TNO	**Presentation** and demonstration of the project
Settimana della Scienza	FCSR and OSR and Dri	Lesmo	30/05/2018	Children angd 6 -10 y.o.	FCSR	Robot Demonstration
Digital assembly 2018	European Commission	Sofia, Bulgaria	25/06/18-26/06/18	more than 1,000 stakeholders and high-level policymakers	TNO	Stand, flyers and **presentation** in plenary session (Digital health)
Philips World Usability Day	Philips	Eindhoven, NL	08/11/2018	Students, researchers and implementers	TNO	stand, flyers and **pitch**
What's next Innovationcongress	Ministry of Justice and Security	Rotterdam, NL	20/11/18-21/11/18	Innovators	TNO	Stand, flyer and robot demonstration
CLIN29	SIKS	Groningen, NL	31/01/2019	Students	TNO	
Social robots in diabetes mellitus type 1; 4TU research meet symposium	Technical University Eindhoven	Eindhoven, NL	25/01/2018		ZGV	Gert Jan van der Burg Pediatrician Medical Information Innovation Consultant Gelderse Vallei Hospital Present PAL
Human robot in pediatric diabetes	Regional Health Insurance companies	Netherlands	29/03/2019	insurance companies	ZGV	Gert Jan van der Burg Pediatrician Medical Information Innovation Consultant Gelderse Vallei Hospital Present PAL at the Regional Health Insurance companies"

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| the 17th Congress of the European Society for Developmental Perinatal and Paediatric Pharmacology | ESDPPP | Basel, SW | 28-29/05/2019 | Pediatricians | TNO | Wednesday May 29, 2019 Presentation about PAL study background, project details, overall method, and results last cycle 08:30-10:00: Tools to improve clinical trials in children and adolescents? - Olivier Blanson Henkemans: Robotic Buddy "PAL Charly" to improve diabetic selfmanagement in children [Senior Scientist Child Health, the Netherlands Organisation for Applied Scientific Research (TNO)] |

1.3 Events Promoted

EVENT	PROMOTER	WHERE	WHEN	AUDIENCE	PARTNER	HOW IS THE PAL PROJECT PROMOTED
YEAR 1						
Student tour	TNO	Soesterberg	09/ giu 15	Students in the field of psychology	TNO	Robot demonstration and flyers
Open day at TNO	TNO	Soesterberg	27/ giu 15	TNO employees and their families, students, neighbours of TNO Soesterberg and retired TNO personnell	TNO	Robot demonstration and flyers

Visit board TNO and University of Twente	TNO	Soesterberg	02/ lug 15	TNO and Twente University Board members + professors	TNO	Robot demonstration
Wetenschapsdag Delft	DUT science center	Delft	25/ ott 15	General public	DUT TNO	Robot demonstration
World Diabetes Day MMC	Meander MC	Amersfoort	14/ nov 15	Adults and children with T1DM or interest in diabetes	MeanderMC TNO	Robot demonstration and flyers
DRItti a voi	Ospedale San Raffaele, DRI, SOS70 &	Milan	30/ gen 16	General public, doctors, children with T1DM and their families	FCSR SOS70	Robot demonstration (interactive lesson with children) and flyers
YEAR 2						
Settimana della scienza	OSR DRI (Diabetes Research Institute)	Lesmo	18/ mar 16	Children aged 6 to 10 y.o.	FCSR	Robot demonstration
T1DM soresvrij	Zilveren Kruis	Den Dolder	4-5 marzo 2016	Children	TNO	
Plenary meeting	SOStegno70	Montebello della Battaglia	21/ ott 16	Parents and children	FCSR	Project presentation and flyers
Delegation of Ministry of healthcare	TNO	The Hague	03/ feb 16	Delegation of Ministry of Healthcare with Minister Schippers	TNO	Project Presentation
Plenary meeting	SOStegno70	Milan	21/ mar 16	Parents and children	FCSR	Project Presentation
Dies Nathalis	TU Delft	Delft	08/ gen 16	Academics	TU Delft	Robot Demonstration
YEAR 3						
Plenary meeting	SOStegno70	Milan	27/ apr 17	Parents and children	FCSR	Project presentation and flyers
MedicalDelta	F. Kaptein	Leiden	27/06/2017	Industries and scientific community	TU Delft	Project Presentation

DRI - Dritti a VOI	Ospedale San Raffaele, DRI, SOS70	Milan	11/02/2017	Clinicians and Reaserchers, families and stakeholders with T1DM	OSR, FCSR, SOStegno70	Demonstration
YEAR 4						
PAL 4 Future Health - Final Event	Consortium	Milan - Amersfoort	07-feb	All stakeholders	ALL	Project sum up, result presentation, demos and networking
DRItti a VOI 2018	OSR and DRI	Milan	10/03/2018	General public, doctors, children with T1DM and their families	FCSR and SOS70	poster, brochures and demo of MyPAL
Applied AI/datascience congress	TNO	Den haag, NL	27/09/2018	Researchers and companies interested in AI and data science	TNO	Stand and flyers
GET TO KNOW TNO	TNO	Delft, NL	12/10/2018	Students	TNO	Stand and flyers
Applied AI hackathon	TNO	Utrecht, NL	06/11/2018	Students	TNO	**Presentation**
Innovation 4 health	TNO	Rotterdam, NL	14/02/2019	People interested in Life Sciences and Health	TNO	Stand, flyer and robot demonstration
EADV symposium	TNO/Meander MC	Nieuwegein, NL	14/03/2019	Healthcare professionals Working with diabetic patients	TNO/Meander MC	**Presentation**; overview of the PAL project + present results

1.4 Conferences

CONFERENCE TITLE	PUBLICATION TITLE	AUTHORS	WHERE	WHEN

YEAR 1				
New Friends Conference	Let's Be Friends: Perception of a Social Robotic Companion for children with T1DM	Kruijff-Korbayov\'{a}, I. et al		
New Friends Conference	How do diabetic children react on a social robot during multiple sessions in a hospital	Looije, R. et al.		
Springer	Young Users' Perception of a Social Robot Displaying Familiarity and Eliciting Disclosure	Kruijff-Korbayov\'{a}, I. et al.		
11th ACM/IEEE International Conference on Human-Robot Interaction (HRI)	Child's Culture-related Experiences with a Social Robot at Diabetes Camps	A. Neerincx, F. Sacchitelli, R. Kaptein, S. van der Pal, E. Oleari and M. Neerincx	New Zealand	7-10 marzo 2016
YEAR 2				
21st Conference on Formal Grammar	A Modal Representation of Graded Medical Statements	Hans-Ulrich Krieger, Stefan Schulz	Bolzano	20-21 agosto 2016
16th International Conference, IVA 2016	A Disclosure Intimacy Rating Scale for Child-Agent Interaction	Franziska Burger, Joost Broekens, and Mark A. Neerincx	Los Angeles	20-23 agosto 2016
16th International Conference on Intelligent Virtual Agents (IVA 2016)	CAAF: A Cognitive Affective Agent Programming Framework	F. Kaptein, J. Broekens, K. V. Hindriks and M. Neerincx	Los Angeles	20-23 settembre 2016
8th International Joint Conference on Knowledge Engineering and Ontology Development (KEOD 2016)	The Federated Ontology of the PAL Project. Interfacing Ontologies and Integrating Time–Dependent Data (RoboNed)	Hans-Ulrich Krieger, Rifca Peters, Bernd Kiefer, Michael A. van Bekkum, Frank Kaptein, Mark A. Neerincx	Porto	9-11 novembre 2016
Second International Conference on e-Coaching for Health and Wellbeing	Evaluating an autonomous and responsive avatar for diabetic care: the pitfalls of questionnaire based research with children	Michael A. van Bekkum, et al.	Amsterdam	26-27 gennaio 2017
12th International Conference on Semantic Systems (SEMANTiCS)	Ontology Engineering for the Design and Implementation of Personal Pervasive Lifestyle Support	Michael A. van Bekkum, et al.	Leipzig	12-15 Febbraio 2016

International Conference on Agents and Artificial Intelligence	Capturing Graded Knowledge and Uncertainty in a Modalized Fragment of OWL	Hans-Ulrich Krieger	Rome	24-26 Febbraio 2016
YEAR 3				
Second International Conference on e-Coaching for Health and Wellbeing	Evaluating an autonomous and responsive avatar for diabetic care: the pitfalls of questionnaire based research with children	Michael A. van Bekkum, et al.	Amsterdam	26-27 Gennaio 2017
22nd annual meeting of the intelligent user interfaces community (ACM IUI 2017)	Guidelines for Tree-based Learning Goal Structuring	R. Peters, J.Broekens and Mark A. Neerincx	Limassol	13- 16 marzo 2017
26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2017)	Robots Educate in Style: The Effect of Context and Non-verbal Behaviour on Childrens Perceptions of Warmth and Competence	R. Peters, J.Broekens and Mark A. Neerincx	Lisbon	29/ ago 17
26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN 2017)	Personalised Self-Explanation by Robots: The Role of Goals versus Beliefs in Robot-Action Explanation for Children and Adults	F. Kaptein, J. Broekens, K. V. Hindriks and M. Neerincx	Lisbon	29/ ago 17
7th International Conference on Affective Computing and Intelligent Interaction (ACII2017). Demo track	Self-Explanations of a Cognitive Agent by Citing Goals and Emotions	F. Kaptein, J. Broekens, K. V. Hindriks and M. Neerincx	Texas	23-27 Okt 2017
International Research Conference Robophilosophy 2018 - Envisioning Robots in Society—Politics, Power, and Public Space	Humanoid robot for children with type1 diabetes: challenges and ethical implications of a supportive tool in the therapeutic process	V. Sanchini, C. Pozzi, E. Oleari, F, Sacchitelli, A. Sanna, M. Neerinx	Vienna, Austria	14-17 February 2018
YEAR 4				
GECCO 2018: The Genetic and Evolutionary Computation Conference	Hierarchical Behavioral Repertoires with Unsupervised Descriptors	A. Cully, Y. Demiris	Kyoto, Japan	15-19 July 2018
European Conference on Computer Vision (ECCV 2018)	Inferring Human Knowledgeability from Eye Gaze in Mobile Learning Environments	O. Celiktutan and Y. Demiris	Munich, Germany	8-14 September 2018
European Conference on Computer Vision (ECCV 2018)	RT-GENE: Real-Time Eye Gaze Estimation in Natural Environments	T.Fischer, H. J. Chang, Y. Demiris	Munich, Germany	8-14 September 2018

International Conference on Engineering Psychology and Cognitive Ergonomics	Using Perceptual and Cognitive Explanations for Enhanced Human-Agent Team Performance	Neerincx, M. A., van der Waa, J., Kaptein, F., & van Diggelen, J.	Las Vegas, Nevada, US	15-20 July 2018
The 5th International Conference on e-Society, e-Learning and e-Technologies (ICSLT 2019)	Usability of the PAL Objectives Dashboard for Children's Diabetes Self-Management Education	R. Peters, E. Oleari, F. Sardu, M. Neerincx	Vienna, Austria	10-12 Jan 2019
Tenth International Workshop on Spoken Dialogue Systems Technology (IWSDS) 2019	VOnDA: A Framework for Ontology-Based Dialogue Management	Kiefer, B., Welker, A., Biwer, C.	Siracusa (Sicily, Italy)	April 24-26, 2019
European Pediatric Psychology Conferece, Ghent Belgium	How do children with diabetes evaluate the usability of a personal robot study supporting self-management at camp?	Sylvia van der Pal, Olivier Blanson Henkemans, Willeke van Vught, Bert Bierman, Mark Neerincx		20-21/09
the 11th International Conference on e-Health	"Sharing is caring": designing a value-sensitive mhealth platform for sharing type 1 diabetes management within families	Oleari, E., Pozzi, C., Sardu, F., Sacchitelli, F., Sanchini, V., Sanna, A.		17-19 July 2019

1.5 Workshops

EVENT	WORKSHOP TITLE	WHERE	WHEN	AUDIENCE	PARTNER	HOW IS THE PAL PROJECT PROMOTED
YEAR 1						
Endocrinology and Diabetes unit of the Paediatric Department of San Raffaele Hospital	XVII workshop in Endocrinologia e Metabolismo dell'età evolutiva	Milan	21-22 Maggio 2015	Healthcare professionals	FCSR SOS70	Divulgative project material and possible one to one discussion
Include	Include Project	The Hague	08/ giu 15	Companies/institutions interested in ICT for people with special needs	TNO	Robot demonstration and flyers
Inspiratiedag serious gaming	Link4All	Soesterberg	23/ set 15	Healthcare professionals (projectleaders and managers) in domain of mentally challenged and blind	TNO	Robot demonstration and information
ICSR workshop	Let Me Guide You! Pedagogical Interaction Style for a Robot in Children's Education	Paris	26/ ott 15	Organisation and presentation &	TNO FCSR	Organisation and presentation &
YEAR 2						
Joint Second Workshop on Language and Ontology & Terminology and Knowledge Structures (LangOnto2 + TermiKS)	X-Protege: An Ontology Editor for Defining Cartesian Types to Represent n-ary Relations	Portoroz	23/ mag 16		DFKI	

Workshop on Artificial Intelligence for Diabetes (ECAI 2016)	Ontologies for social, cognitive and affective agent-based support of child's diabetes self-management	The Hague	30/ ago 16		DFKI	
Management Development training of Medical Health Leaders	"Excellent Ehealth"	Ede, NL	7/10/2016	Medical leaders		
YEAR 3						
HRI 2017	Evaluating Child-Robot Interaction	Vienna (HRI)	06-09 marzo 2017	Researchers	TNO+TUD	Invited panel discussion (Mark)+ video of NL summer camps
2017 Seventh International Conference on Affective Computing and Intelligent Interaction Workshops and Demos (ACIIW)	The Role of Emotion in Self-Explanations by Cognitive Agents	Texas (ACII)	23-27 Okt 2017	Researchers	DUT	Paper published and Presentation and cognitive AI demo
Gert Jan van der Burg Pediatrician present PAL project to the ICT Board of the ZGV	Robotics and Serious gaming in eHealth	Ede, NL	04/07/2017	Decision maker	ZGV	
	Goals, transparency and explainability of agents	Lisbon (ROMAN)	28/08-1/09/2017	Researchers	DUT	Panel presentation
	Guidelines for Tree-based Collaborative Goal Setting	Limassol	13-16/03/2017	Researchers	DUT	Paper presentation
YEAR 4						

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RO-MAN conference 2018	A social robot that motivates and learns children to manage diabetes, harmonized to child's present objectives, states and behaviors	Nanjing, China	27-31/08/2018	Researchers	TNO/TUD	Keynote
HRI 2018	What could go wrong?!	Chicago,	March 5, 2018	Researchers	TUD	paper published: The Challenges of Evaluating Child-Robot Interaction with Questionnaires
IEEE IROS (Intelligent Robots and Systems) conference	Robots for Assisted Living	Madrid, Spain	05-ott		IMPC	

1.6 Invited Lectures

EVENT	PROMOTER	WHERE	WHEN	AUDIENCE	PARTNER	HOW IS THE PAL PROJECT PROMOTED
YEAR 1						
IROS 2015	IEEE and RSJ	Hamburg	02/ ott 15	Researchers and students in the field of of assistance and service robots	IMPC	Presentation of the PAL project, and its objectives and interdisciplinary methodology
HRI Summer school	IEEE Robotics and Automation Society, EU projects DREAM and Robot-ERA	Aland	24-28 Settembre 2015	About 60 PhD students and postdocs in the fields of Human Robot Interaction, Psychology and Computer Science	IMPC	Presentation of the PAL project, and its objectives and interdisciplinary methodology
NSPOH	NSPOH	Amsterdam	07/ dic 15	Company doctors	TNO	Robot demonstration

YEAR 2						
The Institution of Engineering and Technology (IET)	IET (Institution of Engineering and Technology)	London	21/ feb 16	General public, around 150 attendees, including pupils and students, members of the Institution of Engineering and Technology, and interested citizens (lecture is open to all)	IMPC	PAL project presentation, description of project's aims and objectives, methodology and results
The Institution of Engineering and Technology (IET)	IET (Institution of Engineering and Technology)	London	11/ mag 16	General public, around 150 attendees, including pupils and students, members of the Institution of Engineering and Technology, and interested citizens (lecture is open to all)	IMPC	PAL project presentation, description of project's aims and objectives, methodology and results
SMART School on Computational Social and Behavioural Sciences	SMART Consortium	Paris	5- 9 settembre 2016	Scientific community, industry. around 70 PhD students / post-docs from different disciplines	IMPC	PAL project presentation, description of project's aims and objectives, methodology and results
Benelux Conference on Artificial Intelligence		Amsterdam	11/ nov 16		TNO	
Fall Symposium on Shared Autonomy in Theory and Practice	AAAI (Association for the Advancement of Artificial Intelligence)	Arlington, USA	17/ nov 16	Scientific public (40 attendees), students and researchers interested in human robot interaction and collaboration	IMPC	PAL project presentation, description of project's aims and objectives, methodology and results
International Workshop on Assistive and Rehabilitation Technology (IWART)	AIDE European Consortium	Elche	15/ dic 16	Scientific public (50 attendees), students of local universities and consortium partners	IMPC	PAL project presentation, description of project's aims and objectives, methodology and results
YEAR 3						

IET Prestige Lecture	Institution of Engineering and Technology	Cambridge	21/ feb 17	General public, around 150 attendees, including pupils and students, members of the Institution of Engineering and Technology, and interested citizens (lecture is open to all)	IMPC	PAL project presentation, description of project's aims and objectives, methodology and results
Seminar for Multimedia Standards (MMI 726) course	Informatics Institute, Middle East Technical University	Ankara	05/01/2018	Lecturers and master students (15 attendees)	IMPC	A general description of the PAL project, aims and objectives
Health2.0 Event	Health 2.0 organisation	Amsterdam	01/02/2018	healthcare entrepreneurs, researchers, doctors, corporate innovators, investors, insurers, pharma, and students	TNO	Presentation of the PAL-project as an example of an innovative social robot system
YEAR 4						
Course of Health Informatics	San Raffaele University	Milan	05/04/2018	psychology students	FCSR	the basis of social robotics and related discussions about ethics and psychological theories applied in PAL
Course of Bioethics	San Raffaele High School	Milan	16/04/2018	High school students	FCSR	in the context of the course of bio-technology, a lesson and related discussion regarding the implication of HRI and CRI in the process of education and care
DRI seminars	Diabetes Research Institute of OSR	Milan	25/05/2018	HCPs, researchers and nurses	FCSR	In the context of the periodic seminars of the Diabetes Research Centre of OSR, PAL project aims, technologies and results obtained through the first two experimental cycles were discussed, as well as was given a brief overlook of the last experimental test campaign and potentialities to a public made of HCPs, medical doctors, researchers.

The correct nutrition	San Raffaele High School	Milan	07/11/2018	Students	FCSR	PAL robot educates elementary school children, talking about topics related to PAL as the importance of nutrition in all aspects of life: school, sport, home (especially snack). Scuola Stoppani, a Milano.
International Internet of Things Day	NA	Rotterdam ,NL	09/04/2018	Symposium participants	TNO/TUD	keynote at the Symposium "Internet of Things": Integrating social robots into personal care and living environments: Examples of pediatric diabetics care and elderly health care
Symposium "Trends in Behavior Change Technology"	University Twente	Enschede, NL	14/11/2018	Symposium participants	TNO/TUD	Robotic ePartners for Persistent Social Behaviour Change
University laboratory "Giocare guarire"	IULM - Università di Lingue e Scienze della Comunicazione of Milan	Milan	21/03/2019	University students	FCSR	"Giocare guarire - La Gamification al servizio della conoscenza" ("Playing healing – gamification serving the consciousness") present the Project and assign to the students, divided in 8 groups, 4 Consumer Targets: Children with T1DM, Parents of children with T1DM, Associations supporting families of Children with T1DM and Pediatricians specialized in Diabetology to allow them to produce a market and a swot analysis, identify any exploitable result and develop a communication plans.
OSR annual scientific retreat	OSR	Baveno, Italy	15/03/2019	OSR researchers and healthcare professionals	FCSR	Keynote "Robotics for healthcare of the future"
IEEE International Conference on Intelligent Robots and Systems	Personalisation in Assistive Robotics	Madrid, Spain	02/10/2018		IMPC	Yiannis Demiris (Imperial College London) presented the methodology and computational architectures required for personalising robot behaviours to individual users.

Wageningen University and Research	"eHealth and Innovations" guest lecture	Wageningen	08/03/2019		ZGV	Gert Jan van der Burg Pediatrician Medical Information Innovation Consultant Gelderse Vallei Hospital
European Robotic Forum	Invited speaker at the Workshop "End users needs if Social Robots: Ecosystem, Implications and Policies".	Bucharest	20-22/03/2019		FCSR	The workshop aimed at presenting lessons learned from various EU, as well as industry projects, from the real deployment of social robots in different healthcare-related sectors. It envisioned to disseminate and identify the needs, R&D challenges and potential uses towards contributing in B2B ecosystem of social robots. In this context, the PAL approach extorted in involving in the full-research loop the real end users was presented by FCSR.

1.7 Journals & Books

YEAR	PUBLICATION TITLE/EVENT NAME	AUTHORS	SUB CATE GOR Y	BOOK/CONF ERENCE TITLE	ABSTRACT	URL
2	A Motivational Approach to Support Healthy Habits in Long-term Child--Robot Interaction, article, 2016 (as author)	Raquel Ros and Elettra Oleari and Clara Pozzi and Francesca Sacchitelli and Daniele Baranzini and Anahita Bagherzadhalimi and Alberto	Journa l article	International Journal of Social Robotics	We examine the use of role-switching as an intrinsic motivational mechanism to increase engagement in long-term child--robot interaction. The present study describes a learning framework where children between 9 and 11-years-old interact with a robot to improve their knowledge and habits with regards to healthy life-styles. Experiments were carried out in Italy where 41 children were divided in three groups interacting with: (i) a robot with a role-switching mechanism, (ii) a robot without a role-switching mechanism and (iii) an interactive video. Additionally, a control group composed of 43 more children, who were not exposed to any	http://dx.doi. org/10.1007 /s12369-016-0356-9

		Sanna and Yiannis Demiris			interactive approach, was used as a baseline of the study. During the intervention period, the three groups were exposed to three interactive sessions once a week. The aim of the study was to find any difference in healthy-habits acquisition based on alternative interactive systems, and to evaluate the effectiveness of the role-switch approach as a trigger for engagement and motivation while interacting with a robot. The results provide evidence that the rate of children adopting healthy habits during the intervention period was higher for those interacting with a robot. Moreover, alignment with the robot behaviour and achievement of higher engagement levels were also observed for those children interacting with the robot that used the role-switching mechanism. This supports the notion that role-switching facilitates sustained long-interactions between a child and a robot.	
2	Charlie, weet je...?, article, 2016 (as author)	Rosemarijn Looije and Oldewarris	Journal article	Dixit		https://doi.org/10.5281/zenodo.268907
2	Kinderen praten met robot over diabetes, article, 2016 (as author)		Journal article	Diabetes Pro	Hoe kan de sociale robot Charlie de kinderdiabeteszorg ondersteunen? Die vraag staat centraal in het internationale PAL-onderzoek dat in maart 2015 van start is gegaan. Na de programmering van de robot zelf, konden in mei 2016 veertig kinderen tussen de zeven en tien jaar de eerste spellen en tests met de robot doen in het ziekenhuis. Hij is ook geïntroduceerd in diabeteskampen van de Diabetesvereniging Nederland en een ziekenhuis in Italië. Samen met de kinderen stelden de zorgverlener en de ouders een aantal weet-en-doe-doelen op, gericht op diabetes. Thuis konden ze op met die doelen aan de slag via een avatar, een digitale versie van de robot.	https://www.meandermc.nl/wps/wcm/connect/www/b0435275-ef9a-44fd-9a44-8f6cf7a4c4cb/Diabetes+Pro+4-2016+LR+def+artikel+robot+Charlie.pdf?MOD=AJPERES
2	Integrating Robot Support Functions into Varied Activities at Returning Hospital Visits, article, 2016 (as author)	Rosemarijn Looije and Mark A. Neerincx and Johanna K. Peters and Olivier A.	Journal article	International Journal of Social Robotics	Persistent progress in the self-management of their disease is important and challenging for children with diabetes. The European ALIZ-e project developed and tested a set of core functions for a social robot that may help to establish such progress. These functions were studied in different set-ups and with different groups of children (e.g. classmates at a school, or	http://dx.doi.org/10.1007/s12369-016-0365-8

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		Blanson-Henkemans			participants of a diabetes camp). This paper takes the lessons learned from these studies to design a general scenario for educational and enjoying child–robot activities during returning hospital visits. The resulting scenario entailed three sessions, each lasting almost one hour, with three educational child–robot activities (quiz, sorting game and video watching), two intervening child–robot interactions (small talk and walking), and specific tests to assess the children and their experiences. Seventeen children (age 6–10) participated in the evaluation of this scenario, which provided new insights of the combined social robot support in the real environment. Overall, the children, but also their parents and formal caregivers, showed positive experiences. Children enjoyed the variety of activities, built a relationship with the robot and had a small knowledge gain. Parents and hospital staff pointed out that the robot had positive effects on child's mood and openness, which may be helpful for self-management. Based on the evaluation results, we derived five user profiles for further personalization of the robot, and general requirements for mediating the support of parents and caregivers.	
2	Specifying and testing the design rationale of social robots for behavior change in children. , article, 2016 (as author)	Rosemarijn Looije and Mark A. Neerincx and Koen V. Hindriks	Journal article	Cognitive Systems Research	We are developing a social robot that helps children with diabetes Type 1 to acquire self-management skills and routines. There is a diversity of Behavior Change Techniques (BCTs) and guidelines that seem to be useful for the development of such support, but it is not yet clear how to work out the techniques into concrete robot support functions and behaviors. The situated Cognitive Engineering (sCE) methodology provides guidance for the design and evaluation of such functions and behaviors, but doesn't provide a univocal specification method of the theoretical and empirical justification. This paper presents an extension of sCE: a formal template that describes the relations between support objectives, behavior change theory, design specifications and evaluation outcomes, called situated Design Rationale (sDR) and the method to get this. As test case, the European ALIZ-e project is used to instantiate this design rationale and to evaluate the usage. This case study showed that sDR provides concrete	10.1016/j.cogsys.2016.07.002

				guidance (1) to derive robot functions and behaviors from the theory and (2) to designate the corresponding effects with evaluation instruments. Furthermore, it helps to establish an effective, incremental and iterative, design and evaluation process, by relating positive and negative evaluation outcomes to robot behaviors at the task and communication level. The proposed solution for explicating the design rationale makes it possible for others to understand the decisions made and thereby supports replicating experiments or reusing parts of the design rationale.	
3	Quality and diversity optimization: A unifying modular framework. , proceedings, 2017 (as author)	A. Cully, Y. Demiris.	procee ding		The optimization of functions to find the best solution according to one or several objectives has a central role in many engineering and research fields. Recently, a new family of optimization algorithms, named Quality-Diversity optimization, has been introduced, and contrasts with classic algorithms. Instead of searching for a single solution, Quality-Diversity algorithms are searching for a large collection of both diverse and high-performing solutions. The role of this collection is to cover the range of possible solution types as much as possible, and to contain the best solution for each type. The contribution of this paper is threefold. Firstly, we present a unifying framework of Quality-Diversity optimization algorithms that covers the two main algorithms of this family (Multi-dimensional Archive of Phenotypic Elites and the Novelty Search with Local Competition), and that highlights the large variety of variants that can be investigated within this family. Secondly, we propose algorithms with a new selection mechanism for Quality-Diversity algorithms that outperforms all the algorithms tested in this paper. Lastly, we present a new collection management that overcomes the erosion issues observed when using unstructured collections. These three contributions are supported by extensive experimental comparisons of Quality-Diversity algorithms on three different experimental scenarios.	https://doi.or g/10.1109/T EVC.2017.2 704781
3	Fostering relatedness between children and virtual agents through reciprocal self-	Burger, F., Broekens, J., & Neerincx, M. A.	Book chapte r	Communication s in Computer	A key challenge in developing companion agents for children is keeping them interested after novelty effects wear off. Self Determination Theory posits that motivation is sustained if the human feels related to another	https://link.s pringer.com /chapter/10.

			and Information Science	human. According to Social Penetration Theory, relatedness can be established through the reciprocal disclosure of information about the self. Inspired by these social psychology theories, we developed a disclosure dialog module to study the self-disclosing behavior of children in response to that of a virtual agent. The module was integrated into a mobile application with avatar presence for diabetic children and subsequently used by 11 children in an exploratory field study over the course of approximately two weeks at home. The number of disclosures that children made to the avatar during the study indicated the relatedness they felt towards the agent at the end of the study. While all children showed a decline in their usage over time, more related children used the application more, and more consistently than less related children. Avatar disclosures of lower intimacy were reciprocated more than avatar disclosures of higher intimacy. Girls reciprocated disclosures more frequently. No relationship was found between the intimacy level of agent disclosures and child disclosures. Particularly the last finding contradicts prior child-peer interaction research and should therefore be further examined in confirmatory research.	1007/978-3-319-67468-1_10
disclosure., book, 2017 (as author)					
3	Design and evaluation of a personal robot playing a self-management education game with children with diabetes type 1, article, 2017 (as author)	Olivier A. Blanson Henkemans Bert P.B.Bierman Joris Janssen Rosemarijn Looije Mark A.Neerincx Marierose M.M.van Dooren Jitske L.E.de Vries Gert Janvan	Journal article	International Journal of Human-Computer Studies	Objective To assess the effects of a personal robot, providing diabetes self-management education in a clinical setting on the pleasure, engagement and motivation to play a diabetes quiz of children (7–12) with type 1 diabetes mellitus (T1DM), and on their acquisition of knowledge about their illness. Methods Children with T1DM (N = 27) participated in a randomized controlled trial (RCT) in which they played a diabetes mellitus self-management education (DMSE) game, namely a diabetes quiz, with a personal or neutral robot on three occasions at the clinic, or were allocated to a control group (care as usual). Personalised robot behaviour was based on the self-determination theory (SDT), focusing on the children's needs for competence, relatedness	https://www.sciencedirect.com/science/article/pii/S1071581917300861?via%3Dihub

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					and autonomy. The SDT determinants pleasure, motivation and diabetes knowledge were measured. Child-robot interaction was observed, including level of engagement. Results Results showed an increase in diabetes knowledge in children allocated to the robot groups and not in those allocated to the control group (P = .001). After three sessions, children working with the personal robot scored higher for determinants of SDT than children with the neutral robot (P = .02). They also found the robot to be more pleasurable (P = .04), they answered more quiz questions correctly (P = .02), and were more motivated to play a fourth time (P = .03). The analysis of audio/video recordings showed that in regard to engagement, children with the personal robot were more attentive to the robot, more social, and more positive (P < .05). Conclusion The study showed how a personal robot that plays DMSE games and applies STD based strategies (i.e., provides constructive feedback, acknowledges feelings and moods, encourages competition and builds a rapport) can help to improve health literacy in children in an pleasurable, engaging and motivating way. Using a robot in health care could contribute to self-management in children with a chronic disease and help them to cope with their illness.	
der Burgd Sasja D.Huismane					
4	Friendship with a robot: Children's perception of similarity between a robot's physical and virtual embodiment that supports diabetes self-management. , article, 2018 (as author)	Sinoo, C., van der Pal, S., Blanson, H. O., Keizer, A., Bierman, B. P. B., Looije, R., & Neerincx, M. A.	Journal article	Patient education and counseling	OBJECTIVE: The PAL project develops a conversational agent with a physical (robot) and virtual (avatar) embodiment to support diabetes self-management of children ubiquitously. This paper assesses 1) the effect of perceived similarity between robot and avatar on children's' friendship towards the avatar, and 2) the effect of this friendship on usability of a self-management application containing the avatar (a) and children's motivation to play with it (b). METHODS: During a four-day diabetes camp in the Netherlands, 21 children	https://www.ncbi.nlm.nih.gov/pubmed/29548599

				participated in interactions with both agent embodiments. Questionnaires measured perceived similarity, friendship, motivation to play with the app and its usability. RESULTS: Children felt stronger friendship towards the physical robot than towards the avatar. The more children perceived the robot and its avatar as the same agency, the stronger their friendship with the avatar was. The stronger their friendship with the avatar, the more they were motivated to play with the app and the higher the app scored on usability. CONCLUSION: The combination of physical and virtual embodiments seems to provide a unique opportunity for building ubiquitous long-term child-agent friendships. PRACTICE IMPLICATIONS: an avatar complementing a physical robot in health care could increase children's motivation and adherence to use self-management support systems.	
4	Online Knowledge Level Tracking with Data-Driven Student Models and Collaborative Filtering	A. Cully, Y. Demiris	Journal article	IEEE Transactions on Knowledge and Data Engineering	Accepted, to be published
4	Socio-Cognitive Engineering of a Robotic Partner for Child's Diabetes Self-Management	Neerincx, M. et al.	Journal article		Accepted, to be published
4	Assistive Robotic Technology to Combat Social Isolation in Acute Hospital Settings	M. Sarabia, N. Young, K. Canavan, T. Edginton, Y. Demiris, MP Vizcaychipi	Journal article			https://link.springer.com/article/10.1007/s12369-017-0421-z

ANNEX 2 – SUMMARY OF PAL PUBLICATIONS AND PROCEEDINGS

In this section are summarised all PAL project publications, divided by typology and by year. Journals & Book have been inserted in the previous chapter (see 1.7 Journals & Books). In the Publications section of the PAL website (http://www.pal4u.eu/home/publications/), all the PAL related publications and proceedings of the last four years can be found. They are reported and divided by typology.

2.1 Publications' Summary

In four years the consortium released a total of 39 publications (51 including Journals & books), mainly coming from Conferences (31), 4 from workshops and 4 are Master Thesis.
For a better overview all publications have been classified in three categories and divided by year (see Figure 63 and Figure 64).

PAL PUBLICATIONS	2015	2016	2017	2018/2019
Conferences	5	11	6	9
Workshops	2	2	0	0
Master Thesis	0	4	0	0

Figure 63 - Data summarising all publications
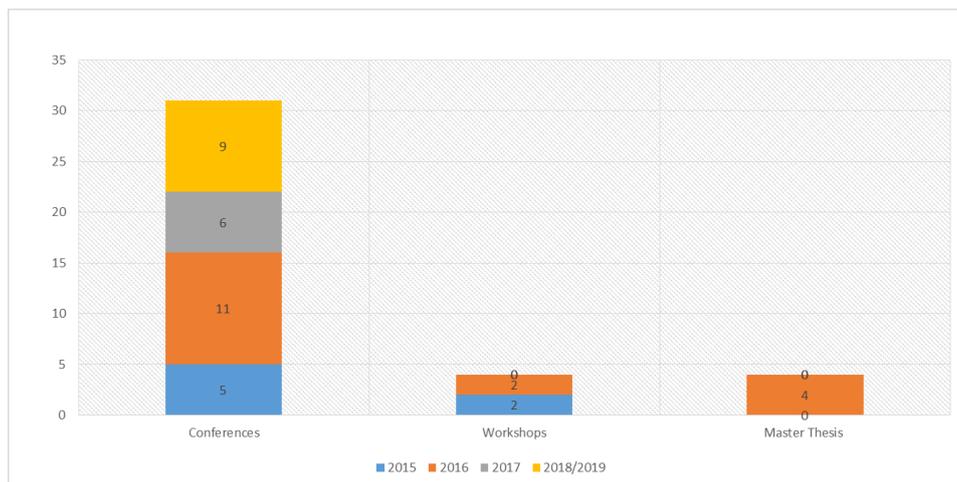
Figure 64 - Graphic summarising all publications

2.2 Conferences

PUBLICATION TITLE/EVENT NAME	AUTHORS	BOOK/CONFERENCE TITLE	ABSTRACT	URL
			YEAR 1	
Let's Be Friends : Perception of a Social Robotic Companion for children with T1DM, inproceedings, 2015 (as author)	Ivana Kruijff-Korbayová and Elettra Oleari and et al.	New Friends Conference	We describe the social characteristics of a robot developed to support children with Type 1 Diabetes Mellitus (T1DM) in the process of education and care. We evaluated the perception of the robot at a summer camp where diabetic children aged 10-14 experienced the robot in group interactions. Children in the intervention condition additionally interacted with it also individually, in one-to-one sessions featuring several game-like activities. These children perceived the robot significantly more as a friend than those in the control group. They also readily engaged with it in dialogues about their habits related to healthy lifestyle as well as personal experiences concerning diabetes. This indicates that the one-on-one interactions added a special quality to the relationship of the children with the robot.	https://zenodo.org/record/100617#.XNwExcgzaHs
Young Users' Perception of a Social Robot Displaying Familiarity and Eliciting Disclosure, inproceedings, 2015 (as author)	Ivana Kruijff-Korbayová and Elettra Oleari and Anahita Bagherzadhal and Francesca Sacchitelli and Bernd Kiefer and	Proceedings of the 7th International Conference on Social Robotics. International Conference on Social Robotics (ICSR-2015), 7th, October 26-30, Paris, France	Establishing a positive relationship between a user and a system is considered important or even necessary in applications of social robots or other computational artifacts which require long-term engagement. We discuss sever- al experiments investigating the effects of specific relational verbal behaviors within the broader context of developing a social robot for long-term support of self-management improvement in children with Type 1 diabetes. Our results show that displaying familiarity with a user as well as eliciting the user's self- disclosure in off-activity talk contribute to the user's perception of the social robot as a friend. We also observed increased commitment to interaction success related to familiarity display and increased interest in further interactions related to off-activity talk.	http://www.dfki.de/web/forschung/iwi/publikationen/renameFileForDownload?filename=icsr2015_korbayetal_20150820_cameraready.pdf&file_id=uploads_2715

	Stefania Racioppa and Clara Pozzi			
Let Me Guide You! Pedagogical Interaction Style for a Robot in Children's Education, inproceedings, 2015 (as author)	Rifca Peters and Joost Broekens and Mark A. Neerincx	WONDER workshop at ICSR 2015	Social Robots are increasingly applied in healthcare and education. Pedagogical Agents (PAs) are being developed to adapt to the users knowledge, and e orts are made in strategic action selection: what action is appropriate given the context and user preference. However, the issues of how these actions can be appropriately communicated receives less attention. In this paper we propose the development of an adaptive pedagogical interaction style for a robot. We discuss the role of style in human-human interaction and the lack thereof in human-robot interaction. While human educators heavily rely on their ability to identify and respond accordingly to social signals in a fluent and natural way, robots cannot adapt their style of interaction effectively. By adapting the pedagogical interaction style of a robot to the learner and context we expect to be able to create rich and fruitful personalized educational interactions and ultimately facilitate social bonding between the learner and robot. In this position paper we present our view as a starting point for the management of this interaction style. As a basis for the proposition, pedagogic and motivational theories are used.	https://icsrwonder2015.files.wordpress.com/2015/10/p8-peters.pdf
How do diabetic children react on a social robot during multiple sessions in a hospital ?, inproceedings, 2015 (as author)	Rosemarijn Looije and Mark A. Neerincx and Johanna K. Peters		In the European project ALIZ - e , many aspects of social robot interaction were evaluated, mainly with healthy children. In this paper , we take the lessons learned and apply them in a field experiment with diabetic children. The observations show ed that a robot requesting help added to the bonding, that the children with diabetes acquired relevant knowledge, seemed to appreciate the robot more than the healthy children in earlier experiments and showed to have different profiles between them th at set requirements for personalization .	http://dx.doi.org/10.5281/zenodo.35462
YEAR 2				
A Modal Representation of Graded Medical Statements, incollection, 2016 (as author)	Hans-Ulrich Krieger and	Formal Grammar 2015/2016	Medical natural language statements uttered by physicians are usually graded, i.e., are associated with a degree of uncertainty about the validity of a medical assessment. This uncertainty is often expressed through specific verbs, adverbs, or	https://doi.org/10.1007/978-3-662-53042-9_8

	Stefan Schulz		adjectives in natural language. In this paper, we look into a representation of such graded statements by presenting a simple non-standard modal logic which comes with a set of modal operators, directly associated with the words indicating the uncertainty and interpreted through confidence intervals in the model theory. We complement the model theory by a set of RDFS-/OWL 2 RL-like entailment (if-then) rules, acting on the syntactic representation of modalized statements. Our interest in such a formalization is related to the use of OWL as the de facto standard in (medical) ontologies today and its weakness to represent and reason about assertional knowledge that is uncertain or that changes over time. The approach is not restricted to medical statements, but is applicable to other graded statements as well (e.g., in technical diagnosis).	
CAAF: A Cognitive Affective Agent Programming Framework, inbook, 2016 (as author)	Frank Kaptein and Joost Broekens and Koen V. Hindriks and Mark A. Neerincx		Cognitive agent programming frameworks facilitate the development of intelligent virtual agents. By adding a computational model of emotion to such a framework, one can program agents capable of using and reasoning over emotions. Computational models of emotion are generally based on cognitive appraisal theory; however, these theories introduce a large set of appraisal processes, which are not specified in enough detail for unambiguous implementation in cognitive agent programming frameworks. We present CAAF (Cognitive Affective Agent programming Framework), a framework based on the belief-desire theory of emotions (BDTE), that enables the computation of emotions for cognitive agents (i.e., making them cognitive affective agents). In this paper we bridge the remaining gap between BDTE and cognitive agent programming frameworks. We conclude that CAAF models consistent, domain independent emotions for cognitive agent programming.	http://dx.doi.org/10.1007/978-3-319-47665-0_28
Child's Culture-related Experiences with a Social Robot at Diabetes Camps, inproceedings, 2016 (as author)	Anouk Neerincx and Francesca Sacchitelli and Rianne Kaptein and Sylvia van	The Eleventh ACM/IEEE International Conference on Human Robot Interation	This paper investigates the experiences of Italian and Dutch children while interacting with a social robot that is designed to support their diabetes self-management. Observations of children's behaviors and analyses of questionnaires at diabetes camps, showed positive experiences with variation (e.g., Italian children seemed to be more open and expressive, and more close to the robot compared to the Dutch children). A culture-aware robot should be sensitive to such differences.	http://dl.acm.org/citation.cfm?id=2906831.2906939

	der Pal and Elettra Oleari and Mark A. Neerincx			
A Disclosure Intimacy Rating Scale for Child-Agent Interaction, article, 2016 (as author)	Franziska Burger and Joost Broekens and Mark A Neerincx	International Conference on Intelligent Virtual Agents	Reciprocal self-disclosure is an integral part of social bonding between humans that has received little attention in the field of human-agent interaction. To study how children react to self-disclosures of a virtual agent, we developed a disclosure intimacy rating scale that can be used to assess both the intimacy level of agent disclosures and that of child disclosures. To this end, 72 disclosures were derived from a biography created for the agent and rated by 10 university students for intimacy. A principal component analysis and subsequent k-means clustering of the rated statements resulted in four distinct levels of intimacy based on the risk of a negative appraisal and the impact of betrayal by the listener. This validated rating scale can be readily used with other agents or interfaces.	https://doi.org/10.1007/978-3-319-47665-0_40
Capturing Graded Knowledge and Uncertainty in a Modalized Fragment of OWL, inproceedings, 2016 (as author)	Hans-Ulrich Krieger	Proceedings of the 8th International Conference on Agents and Artificial Intelligence	Natural language statements uttered in diagnosis (e.g., in medicine), but more general in daily life are usually graded, i.e., are associated with a degree of uncertainty about the validity of an assessment and is often expressed through specific verbs, adverbs, or adjectives in natural language. In this paper, we look into a representation of such graded statements by presenting a simple non-standard modal logic which comes with a set of modal operators, directly associated with the words indicating the uncertainty and interpreted through confidence intervals in the model theory. We complement the model theory by a set of RDFS-/OWL 2 RL-like entailment (if-then) rules, acting on the syntactic representation of modalized statements. Our interest in such a formalization is related to the use of OWL as the de facto language in today's ontologies and its weakness to represent and reason about assertional knowledge that is uncertain or that changes over time.	http://www.dfki.de/web/forschung/iwi/publikationen/renameFileForDownload?filename=gradedmodals.pdf&file_id=uploads_2684
The Federated Ontology of the PAL Project. Interfacing Ontologies and Integrating Time-Dependent Data,	Hans-Ulrich Krieger and Rifca Peters and Bernd	8th International Joint Conference on Knowledge Engineering and	This paper describes ongoing work carried out in the European project PAL which will support children in their diabetes self-management as well as assist health professionals and parents involved in the diabetes regimen of the child. Here, we will focus on the construction of the PAL ontology which has been assembled from	http://www.dfki.de/web/forschung/iwi/publikationen/renameFileForDownload?filename

inproceedings, 2016 (as author)	Kiefer and Michael A. van Bekkum and Frank Kaptein and Mark A. Neerincx	Ontology Development	several independently developed sub-ontologies and which are brought together by a set of hand-written interface axioms, expressed in OWL. We will describe in detail how the triple model of RDF has been extended towards transaction time in order to represent time-varying data. Examples of queries and rules involving temporal information will be presented as well. The approach is currently been in use in diabetes camps.	=palonto.pdf&file_id =uploads_2973
Integrating Graded Knowledge and Temporal Change in a Modal Fragment of OWL, inbook, 2016 (as author)	Hans-Ulrich Krieger	New Friends Conference	Natural language statements uttered in diagnosis, but more general in daily life are usually graded, i.e., are associated with a degree of uncertainty about the validity of an assessment and is often expressed through specific words in natural language. In this paper, we look into a representation of such graded statements by presenting a simple non-standard modal logic which comes with a set of modal operators, directly associated with the words indicating the uncertainty and interpreted through confidence intervals in the model theory. We complement the model theory by a set of RDFS-/OWL 2 RL-like entailment (if-then) rules, acting on the syntactic representation of modalized statements. After that, we extend the modal statements by transaction time, in order to implement a notion of temporal change. Our interest in such a formalization is related to the use of OWL as the de facto language in today's ontologies and its weakness to represent and reason about assertional knowledge that is uncertain and that changes over time.	https://link.springer.co m/chapter/10.1007/97 8-3-319-53354-4_5
How to improve human-robot interaction with Conversational Fillers, inproceedings, 2016 (as author)	N Wigdor and J de Greeff and R Looije and M A Neerincx	2016 25th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)	Conversation Fillers (CFs), such as `um', `hmm', and `ah', may help to improve the human-robot interaction by smoothening the robot's responses. This paper presents the design and test of such CFs - alongside iconic pensive or acknowledging gestures - for Wizard of Oz (WoZ) controlled open-ended dialogues in child-robot interactions. A controlled experiment with 26 children showed that these CFs can improve the perceived speediness, aliveness, humanness, and likability of the robot, without decreasing perceptions of intelligence, trustworthiness, or autonomy.	https://doi.org/10.110 9/ROMAN.2016.7745 134
Co-design of the PAL robot and avatar that perform joint activities with children for	Blanson Henkemans, O. A.,	Ro-man 2016	Children with type 1 diabetes mellitus need social, cognitive and affective support to develop the required skills and motivation for self-management. A PAL robot and its avatar could complement parents' and caregivers' support by initiating,	https://www.researchg ate.net/publication/31 9981355_Co-

improved diabetes self-management., presentation, 2016 (as author)	Neerincx, M., Oleari, E., & Pozzi, C.		encouraging and participating in beneficial computer-based activities (e.g., playing educative games). Participatory development with children of this envisioned PAL-system is a challenge. This paper presents a small suite of co-design methods for young end-users, aged 7-14: image-theatre, draw-write-and-tell, storytelling, photo-elicitation and user journey maps. These methods were valuable as children did not find research participation burdensome, but very pleasurable. Results showed among others that children are knowledgeable about diabetes, but struggle with daily practice of self-management. Finally, they provided a rich set of user requirements and use cases for pervasive, personalized and situated support that are expected to improve children's daily self-management. In three iteration cycles these requirements are being implemented in a prototype, tested and refined, in Italy and the Netherlands. (PDF) Co-design of the PAL robot and avatar.... Available from: https://www.researchgate.net/publication/319981355_Co-design_of_the_PAL_robot_and_avatar_that_perform_joint_activities_with_children_for_improved_diabetes_self-management [accessed Jul 24 2018].	design_of_the_PAL_robot_and_avatar_that_perform_joint_activities_with_children_for_improved_diabetes_self-management
Guidelines for Tree-based Learning Goal Structuring, inproceedings, 2017 (as author)	Rifca Peters and Joost Broekens and Mark A Neerincx	Proceedings of Intelligent User Interface (IUI) Conference	Educational technology needs a model of learning goals to support motivation, learning gain, tailoring of the learning process, and sharing of the personal goals between different types of users (i.e., learner and educator) and the system. This paper proposes a tree-based learning goal structuring to facilitate personal goal setting to shape and monitor the learning process. We developed a goal ontology and created a user interface representing this knowledge-base for the self-management education for children with Type 1 Diabetes Mellitus. Subsequently, a co-operative evaluation was conducted with healthcare professionals to refine and validate the ontology and its representation. Presentation of a concrete prototype proved to support professionals' contribution to the design process. The resulting tree-based goal structure enables three important tasks: ability assessment, goal setting and progress monitoring. Visualization should be clarified by icon placement and clustering of goals with the same difficulty and topic.	https://doi.org/10.1145/3025171.3025188

			Bloom's taxonomy for learning objectives should be applied to improve completeness and clarity of goal content.	
Ontology Engineering for the Design and Implementation of Personal Pervasive Lifestyle Support	Michael A. van Bekkum, et al.	The 12th International Conference on Semantic Systems (SEMANTiCS)	The PAL project1 is developing an embodied conversational agent (robot and its avatar), and applications for child-agent activities that help children from 8 to 14 years old to acquire the required knowledge, skills, and attitude for adequate diabetes selfmanagement. Formal and informal caregivers can use the PAL system to enhance their supportive role for this self-management learning process. We are developing a common ontology (i) to support normative behavior in a flexible way, (ii) to establish mutual understanding in the human-agent system, (iii) to integrate and utilize knowledge from the application and scientific domains, and (iv) to produce sensible human-agent dialogues. The common ontology is constructed by relating and integrating partly existing separate ontologies that are specific to certain contexts or domains. This paper presents the general vision, approach, and state of the art.	https://repository.tudelft.nl/islandora/object/uuid%3A635375e0-bf26-4958-b110-53b539fc5e7c
Evaluating an autonomous and responsive avatar for diabetic care: the pitfalls of questionnaire based research with children	Michael A. van Bekkum, et al.	the Second International Conference on e-Coaching for Health and Wellbeing		na
YEAR 3				
Personalized Self-Explanation by Robots: the role of Goals Versus Beliefs in Robot-Action Explanation for Children and Adults, inproceedings, 2017 (as author)	F. Kaptein, J. Broekens, K. V. Hindriks and M. Neerincx	26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN), Lisbon, Portugal	A good explanation takes the user who is receiving the explanation into account. We aim to get a better understanding of user preferences and the differences between children and adults who receive explanations from a robot. We implemented a Nao-robot as a belief-desire-intention (BDI)-based agent and explained its actions using two different explanation styles. Both are based on how humans explain and justify their actions to each other. One explanation style communicates the beliefs that give context information on why the agent performed the action. The other explanation style communicates the goals that inform the user of the agent's desired state when performing the action. We	https://doi.org/10.1109/ROMAN.2017.8172376

			conducted a user study (19 children, 19 adults) in which a Nao-robot performed actions to support type 1 diabetes mellitus management. We investigated the preference of children and adults for goalversus belief-based action explanations. From this, we learned that adults have a significantly higher tendency to prefer goal-based action explanations. This work is a necessary step in addressing the challenge of providing personalised explanations in human-robot and human-agent interaction.	
Self-Explanations of a Cognitive Agent by Citing Goals and Emotions, proceedings, 2017 (as author)	F. Kaptein, J. Broekens, K. V. Hindriks and M. Neerincx		This paper presents a cognitive (belief-desire-intention based) agent that can self-explain its behaviour based on its goals and emotions. We implement a cognitive agent, embodied by a nao-robot or virtual avatar thereof, to play a quiz with its user. During the interaction the agent intelligently selects questions to optimally educate the user. We show how the simulation of emotions can be used to generate end-user explanations of the agent's behaviour. With this we provide a first proof of concept showing the value of using simulated emotions in addition to goals for generating agent behaviour explanations.	https://doi.org/10.1109/ACIIW.2017.8272592
Learning with Charlie: A robot buddy for children with diabetes., conference, 2017 (as author)	Blanson Henkemans, O. A., Van der Pal, S., Werner, I., Neerincx, M. A., & Looije, R.	HRI '17 Proceedings of the Companion of the 2017 ACM/IEEE International Conference on Human-Robot Interaction	Children with type 1 diabetes mellitus (T1DM) have a need for social, cognitive and affective support for self-management. The PAL project develops a social robot and its avatar. The aim is to assist the child, health care professional and parents to jointly perform diabetes management. Diabetes camps are an important setting in which the PAL can support children with T1DM. The video 'Learning with Charlie' shows how different robot buddies and children interact in a camp setting and learn about T1DM through educative activities. Also, the robots offer socio-emotional support in a pleasurable and safe environment.	https://dl.acm.org/citation.cfm?id=3036656&picked=formats
Expectation management in child-robot interaction., conference, 2017 (as author)	Ligthart, M., Henkemans, O. B., Hindriks, K., & Neerincx, M. A.	Conference: 2017 26th IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)	Children are eager to anthropomorphize (ascribe human attributes to) social robots. As a consequence they expect a more unconstrained, substantive and useful interaction with the robot than is possible with the current state-of-the art. In this paper we reflect on several of our user studies and investigate the form and role of expectations in child-robot interaction. We have found that the effectiveness of the social assistance of the robot is negatively influenced by misaligned expectations. We propose three strategies that have to be worked out for the management of expectations in child-robot interaction: 1) be aware of and analyze children's	http://dx.doi.org/10.1109/ROMAN.2017.8172412

			expectations, 2) educate children, and 3) acknowledge robots are (perceived as) a new kind of 'living' entity besides humans and animals that we need to make responsible for managing expectations.	
Robots Educate in Style: The Effect of Context and Non-verbal Behaviour on Childrens Perceptions of Warmth and Competence	Neerincx, Rifca Peters Joost Broekens Mark ;		Social robots are entering the private and public domain where they engage in social interactions with nontechnical users. This requires robots to be socially interactive and intelligent, including the ability to display appropriate social behaviour. Progress has been made in emotion modelling. However, research into behaviour style is less thorough; no comprehensive, validated model exists of non-verbal behaviours to express style in human-robot interactions. Based on a literature survey, we created a model of non-verbal behaviour to express high/low warmth and competence - two dimensions that contribute to teaching style. In a perception study, we evaluated this model applied to a NAO robot giving a lecture at primary schools and a diabetes camp in the Netherlands. For this, we developed, based on expert ratings, an instrument measuring perceived warmth, competence, dominance and affiliation. We show that even subtle manipulations of robot behaviour influence children's perceptions of the robot's level of warmth and competence.	https://ieeexplore.ieee.org/document/8172341
Humanoid robot for children with type1 diabetes: challenges and ethical implications of a supportive tool in the therapeutic process., conference, 2018 (as author)	V. Sanchini, C. Pozzi, E. Oleari, F, Sacchitelli, A. Sanna, M. Neerincx.		Type 1 Diabetes (T1DM) is an overwhelming pathology, since it requires to cope with different therapeutic tasks and to adopt major life changes. In recent years, it is widely spreading up, affecting a growing number of children. Some proposals have been raised with respect to the introduction of humanoid robots in the healthcare domain for paediatric patients, especially in the contexts of rehabilitation and autism. Our aim is to discuss to what extent a humanoid robot can represent a supportive tool for children with T1DM and their families, thus proving to have a huge impact in the diabetes-related care process.	n.a.
Usability of the PAL Objectives Dashboard for Children's Diabetes Self-Management Education	Peters R., Oleari E., Sardu F., Mark A. Neerincx	ICSLT 2019, January 2019, Vienna, Austria	Children will only bene€t from educational technologies and ecoaches when they understand the long-term consequences and are (intrinsically) motivated to use these support systems. ŒThis paper presents an Objective Dashboard that integrates educational achievements, goals and tasks with gami€cation features (such as challenges, scores and rewards) to advance the interests and engagements of children with	http://www.rifca.nl/publications/

				type 1 diabetes when using the Personal Assistant for a healthy Lifestyle (PAL) system. By linking in-app activities (e.g., play a quiz or keep a diary) to relevant educational achievements, and to skills and knowledge required in daily life, we aim to increase intrinsic motivation and thereby usage. We designed a dashboard displaying personalised achievements, learning goals and tasks in the domain of diabetes self-management education. We used common user interface design paŠerns such as layering, colouring, and iconic presentation to organise complex information and reinforce the relations between concepts. Subsequently, we conducted a usability evaluation with twelve children, on the basis of which we refined our design. We found that, colouring and layering were to some extent effective, however, iconic representations were insufficient. Œerefore, we recommend to provide short, descriptive labels at any time.	
The Challenges of Evaluating Child-Robot Interaction with Questionnaires	Mike Ligthart, Rifca Peters	HRI conference	2018	In this paper we reflect on the use of questionnaires as an evaluation tool in child-robot interaction research. We provide a case study containing eight user studies. While doing these user studies we ran into two major challenges: violations of the constructs used in questionnaires and a ceiling effect in the responses of the children. These issues are caused by a combination of factors such as, but not limited to, misinterpretations of questions, response biases, and the novelty effect. A first lesson learned is that a proper design of a questionnaire, and how questions are asked and answered, is essential. In this paper we discuss two questionnaire methods we have been developing that potentially could circumvent some of the issues. A second lesson learned is that user studies could benefit if they reflect the long-term nature of the child-robot interaction.	http://www.rifca.nl/wp-content/uploads/2018/05/challenges-evaluating-child_FINAL1.pdf
YEAR 4					
Using perceptual and cognitive explanations for enhanced human-agent team performance., book, 2018 (as author)	M.A. Neerincx, J. Van der Waa, F. Kaptein, and J. Van Diggelen			Most explainable AI (XAI) research projects focus on well-delineated topics, such as interpretability of machine learning outcomes, knowledge sharing in a multi-agent system or human trust in agent's performance. For the development of explanations in human-agent teams, a more integrative approach is needed. This paper proposes a perceptual-cognitive explanation (PeCoX) framework for the development of explanations that address both the perceptual and cognitive	https://link.springer.com/chapter/10.1007/978-3-319-91122-9_18

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			foundations of an agent's behavior, distinguishing between explanation generation, communication and reception. It is a generic framework (i.e., the core is domain-agnostic and the perceptual layer is model-agnostic), and being developed and tested in the domains of transport, health-care and defense. The perceptual level entails the provision of an Intuitive Confidence Measure and the identification of the "foil" in a contrastive explanation. The cognitive level entails the selection of the beliefs, goals and emotions for explanations. Ontology Design Patterns are being constructed for the reasoning and communication, whereas Interaction Design Patterns are being constructed for the shaping of the multimodal communication. First results show (1) positive effects on human's understanding of the perceptual and cognitive foundation of agent's behavior, and (2) the need for harmonizing the explanations to the context and human's information processing capabilities.	
Hierarchical Behavioral Repertoires with Unsupervised Descriptors	A. Cully, Y. Demiris	GECCO 2018: The Genetic and Evolutionary Computation Conference	Enabling artificial agents to automatically learn complex, versatile and high-performing behaviors is a long-lasting challenge. This paper presents a step in this direction with hierarchical behavioral repertoires that stack several behavioral repertoires to generate sophisticated behaviors. Each repertoire of this architecture uses the lower repertoires to create complex behaviors as sequences of simpler ones, while only the lowest repertoire directly controls the agent's movements. This paper also introduces a novel approach to automatically define behavioral descriptors thanks to an unsupervised neural network that organizes the produced high-level behaviors. The experiments show that the proposed architecture enables a robot to learn how to draw digits in an unsupervised manner after having learned to draw lines and arcs. Compared to traditional behavioral repertoires, the proposed architecture reduces the dimensionality of the optimization problems by orders of magnitude and provides behaviors with a twice better fitness. More importantly, it enables the transfer of knowledge between robots: a hierarchical repertoire evolved for a robotic arm to draw digits can be transferred to a humanoid robot by simply changing the lowest layer of the hierarchy. This enables the humanoid to draw digits although it has never been trained for this task.	https://dl.acm.org/citation.cfm?doid=3205455.3205571

Real-Time Eye Gaze Estimation in Natural Environments	T.Fischer, H. J. Chang, Y. Demiris	European Conference on Computer Vision (ECCV 2018)	In this work, we consider the problem of robust gaze estimation in natural environments. Large camera-to-subject distances and high variations in head pose and eye gaze angles are common in such environments. This leads to two main shortfalls in state-of-the-art methods for gaze estimation: hindered ground truth gaze annotation and diminished gaze estimation accuracy as image resolution decreases with distance. We first record a novel dataset of varied gaze and head pose images in a natural environment, addressing the issue of ground truth annotation by measuring head pose using a motion capture system and eye gaze using mobile eyetracking glasses. We apply semantic image inpainting to the area covered by the glasses to bridge the gap between training and testing images by removing the obtrusiveness of the glasses. We also present a new real-time algorithm involving appearance-based deep convolutional neural networks with increased capacity to cope with the diverse images in the new dataset. Experiments with this network architecture are conducted on a number of diverse eye-gaze datasets including our own, and in cross dataset evaluations. We demonstrate state-of-the-art performance in terms of estimation accuracy in all experiments, and the architecture performs well even on lower resolution images.	http://openaccess.thecvf.com/content_ECCV_2018/papers/Tobias_Fischer_RT-GENE_Real-Time_Eye_ECCV_2018_paper.pdf
Inferring Human Knowledgeability from Eye Gaze in Mobile Learning Environments	O. Celiktutan, Y. Demiris	The European Conference on Computer Vision (ECCV) Workshops	What people look at during a visual task reflects an interplay between ocular motor functions and cognitive processes. In this paper, we study the links between eye gaze and cognitive states to investigate whether eye gaze reveal information about an individual's knowledgeability. We focus on a mobile learning scenario where a user and a virtual agent play a quiz game using a hand-held mobile device. To the best of our knowledge, this is the first attempt to predict user's knowledgeability from eye gaze using a noninvasive eye tracking method on mobile devices: we perform gaze estimation using front-facing camera of mobile devices in contrast to using specialised eye tracking devices. First, we define a set of eye movement features that are discriminative for inferring user's knowledgeability. Next, we train a model to predict users' knowledgeability in the course of responding to a question. We obtain a classification performance of 59.1% achieving human performance, using eye movement features only, which has implications for (1)	https://link.springer.com/chapter/10.1007/978-3-030-11024-6_13

			adapting behaviours of the virtual agent to user's needs (e.g., virtual agent can give hints); (2) personalising quiz questions to the user's perceived knowledgeability.	
How do children with diabetes evaluate the usability of a personal robot study supporting self-management at camp?	S. van der Pal, O. Blanson Henkemans, W. van Vught, B. Bierman, M. Neerincx	European Pediatric Psychology Conferece		
VOnDA: A Framework for Ontology-Based Dialogue Management	Kiefer, B., Welker, A., Biwer, C.	the Tenth International Workshop on Spoken Dialogue Systems Technology (IWSDS) 2019 in Siracusa, Italy		
"Sharing is caring": designing a value-sensitive mhealth platform for sharing type 1 diabetes management within families	Oleari, E., Pozzi, C., Sardu, F., Sacchitelli, F., Sanchini, V., Sanna, A.	11th International Conference on e-Health in Porto, Portugal on 17 - 19 July 2019		
Ontology Engineering for the Design and Implementation of Personal Pervasive Lifestyle Support	Michael A. van Bekkum, et al.	The 12th International Conference on Semantic Systems (SEMANTiCS)		https://repository.tudelft.nl/islandora/object/uuid%3A635375e0-bf26-4958-b110-53b539fc5e7c

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Evaluating an autonomous and responsive avatar for diabetic care: the pitfalls of questionnaire based research with children	Michael A. van Bekkum, et al.	the Second International Conference on e-Coaching for Health and Wellbeing			na

2.3 Workshops

YEAR	PUBLICATION TITLE/EVENT NAME	AUTHORS	BOOK/CONFERENCE TITLE	ABSTRACT	URL
2015	An OWL Ontology for Biographical Knowledge. Representing Time-Dependent Factual Knowledge, inproceedings, 2015 (as author)	Hans-Ulrich Krieger and Thierry Declerck	Proceedings of the Workshop on Biographical Data in a Digital World	Representing time-dependent information has become increasingly important for reasoning and querying services defined on top of RDF and OWL. In particular, addressing this task properly is vital for practical applications such as modern biographical information systems, but also for the Semantic Web/Web 2.0/Social Web in general. Extending binary relation instances with temporal information often translates into a massive proliferation of useless container objects when trying to keep the underlying RDF model. In this paper, we argue for directly extending RDF triples with further arguments in order to easily represent time-dependent factual knowledge and to allow for practical forms of reasoning. We also report on a freely available lightweight OWL ontology for representing biographical knowledge that models entities of interest via a tri-partite structure of the pairwise disjoint classes Abstract, Object, and Happening.	https://doi.org/ 10.5281/zenod o.166695

Year	Title	Authors	Source	Description	Link
				Even though the ontology was manually developed utilizing the Prot´eg´e ontology editor, and thus sticking to the triple model of RDF, the meta-modelling facilities allowed us to cross-classify all properties as being either synchronic or diachronic. When viewing the temporal arguments as "extra" arguments that only apply to relation instances, universal biographical knowledge from the ontology can still be described as if there is no time.	
2015	Extending OWL Ontologies by Cartesian Types to Represent N-ary Relations in Natural Language, inproceedings, 2015 (as author)	Hans-Ulrich Krieger and Christian Willms	Proceedings of the IWCS Workshop on Language and Ontologies	n-ary relations (n <1) can in principle be realized through binary relations obtained by a reification process that introduces new individuals to which the additional arguments are linked via accessor properties. Modern ontologies which employ standards such as RDF and OWL have mostly obeyed this restriction, but have struggled with it nevertheless. Additional arguments for representing, e.g., valid time, grading, uncertainty, negation, trust, sentiment, or additional verb roles (for ditransitive verbs and adjuncts) are often better modeled in relation and information extraction systems as direct arguments of the relation instance, instead of being hidden in deep structures. In order to address non-binary relations directly, ontologies must be extended by Cartesian types, ultimately leading to an extension of the standard entailment rules for RDFS and OWL. In order to support ontology construction, ontology editors such as Protege have to be adapted as well.	https://doi.org/10.5281/zenodo.166687
2016	Ontologies for social, cognitive and affective agent-based support of	Mark A. Neerincx and Frank Kaptein and Michael A. van Bekkum and Hans-	Workshop on Artificial Intelligence for Diabetes	The PAL project is developing: (1) an embodied conversational agent (robot and its avatar); (2) applications for child-agent activities that help children from 8 to 14 years old to acquire the required knowledge, skills and attitude for	http://www.dfki.de/web/forschung/iwi/publikationen/ren

	child's diabetes self-management, inproceedings, 2016 (as author)	Ulrich Krieger and Bernd Kiefer and Rifca Peters and Joost Broekens and Yiannis Demiris and Maya Sapelli		adequate diabetes self-management; and (3) dashboards for caregivers to enhance their supportive role for this self-management learning process. A common ontology is constructed to support normative behavior in a flexible way, to establish mutual understanding in the human-agent system, to integrate and utilize knowledge from the application and scientific domains, and to produce sensible human-agent dialogues. This paper presents the general vision, approach, and state of the art.	ameFileForDownload?filename=PAL_ECAIpaper_AIdiabetesWorkshop2016_final.pdf&file_id=uploads_2955
2016	X-Protege: An Ontology Editor for Defining Cartesian Types to Represent n-ary Relations., inproceedings, 2016 (as author)	Christian Willms and Hans-Ulrich Krieger and Bernd Kiefer	Joint Second Workshop on Language and Ontology & Terminology and Knowledge Structures	Arbitrary n-ary relations (n ≥ 1) can, in principle, be realized through binary relations obtained by a reification process which introduces new individuals to which the additional arguments are linked via "accessor" properties. Modern ontologies which employ standards such as RDF and OWL have mostly obeyed this restriction, but have struggled with it nevertheless. In (Krieger and Willms, 2015), we have laid the foundations for a theory-agnostic extension of RDFS and OWL and have implemented in the last year an extension of Proteǵe´, called ×-Proteǵe´, which supports the definition of Cartesian types to represent n-ary relations and relation instances. Not only do we keep the distinction between the domain and the range of an n-ary relation, but also introduce so-called extra arguments which canbe seen as position-oriented unnamed annotation properties and which are accessible to entailment rules. As the direct representation of n-ary relations abolishes RDF triples, we have backed up ×-Proteǵe´ by the semantic repository and entailment engine HFC which supports tuples of arbitrary length. ×-Proteǵe´	http://www.dfki.de/web/forschung/iwi/publikationen/renameFileForDownload?filename=xprotege.pdf&file_id=uploads_2750

				is programmed in Java and is made available under the Mozilla Public License.	

2.4 Master Thesis

YEAR	PUBLICATION TITLE/EVENT NAME	AUTHORS	School	ABSTRACT	URL
2016	Analysis of system usage and knowledge development of the current PAL system for children with Type 1 Diabetes Mellitus, masters thesis, 2016 (as author)	Anika Boelhouwer	University of Twente	Children who are diagnosed with type 1 diabetes mellitus need to learn a lot about diabetes and selfmanagement in a short period of time. A large problem in the support of this process is that health institutions cannot provide help at any given moment in the child life and are bounded by set face to face appointments. While digital interventions may address this issue by providing help and knowledge online which may be used at all times, this help and knowledge is general and not tailored to the individual. Also, actual usage of (digital) diabetes interventions has shown to be either extremely low or quickly decreasing. The Personal Assistant for a healthy Lifestyle project (PAL) strives to address these issues by providing a digital application with personalised communication and content. This study evaluated the current PAL application during a prolonged period of time with children diagnosed with type 1 diabetes mellitus between the ages of 6 and 12 years old. The main goals were to identify trends and possible predictors for both system usage and diabetes knowledge development. Three main trends were found in the system usage in which the majority of the users showed an overall low usage or quickly decreasing usage. A small number of users showed continuous and consistent usage throughout the entire experiment.	https://doi.org/10.5 281/zenodo.26890 9

				As the personalisation was only minimally implemented the results are in line with common (digital) diabetes interventions. The results did not allow us to explore possible system usage and knowledge development predictors. They do however provide a solid baseline for further versions of the system in which the personalisation is further implemented. The main recommendations are to focus on the implementation of basic game design elements and personalised content to foster user engagement and continuous use. Maintaining the used measures (while adding some psychological predictors) and longitudinal experiment design will allow for comparative analysis in the further research cycles.	
2016	Healthcare professionals gain control of children's diabetes self-management, masters thesis, 2016 (as author)	Jet Shin Hong	University of Amsterdam	Children aged 8 to 12 with diabetes type I are motivated to get involved in their diabetes management to reduce the impact of their illness on their short- and long-term health. Self-management of diabetes is an active and proactive process and it involves shifting and sharing responsibility for diabetes care tasks and decision-making in frequent collaboration with healthcare professionals. The research question this study sought to answer is: 'How can a healthcare management tool support healthcare professionals in guiding children with diabetes self-management involving a social actor (robot/avatar)?'. To answer this question, a prototype of a healthcare management tool was developed and evaluated with end users (diabetes nurses) and an important stakeholder (diabetes doctor), following the situated Cognitive Engineering approach. Overall, this prototype of a redesigned PAL Control was perceived positively by the healthcare professionals and the findings suggested that a combination of an assessment with a robot or its avatar, setting goals, selecting actions and the progression page, is a suitable and effective approach to healthcare professionals in guiding children with	https://doi.org/10.5281/zenodo.268911

				diabetes selfmanagement. Healthcare professionals mentioned that this system has provided them support in making the consult with children and parents more meaningful due to the fact that they can understand their needs better on forehand. However, evaluations for a longer period of time is needed in order to validate if the needs are completely fulfilled. Nonetheless, useful suggestions were found during the evaluation of the prototype and provided important pointers for further development.	
2016	MyPAL: A Digital Diabetes Diary with a Responsive Social Avatar, masters thesis, 2016 (as author)	Mike Ligthart	Radboud University Nijmegen	MyPAL is a digital diabetes diary that children can use to record their insulin use, carbohydrate intake and blood glucose values as well as write something about their day and how they feel. With that information the children can more easily link their diabetes values, what they eat and how they feel together. With this insight they can manage their insulin use and diet more efficiently. Besides children also medical professionals, parents and researchers benefit from this information. For example, a diabetes nurse can improve the treatment plan, parents can get a better idea how their child is doing and researchers can investigate the relationship between food, mood and blood glucose values more closely.	https://doi.org/10.5281/zenodo.268913
2016	Agents Sharing Secrets Self-Disclosure in Long- Term Child-Avatar Interaction, masters thesis, 2016 (as author)	Franziska Burger	TU DELFT	Na	Na