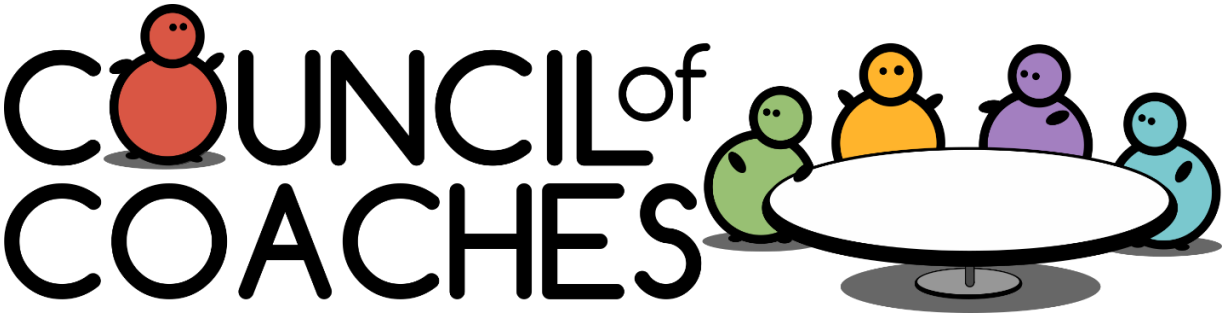


# D6.2: Initial user interface design for Home UI and Mobile UI

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| **Author(s)** | Gerwin Huizing (CMC), Randy Klaassen (CMC), Reshmashree Bangalore Kantharaju (SU), Silke ter Stal (RRD), Tessa Beinema (RRD), Harm op den Akker (RRD), Merijn Bruijnes (CMC) |
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- University of Twente – Centre for Monitoring and Coaching (CMC)
- Roessingh Research and Development (RRD)
- Danish Board of Technology Foundation (DBT)
- Sorbonne University (SU)
- University of Dundee (UDun)
- Universitat Politècnica de València, Grupa SABIEN (UPV)
- Innovation Sprint (iSPRINT)

# Abstract

The goal of this Work Package (WP6) is to design, implement, and evaluate the Human Computer Interaction aspects of the Council of Coaches. In this deliverable, we provide a description the work that is relevant for the initial user interface of the home application and mobile application, as well as describe the work on the design of the initial home application user interface integrated in the first functional prototype.

# Corrections

| | |
|---|---|
| v1.0.1 | Fixed “Error: reference source not found!” in Section 1: Introduction (v1.0.1). |
| v1.0.2 | Correctly applied EU logo on header page. |

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# List of figures

# List of tables

# Symbols, abbreviations and acronyms

| | |
|---|---|
| 2D | Two-dimensional |
| 3D | Three-dimensional |
| ASAP | Articulated Social Agents Platform |
| ASR | Automatic Speech Recognition |
| BML | Behaviour Markup Language |
| CMC | Centre for Monitoring and Coaching |
| COUCH | Council of Coaches |
| D | Deliverable |
| DBT | Danish Board of Technology Foundation |
| DGEP | Dialogue Game Execution Platform |
| EC | European Commission |
| ECA | Embodied Conversational Agent |
| ECC | Embodied Conversation Coach |
| GIF | Graphics Interchange Format |
| HBAF | Holistic Behaviour Analysis Framework |
| ISPRINT | Innovation Sprint |
| M | Month |
| MS | Milestone |
| NLP | Natural Language Processing |
| RRD | Roessingh Research and Development |
| SU | Sorbonne University |
| WP | Work Package |
| UDun | University of Dundee |
| UI | User interface |
| UPV | Universitat Politècnica de València |
| UT | University of Twente |

# 1 Introduction

In the Council of Coaches project an application is being developed that will provide tailored and personalized virtual coaching for ageing people to support them in improving their health and well-being. The focus of the coaches in the Council of Coaches will be on the physical, social, mental, and cognitive domain as well as the specific cases of Diabetes Type 2, Chronic Pain and Age-Related Impairments. Each of the six coaches that will be developed will have their own expertise, appearance, role, personality, and coaching strategies. They will interact with each other and the user to motivate and inform them, as well as discuss issues related to their health and well-being with them.

The main objective of work package 6, which this deliverable is part of, is to design, implement and evaluate the user interaction in different use case scenarios. The main user interface of the Council of Coaches application will be at a large screen in a home environment. The companion mobile application will facilitate interaction with the system when users are on the go. As the Council of Coaches will work on both computers as well as smartphones, several ways to interact with the coaches through a home application and a mobile application will be designed. Describing the start of this design process will be done in this deliverable.

The aim of this deliverable is to present all of the work that is relevant for the initial user interface of the home application and mobile application, as well as describe the work on the design of the initial home application user interface integrated in the first functional prototype. The user interfaces described in this deliverable will focus on the interaction during a coaching session between the coaches and a user. In this deliverable we will start with the defining the objectives in Section 2. Section 3 will describe the character design process for the coaches. Then we describe the initial design process for the home application user interface (Home UI) which will make up Section 4. We will follow this up with the description of the initial design process for the mobile application user interface (Mobile UI) in Section 5. We will conclude by presenting our conclusions in Section 6.

# 2 Objectives

The objective of this deliverable is to present the work that is relevant for the initial user interface of the home application and mobile application, and to describe the work on the home application user interface for the first functional prototype. This includes a description of work done on character design, settings of the council meetings, the interaction possibilities with the coaches, audio, and the investigation of the possibilities for the user interface of the mobile application. In this deliverable we will focus on work done so far and touch upon the next steps to be made. The aims of this deliverable are:

- To present work done so far on the design and development of the interface components for the home application UI of the Council of Coaches.
- To present the thoughts of the Council of Coaches consortium on the objectives of the mobile application of the Council of Coaches and the design options for the UI of this application.
- To present some of the studies and work that is done as well as in progress within the Council of Coaches consortium that helps to further the design and development process.
- To present the plans of the Council of Coaches consortium for the next steps in the design process of the home UI and mobile UI.

# 3 Character design

In this section, we describe the importance of modelling the appearance and the personality of the embodied conversational coach. We provide literature on how these could affect and influence the way users will experience agents. Several user studies will be conducted during the course of this project and we will elaborate on the studies that are in progress to understand the preference of the users. Further, we briefly describe the tools that are used to design the appearance of the agents.

Virtual humans are now becoming more affect-sensitive and have been able to incorporate social skills to build and maintain rapport (Gratch, Kang, & Wang, 2013). The initial research on virtual agents focused on enabling the agents to be involved in dyadic conversations, making them human-like by displaying verbal and non-verbal signals. Now, researchers are focusing on making the agents context aware, engaging and be able to understand human conversational dynamics to handle multi-party conversations and adapt accordingly to provide rich human-computer interaction. Embodied conversational coaches are being developed to be companions or coaches rather than using them as assistants. Virtual humans can be useful in providing a 'safe' environment, that can motivate the users for honest disclosure of important information. In (DeVault, et al., 2014), a virtual human was developed for conducting interviews for healthcare support and it was shown that participants reported willingness to disclose, willingness to recommend and general satisfaction with the system (Stratou, et al., 2015). This shows that virtual agents could be effective in the domain of healthcare and are considered as actors rather than computers.

Nass' CASA (Computers are Social Actors) paradigm states that the social rules of human-human interaction is applicable to computers as well. It also states that the social psychology theories of human interactions are applicable for human computer interaction and that they have clear implication in the user interface design (Lee & Nass, 2010). One previous study (Pratt, Hauser, Ugray, & Patterson, 2007) has shown that individuals are more influenced by agents who are similar to themselves with respect to appearance-related characteristics such as ethnicity and (Baylor, 2009) argued that when characters are role models, similarity to the user is key as well. In (Zanbaka, Goolkasian, & Hodges, 2006), participants were presented with a persuasive passage delivered by a male or female person, virtual human, or virtual character. This study showed that college students found the virtual characters used in this study as persuasive as real people and visual realism of the speakers did not have an effect on the degree of persuasion. This meant that a real person was just as persuasive as a virtual human and a virtual character. Another study showed that students that worked with realistic agents performed better than those who worked with cartoon-like agents. They consider image, animation, affect and voice as key factors in defining persona (Baylor & Kim, 2004). We do not know the cause of the differences between these findings, and might look into finding out what the right representation of the characters is in the context of Council of Coaches. With respect to the agent's visual presence, multiple agents may be preferable to a single agent in some cases (e.g. in a learning system, where motivational support is best kept separate from instructional information) according to (Baylor, 2009). Furthermore, (André & Rist, 2001) remarked that people interacting with multiple agents in their scenarios and context seemed more entertained and amused, and were eager to spend more time with their system. They thought this might make people learn more about subject matter as they would want to spend more time with a system. It seems that in certain contexts multi-agent interactions could be beneficial. Whether this is analogous with preference to be with multiple people in real life is unsure as of now.

Persuasion is one of the fundamental aspects of social interactions and the coaches should be modelled in a way that they are able to successfully handle interactions with the user and establish rapport in order to be effectively persuasive. Although our agents will also work on supporting behaviour change in users who have already been persuaded, they will also have to work to persuade some users. Furthermore,

even users who have been persuaded to change might still have to be persuaded to do this in a certain way that is most effective. Design features of the virtual agent such as the role of the agent or the non-verbal communication skills are critical in establishing and maintaining rapport. Since we aim to have multiple virtual agents in the same environment, it is therefore important to understand the preferences of the users, i.e. features related to the appearance style, group composition, e.g. single or multiple agents in different roles. This will facilitate us in developing coaches that will be able to handle conversations successfully and be effective in user behaviour changes.

An important part of the Home UI are the embodied conversational coaches that the user will interact with. There are two parts that make up an embodied conversational coach. Firstly, a coach will coach on a certain domain, which requires coaching strategies and knowledge about the coaching domain. Secondly, each of the coaches will be a virtual character with their own personality, backstory, looks and typical mannerisms. The design and development of the first part is the subject of other deliverables in the Council of Coaches project (i.e. D3.1-D3.4), but in the following we will shortly describe the process for the second part.

## 3.1 Personality and backstory

To create a set of initial embodied conversational coaches, we have started by defining an initial set of parameters that can define a coach (or any human-like character). Table 1 presents an overview of the different characteristics of the coaches with an example of one of the coaches filled in. These characteristics included more feature-like items such as: hair colour, gender and name. We also constructed a few topics for the backstories that were going to be designed for the coaches, which indicated the elements about a coach that the creator of that coach could elaborate upon in the backstory. These included, for example: motivation for being a coach, strengths, background and personality. Although this has not been done as of yet, we intend to tailor these characteristics to our users.

Following the defined parameters and elements, a small task force wrote character designs for a set of initial coaches. For each of these coaches a short introduction dialogue was also written to provide an impression of a coach's manner of interacting with a user. That is, to illustrate how the personality and backstory could be used in a dialogue.

*For Example:*

*Alexa:*

*Alexa always had a dream of being a world-class athlete. She had the determination, passion and discipline to reach her goal, and she was training to be an Olympic athlete. Unfortunately, an injury to the spine left her paralyzed. She never lost hope and managed to get back on her feet. It was a slow and painful process but she crossed all the hurdles, both physical and mental. Even though she can't continue doing sports, she still trains and exercises regularly. She understands the mental and physical barriers that one would face when it comes to physical activity. This is what motivated her to become a physical activity coach to help others motivate to exercise.*

The following section (Section 3.2) gives an overview of the current *cast* of characters in the Council of Coaches.

**Table 1: Human-like characteristics of the coaches.**

| Parameters | Description | | | | |
|---|---|---|---|---|---|
| **Coach Type** | Diet- | Physical- | Mental- | Cognitive- | Social- |
| **Personality** | | | | | |
| **Openness** | | High | | | |
| **Conscientiousness** | | Medium | | | |
| **Extraversion** | | Medium | | | |
| **Agreeableness** | | Medium | | | |
| **Neuroticism** | | Low | | | |
| **Level of Humour** | | Medium | | | |
| **Backstory** | | | | | |
| **Previous profession** | | Ex-Athlete | | | |
| **Interests** | | Running, Hiking, Music | | | |

## 3.2 The Cast of Characters

At the time of writing, the consortium has developed a first "cast" of characters for the virtual coaches. The following six characters are "work in progress". Their characteristics need to be fine-tuned and validated with end-users, their backstories require further details, and the level of detail between each of the characters should be equalized. The descriptions of these characters also do not follow a strict template as we wanted to give our project members the creative freedom to work in any way.

These "issues" will be fixed in due course. However, we consider the Character Design to be an important element of the Council of Coaches user interaction and user experience, and as such find it important to report the work in progress here.

The following six sections describe the character designs of the following characters:

- Helen Flores (Cognitive Coach) [Section 3.2.1]
- François Dubois (Diet Coach) [Section 3.2.2]
- Hank (Social Coach) [Section 3.2.3]
- Owen (Life Coach) [Section 3.2.4]
- Melissa (Mental Health Coach) [Section 3.2.5]
- Alexa (Physical Activity Coach) [Section 3.2.6]

### 3.2.1 Helen Flores (Cognitive Coach)

**Early days**

She grew up in a fairly well off home with her dad being a general practitioner and her mom running the R&D department in a decently-sized software firm. She had an interest in others from a very young age, always wanting to know what drove people to do what they did. When she was only 6 years old, she saw Nick (7) in the neighbourhood falling off his bike constantly while trying to drive it through the grass. The other kids were teasing him and saying he was a "dummy" for practicing on the grass. She told them they were the dummies, and later on asked him why he did what he did. She found out he

was scared of hurting himself by falling, and he figured he would not hurt as much falling on grass. She helped him change his mind by explaining he needed speed to stay up right on his bike and he would not have that speed on the grass. He learned to ride his bike that week together with her. This is when she found out that understanding what drives others was not only interesting, but that she could help them.

Her motivation to understand others led to go on a trip through Africa and Asia to get insight into other cultures and different groups of people. After growing her understanding of people with other cultures and from different social classes, she returned to England to study psychology. Once done with her studies, she went on to work at a decently sized practice together a friend from her studies and two more senior psychologists.

**Background**

Helen worked in London until her early 40s, but she was always in love with smaller and more rural towns and nature. This is why at 43 she decided to start her own practice in Brockenhurst and move there when she and her husband had saved the money to do so. This was an exciting and new endeavour for her, and she was thrilled when it worked out and her little practice got going. Since then she has worked with a lot of (older) adults, and has helped many change their thoughts and behaviours. Her focus on (older) adults is intentional, as she loves it when the person she helps out has more of a life story to tell and more set ways to change.

When Helen recently retired at the age of 63, she started missing helping others like she used to. That was when she decided to join the Council of Coaches as a Cognitive Coach. She always tried to live a healthy life to some extent, mostly by living "close to nature" in her later years. She makes up for her lack of expertise in the health domain by being quite knowledgeable about how to talk to people, figuring out what makes them tick and helping them reshape their cognitions.

Helen likes to dive in deep and get to know someone quick. She has an easy time talking about anything personal, and opens up quite easily. For some this can be a bit much, as she can ask questions some might feel are intrusive. However, she is not judgemental and will always respect whatever someone thinks and feels. She will prod and poke at your ideas to try and help you change though.

**Main strength**

She is a very good listener and tries to put herself in your shoes. She considers where you're coming from when trying to help you change yourself.

**Main weakness**

She feels she is pretty wise due to her life experience. She has also not worked much in teams before. Combining these two things and her wanting to know a lot about what people think makes for a lady that needs quite some explaining and convincing to consider her fellow coaches' point of view.

**Mannerisms**

- Whenever she listens to people explain something she usually defaults to smiling and nodding.
- When unsure/uncomfortable, she starts fidgeting on her sleeves and lessening eye contact as she speaks (looking down or to the side).
- She likes to summarize points made by others to show her understanding. This is something she picked up during her studies and years of work and has a hard time stopping when asked not to do so.
- When thinking she often plays with her nature-themed earrings.
- When she is excited, she can have a tendency to rattle on.

### 3.2.2 François Dubois (Diet Coach)

**Backstory**

His grandfather was a chef, his father was a chef, so there was never any doubt as to what François was to become when he grew up. Francois did turn out to become a very successful chef, but his heart was never really truly into it.

Now that François is older, he has set his life priorities straight, and has come to terms with his feelings that he utterly hates preparing fancy dishes for the rich, entitled and fancy people that used to visit his Michelin Star restaurant in France.

And so, François finally wanted to do something truly useful for the world. Because food and cooking are the only things he knows, he has decided to become a Diet Coach in the Council of Coaches. Although François doesn't know much about health, he can talk for hours about healthy and delicious meals.

Growing up under the immense pressure of his family's Chef lineage, François is rather incapable of talking about his emotions and feelings, and thus has grown a habit of changing the subject to food whenever things get too emotionally complicated.

**Early days**

As a young chef, François spent some time in the France's southern Mediterranean coast where he was working as an apprentice under well-known French Michelin star chef Roger Vergé. His father sent him here after a few youthful rebellious incidents while working in his father's own restaurant. Roger Vergé was famous for his strict teaching ethics.

**Mannerisms:**

- François is wearing a little French cap. Every time he starts talking he first takes off his hat. When he's finished – it comes back on.
- François becomes excited whenever anyone in the conversation refers to cheese.

### 3.2.3 Hank (Social Coach)

**Physique**

Hank is a person who's 1.95, 120 kilo's, bold head, tan, tattoos. When he was younger he had a ponytail and a moustache (it were the 80's). He wears short sleeved blouses to come across as formally dressed, but not too formal. He is so big build that those shirts always look a little tight on him. Since he's always hot, he won't wear long sleeves or anything with thick material. However this always does look a bit odd, such a big man almost breaking out of a white striped shirt, like the rest of his clothes was in the laundry.

He is 50 and still in very good physical shape.

**Background:**

He comes from a low income household and has spent most of his youth on the street with no parental guidance. His grandmother used to take care of him, but she died when he was 10. He was more or less left to his own. On the streets, he has learned he has to fight for whatever he wants.

Fighting, temper and his urge to keep up with his peers, has left him in and out of prison, throughout his teens.

**Motivation:**

At 18, he had a talk with a psychologist in prison on how he wanted to straighten out his life. He was told if he would continue like this he would end up dead, like most of his peers were already.

He realized he had choice in this. So far he had always assumed that life just continued and you were the product of where you came from, but his person inspired him to take matters into his own hand.

The social worker helped him with finding a study he would like to do. He realized he wanted to help people and let other people realise they are the director of their own life.

**Motto:**
His motto is: You are in control!

**Professional History**
For now he has worked with all kinds of people but as he gets older he likes to work with older people. Older people have lived their lives in a certain way and they are very hard to convince the things they did can be improved. He uses a lot of humour and positivity and "you can do it", to encourage those people.

**Personality:**
He can come across as dominant, because of his build and his loud voice, but when you get to know him, he is very friendly and caring. He is however a straight shooter and will tell you like it is.

Aging has mellowed him out and he has a lot of patience with his patients. Up until the point where people just ignore what he says, or keep making up excuses and blaming everything else for the things that happen to them. He gives them one last chance and then starts a conversation on how they might be better off with a different coach.

**Strength:**
He will almost never give up. Once you are his patient he will go out of his way to motivate you and protect you all the way. He will convince other coaches not to give up on you, like Antoine did with him. Everyone deserves more chances.

**Weakness:**
His weakness is his family. Since he grew up without one, he will do everything for this wife and 2 kids (16-18). He is like a little puppy when he is around them. If someone touches them, his old street fighting spirit will waken up and he will go after them with everything he has. This has led him to demolish a car who had almost driven into his kid on his bike when he was 5.

His hobbies are playing rugby and he has a soft spot for romantic movies. Love actually is his favourite and he watches it every year at Christmas.

### 3.2.4 Owen (Life Coach)

**Summary**
After living in South Africa, where there is so much space and nature, Owen could not live anymore in apartment in the busy city centre. He now lives with Maggie in a suburb of London. He has a bungalow with a large garden.

His hobbies are diving, camping in the wild and fly-fishing, which he learned in Brazil. He loves to go outside after a hard day's work. Sometimes Maggie and this kids joins him, but he also likes spending some time alone.

Owen also likes to barbecue (he has brought back a large South African one), so when the weather is nice, he invites his friends over for a beer and a steak.

**Backstory**
After obtaining a degree in Sociology, Owen started working as an advisor at a NGO for sustainability. He travelled the world, doing research at third-world countries and setting up sustainable projects to support local communities. He married his university-girlfriend, but unfortunately, that did not work out. She wanted him to spend more time home, and he wanted to see the world. After their break-up, Owen spent a few years living in South Africa, supervising and managing several projects his company had

initiated there. There, he met Maggie, also an English expat who was working there. They married and got two kids. 15 years and two kids later, they moved back to England. There he found that he couldn't help the people as good as he could being in the countries themselves. He saw that in England, people also could use help in their lives and he thought about opening a practice for support people in their life choices and coach people who did were doubting where to go (in work, life, relationships, etc.). To his surprise, a lot of older people came to his practice. They were struggling with becoming older, seeing the children leave the house, their bosses hinting towards retirement and the life after retirement.

Owen wants to support them in this transition process. Being retired is not the end of the line, it means unlimited time to explore your old interests and hobbies that you didn't have the time for while working from 9 to 5. It means more time with your family, spending time with your grandchildren and traveling to your bucket list destinations!

Owen knows older age is not just fun, it does influence your physical and cognitive abilities. When he was living in Africa, he and Maggie climbed the top of the Kilimanjaro without much difficulties (actually, that is where he proposed to Maggie), but he can't do such things anymore these days. That is way he now much enjoys going fly-fishing and outdoor hiking.

In this coaching sessions, Owen tries to help people focus on what they can do, instead of focusing on what they cannot do anymore. For example, if people have trouble with walking, why not use a walking cane if that means more mobility? Also, people need to adjust. When they were used to do a lot a things in one day when they were younger, they can start feeling negative about themselves when they can't do all those things anymore. In coaching sessions, Owen talks with people about their dreams, goals and things they want out of this life. From his job he has learned to listen to what they say *and* don't say. But, Owen is also not afraid to tell it as it is if people are too negative and are making excuses for justifying their behaviour. In coaching sessions, Owen works together with this client to set up first some small goals or milestones and then slowly progress to the more important goals. Sometime, he going walking with his client during a session. He believes that being outside in the nature could sometimes provide a positive effect on how his clients view life. This way, he hopes to contribute to the wellbeing and happiness of his clients.

### 3.2.5 Melissa (Mental Health Coach)

**Physique**

Melissa is 1.65 and has a skinny/normal figure. She has blonde hair and is 31 years old.

**Background**

She grew up in a normal suburb, with a mother who was a teacher, a father who worked in accounting and they had a brown Labrador called Mickey. Her older brother Erik (who is 3 years older) works as a financial lawyer.

When she was young Melissa wanted to become a professional gymnast, but an accident at age 16 made this no longer possible.

She works partly as a psychologist, since that is what she was educated for. After her studies she went to travel through Asia for a few months and learned a lot about yoga and mindfulness. This has inspired her to also spend time as a mental health coach.

**Motivation**

Her experiences in Asia and the period after her accident when she had to get to grips with learning that she would never be able to become a professional gymnast, have motivated Melissa to help others. She wants to help others in dealing with the pressure they put upon themselves and in coping with setbacks.

**Motto**

Her motto is: 'There is no harm in taking a minute to stop, take a breath and observe the situation.' (In this way you can decide what to do next instead of trying to respond to everything that happens.)

**Professional History**
In her work as a psychologist and as a coach she works with all kinds of people, but she has always liked her older clients, since she feels she can also learn a lot from them.

**Personality**
Although she is a short blonde girl and she talks about mindfulness, Melissa is actually a fairly down to earth person. She does not like all the floaty Even though at first she is a bit shy, she likes to talk to people and once you get to know her you'll learn that she has a good sense of humour.

**Strength**
She will help choose a focus and helps you to put things into perspective; setbacks happen to everyone and taking a step into the right direction, even if it is a small one, is still going in the right direction.

**Hobbies**
She likes to do yoga, meeting up with friends and sometimes binge-watches a series on Netflix. She is a huge fan of Breaking Bad and Gilmore Girls.

### 3.2.6 Alexa (Physical Activity Coach)

Coming from the ghetto, Alexa always had one dream of making it big. She always had the determination, passion and discipline to reach her goal. Alexa was training to be an Olympic athlete. Unfortunately, an injury to the spine left her paralyzed. She never lost hope and managed to get back on her feet. It was a slow and painful process but she crossed all the hurdles, both physical and mental. Even though she can't continue doing sports, she still trains and exercises regularly. She understands the mental and physical barriers that one would face when it comes to physical activity. This is what motivated her to become a physical activity coach to help others motivate to exercise.

## 3.3 Agent appearance - user study design

Based on the literature reviewed in Section 3 we can now say that agent appearance plays a significant role in interactions. Since the existing studies mostly focus on effects of agent appearance and personality in learning environments and persuasion of users to change their thoughts and behaviours in dyads the effects found there might not be applicable for our project. Since we have multiple virtual agents in the same environment, it is thus necessary to understand the preferences of the users and to see which characteristics are most effective in this context. Hence, we will be conducting several user studies during the course of this project to build a system that will be able to handle conversations successfully and be effective in user behaviour changes.

The first step in this research work will be to understand the user preferences of the agent in a multiparty setting. A user-based study is in progress which aims to understand the effects of gender and role on user's persuasion. The experiment is based on 2 x 2 x 3 design, where the variables include agent gender (male vs. female), role (authoritative vs. peer) and persuasion type (multiple agent user-based vs. multiple agent vicarious vs. single agent). Since we are focusing on the effects of gender, in multiple agent condition, the gender will always be a male agent and a female agent and we alter only the roles. For this study, the four virtual agents are designed using the Autodesk Character Generator software. Based on the literature, we modelled the agents to fit the appropriate roles. For the initial step, we have chosen the topic of discussion on movies, which is one of the most common topics of discussion among the general population. Based on literature, we selected the three most popular, gender neutral movie genres. This is made to ensure there is no personal bias due to the genre. We conduct a pre-study questionnaire to collect user information. Then we ask the user to provide rating of the three fictional

movies based on the textual description available for the movies. Then the participant randomly to one of the 12 conditions specified above. In the next step, the user will be shown a 60-90 second clip where one/several virtual agents will present a persuasive dialogue about the movie which received the lowest rating and ask the participant to provide a rating again. This study could help us in modelling agents that will have a better impact in terms of persuasion to follow advice from agents and improving engagement.

# 4 Home application user interface

The home application is meant to be the meeting place between the coaches and the user of the Council of Coaches system. This is where the coaching sessions take place between the coaches and the user of the system. This is also the place where most of the user interactions with the system take place. The user interface of the home application can make use of different modalities varying from pure text-based interaction to embodied conversational coaches (ECCs) where users can interact by using verbal and nonverbal behaviour. The modalities used in the user interface of the applications affect the ways users can interact with the application and the experience of the users during the interaction. We present four different kinds of user interfaces and interactions between the user and the coaches ranging from interactions through text only in a group chat to interactions with a group of coaches represented as virtual humans in a 3D environment. From literature we know that differences between the user interfaces and interaction with the coaches can possibly have an effect on persuasiveness (Bickmore, Mauer, Crespo, & Brown, 2007) (Mazzotta, Novielli, & De Carolis, 2009), perceived ease of use, (Lester, Barlow, Stone, & Bhogal, 1997) (van Mulken, André, & Müller, 1998)understanding the content (Miksatko, Kipp, & Kipp, 2010), and likability (Klaassen R. , 2015) as well as influence their learning outcomes and understanding (as discussed in Section 3 and (Murano, 2007)). Therefore, it would be of interest to try out responses to different forms of interacting with differing coaches using several different UIs.

## 4.1 Home user interfaces

Four types of user interfaces (UI) and user interactions are considered. These user interfaces and user interactions are based on the most common used user interfaces and user interaction paradigms seen in current applications. The four different user interfaces and user interaction paradigms will be outlined in the next paragraphs.

### 4.1.1 Text-only chat

The first possibility for the user interface and interaction would be a text-based group chat (Figure 1). The user interface would be basic and only show names of the chat participants and the text they shared. Input from the users could be based on buttons, and preformatted sentences of free text entered by the user.

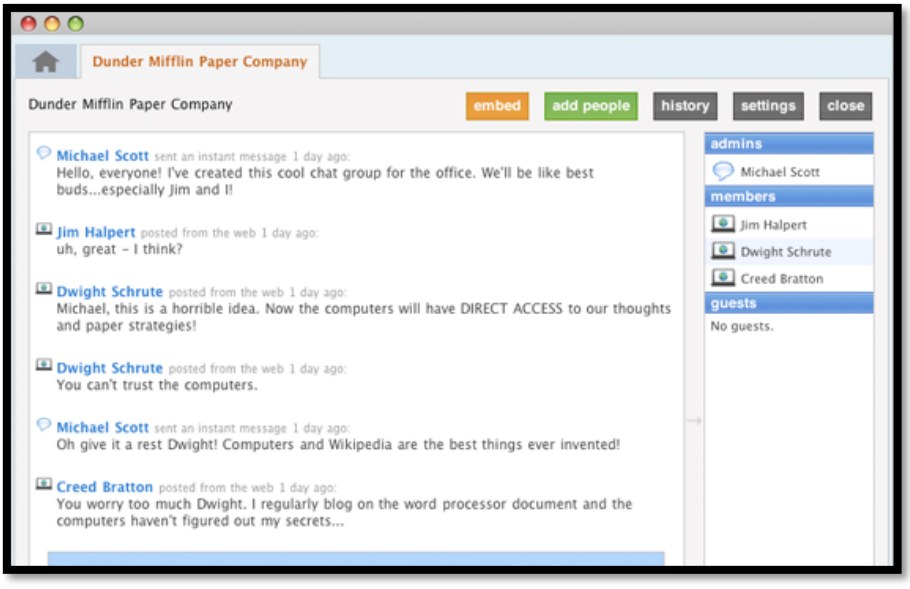


**Figure 1: An example of a text-based group chat.**

### 4.1.2 Multi-modal chat

The second possibility for the user interface and interaction would be similar to a WhatsApp group chat or Skype group chat (Figure 2). This would be a form of chatting that is becoming more well-known to older adult users, as social media use, including WhatsApp use, is on the rise in older adults. In a user interface similar to that of WhatsApp or Skype, the coaches would show their names and also have an avatar of themselves or showing something personal, such as their hobbies or a picture of their family or pet. Furthermore, the coaches could use other modalities next to text, such as emoticons and share things like pictures, GIFs and videos. The pictures, GIFs and videos could also be used to add content and clear things up if the user misunderstands or does not comprehend the coaches when they only use texts. Input from the users could be based on buttons and preformatted sentences and could additionally allow for the users to use emoticons.


**Figure 2: An example of a Skype group chat.**

### 4.1.3 Video call

The third possibility for the user interface and interaction would be more similar to a Skype call (Figure 3). The coaches would be rendered as embodied conversational coaches, although only the head of the coach will be visible (talking head). The coaches would not be in the virtual same location. The coaches and the user could see each other similar to a video call and interact through voice as well as text. This would make it possible to introduce nonverbal communication during the interaction, such as gaze behaviour. As usually is the case in real Skype calls, gaze behaviour and gestures would be more limited compared to face-to-face settings. However, the nonverbal behaviour would already add another dimension to the interaction that was not there in the previously mentioned possibilities. Input from the users could be based on buttons and preformatted sentences and could allow for the users to use emoticons as well as their voice and nonverbal behaviour as input.


**Figure 3: An example of a video group Skype call.**

### 4.1.4 3D environment

The fourth possibility for the user interface and interaction would be a game like environment where the coaches are represented by 3D rendered ECCs with a fully animated body situated in one 3D environment (Figure 4). Nonverbal behaviour such as gaze behaviour would be a lot more extensive than in the Skype call option. Input from the users could be based on buttons and preformatted sentences and could allow for the users to use emoticons as well as their voice and nonverbal behaviour as input. The first functional prototype has been focused on this form of user interface. The ECCs could use verbal and nonverbal behaviour to communicate with the user. The user could communicate via buttons with preformatted sentences.

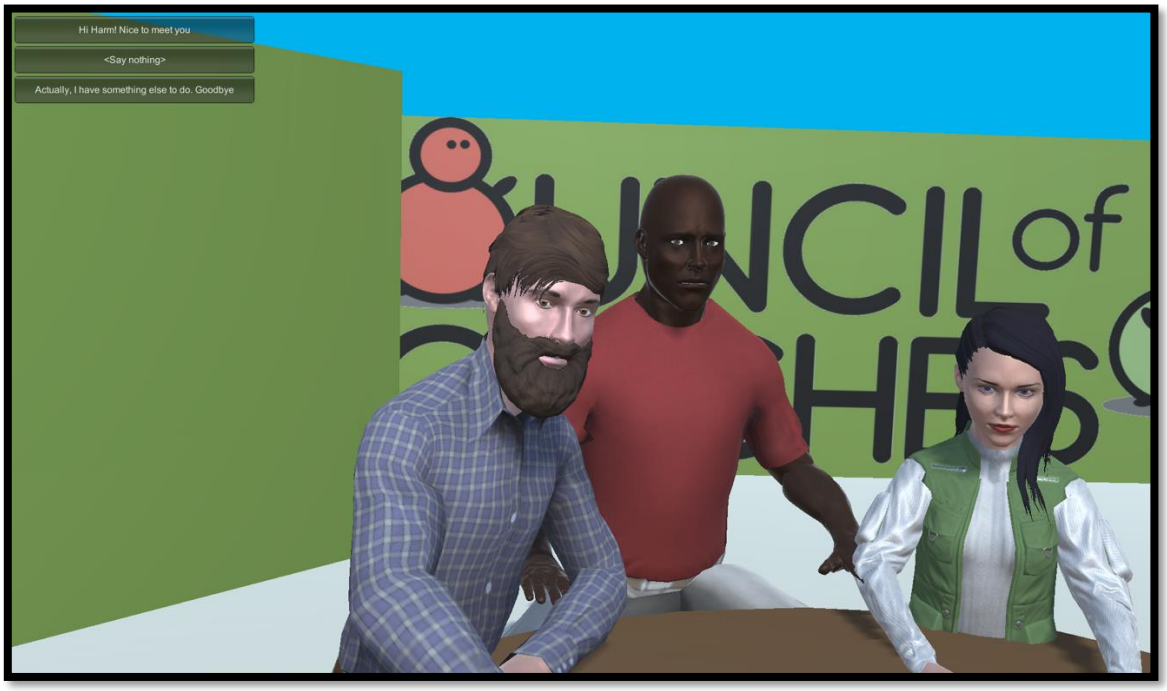


**Figure 4: An example of an interaction with the characters in a 3D environment using ECCs.**

In the next sections we will describe aspects of the interaction that are part of the Home UI of Council of Coaches. This involves describing previous work done on interaction and UIs, work done within the project towards the first functional prototype of the Council of Coaches Home application and its interaction and UI, as well as possibilities to study and improve upon the interaction with the prototype and its UI looking forward. In Section 4.1 we describe the scene in which the interaction takes place. In Section 4.2 we describe the ways one could interact with the system. Finally, in Section 4.3 we describe the audio options for the application, such as background music or notification sounds.

## 4.2 The scene

In this section, we explain the tool used for generation of virtual characters using the Autodesk Character Generator software (see D6.1). New 3D models of virtual characters can be created with Autodesk Character Generator. A script has been developed to make the Autodesk character compatible with the Greta engine. The characters are generated based on the descriptions provided (see Section 3.1) which is summarized below (Table 2).

**Table 2: Description of the designed characters.**

| Parameter | Description | | | | | |
|---|---|---|---|---|---|---|
| **Coach Type** | Diet- | Physical- | Mental- | Cognitive- | Social- | Life- |
| **Name** | Francois | Alexa | Melissa | Helen | Hank | Owen |
| | **Physical** | | | | | |
| **Gender** | Male | Female | Female | Female | Male | Male |
| **Age** | | 30 | 31 | 63 | 50 | 57 |
| **Height** | | 1.73 | 1.95 | 1.64 | 1.95 | |
| **Build** | | Muscular, Fit | Skinny | Lean | Buff | Lean |
| **Origin** | Pau, France | Rio, Brazil | | London, England | | South Africa |

Based on these descriptions the agents were generated which is shown in Figure 5. Further, based on the personality descriptions we will be adding the non-verbal behaviours to each of these virtual agents. The behaviour set will be designed to suit each of them with certain personalized mannerisms. These agent appearances will be further developed and utilized in the upcoming demonstrator.

**Figure 5: Character designs, from left to right Helen, Hank, Owen, Alexa, Francois, and Melissa.**

## 4.3 Interaction

In this section we will discuss the interaction between the user and the coaches during the coaching sessions (Home UI) and interactions with the Council of Coaches system in general. We present the interaction chosen for the first functional prototype (Section 4.3.1), the kinds of feedback the Home UI could give the user (Section 4.3.2) and the look and feel of the UI of the first prototype of the Council of Coaches application (Section 4.3.3).

### 4.3.1 Interaction with the coaches (Functional prototype)

Possible ways how the user could interact with the system is through the use of buttons, scripted text, free text, pictures, GIFs, videos, voice chat and by showing nonverbal behaviour (e.g. when the user frowns, the coaches change their responses) in the Home UI.

We decided to give the user an interface using buttons with scripted responses to interact with the ECCs in the first functional prototype of the Home UI, while they use fully animated bodies in a 3D rendered scene. The ECCs will use speech and nonverbal behaviour to interact with the user. Subtitles could be added, as this is more user friendly towards older adults who have a hard time understanding what the coaches are saying.

We chose for the aforementioned approach for the functional prototype. More advanced possibilities from the fields of Social Signal Processing (SSP), Automatic Speech Recognition (ASR), and Natural Language Processing (NLP) are currently tested in the technical prototype. Challenges for this more advanced way of interaction is the complex multimodality of the messages being sent in social interactions, as well as it being hard to pin down social phenomena with one coherent analysis in the case of SSP (e.g. (Brunet, Cowie, Heylen, Nijholt, & Schröder, 2012)). This makes it easy to imagine how hard it is for systems to respond to the quickly changing multimodal stream of information that could be interpreted in several different ways. Some of the issues we have seen ASR applications struggle with are noise in the surroundings, accents making words hard to understand, and undertones in what is being said being hard to grasp, among other things. One of the issues facing NLP is making the systems actually able to understand what is being said by converting chunks of text to logic structures that systems are actually able to work with and still have the intended semantic meaning.

To summarize, in the setup of the functional prototype we currently chose limited user input. This has the strength of giving the coaches more clarity on what they are responding to as compared to having to recognize speech and interpret nonverbal behaviour and free text for the reasons mentioned previously. It also helps us to more clearly show the concept and effect of the intended interaction with the Council of Coaches in the first functional prototype of the Home UI.

As we want to show off the concept and the potential of the Council of Coaches in the first functional prototype, we have chosen for a simple way to interact with the system to show how engaging it can be to interact with several coaches at once, and how the coaches can naturally keep an interaction going with the user actively partaking. We also want to show how different coaches can support or contradict each other to increase engagement, as well as lead to reflection and critical thinking about their own health by the user. The first functional prototype is an introductory dialogue involving three of the coaches from the previously mentioned personality designs we made (Section 3.1), followed by a goal-setting dialogue involving the same three coaches.

### 4.3.2 System output

Besides the interaction with the coaches during a coaching session, the user interface of the Council of Coaches home application will also have settings and menus where users can setup the system and change settings. The system should also be able to give feedback to the user, such as notifications, (graphical) representations of user's behaviour, progress towards their goals, and required consent needed for certain topics or use of data. We will describe options for these types of interaction in short and end on describing the system output used in the first functional prototype.

The first category of system output is feedback during the interaction with the menus and settings of the application. This group consists of, for example, error notifications, notifications of downloads being made, expiration of consent notifications, and confirmation sounds after pressing confirmation buttons and such. Feedback will most likely consist of audio feedback, text and visual feedback.

The second category is user feedback and is related to the behaviours of the user. This could be for example, showing in a graph how the user's weight slowly went down over the last few months, what their daily average calorie intake was over the last week, or comparing their goal for hanging out with friends three times a week to how often they actually were with their friends.

### 4.3.3 First prototype Home UI

The first functional prototype will consist of three of our coaches (Embodied Conversational Coaches) sitting in a 3D Council of Coaches meeting room together to talk to the user. The user interface will have buttons where preselected answer can be given to the system. The coaching session is a scripted session. The characters are based on the work done in the character and personality design (described in D6.2). The embodied conversational agents are rendered by using the ASAP system in Unity. Verbal and nonverbal behaviour are defined in the behaviour markup language (BML). A screen capture of the user interface of the first functional prototype can be found in Figure 4. A video of an interaction with the first functional prototype can be found on the Council of Coaches website:

| http://www.council-of-coaches.eu/downloads/council-of-coaches-demonstrator-1.zip |
|---|

Compared to the work done in the technical demonstrator the functional demonstrator is less complex. There is only one BML realizer integrated and dialogue is scripted. The argumentation framework (DGEP), dialogue manager (Flipper), holistic behaviour analysis framework (HBAF) and knowledge base are not integrated in the first functional protoheretype. The goal of the first functional prototype is showcase the concept of a multi character coaching session where users can experience an interaction with multiple coaches. A video of the first technical demonstrator can be found on YouTube:

| https://www.youtube.com/watch?v=xWSIXbdGrWE |
|---|

## 4.4 Audio

In this section we give a short description of the audio that we could use in the home application besides the verbal sounds the coaches. Furthermore, the home application will need to give feedback on user actions within the system and when the system wants to notify the user of something. Some of these could be done through earcons. Background music during the coaching sessions is a topic to investigate in further stages of the development.

It is important to keep in mind that hearing deficits grow more common with age. Therefore, only having earcons should be avoided in the Council of Coaches system, as not all older adults will be able to hear these. For the same reason subtitles should be used when the coaches speak, or a text-only alternative should be available. Alternatives to background music to keep the interaction engaging are also worth considering.

# 5 Mobile application user interface

The mobile application of the Council of Coaches will be the addition on top of the home application. Its UI will be different from the home UI, as it will not fulfil the same functions, but instead will complement the home UI and have its UI be suitable for its own purpose. Further explanation regarding the objectives of the mobile UI will be given in Section 5.1. Section 5.2 will describe the option of using a text-based UI to achieve the goals of the mobile application and Section 5.3 will do the same for the option of using an embodied agent-based UI. In Section 5.4 we come to our conclusion regarding the two different UIs and look at what our next steps will be to develop the first mobile UI for the Council of Coaches mobile application.

## 5.1 Objectives for the mobile UI

The mobile companion application of the Council of Coaches system should allow interaction between the coaches and users of the system. The mobile application is a simplified version of the home application of the Council of Coaches application. The main coaching sessions are facilitated by the home UI, the mobile UI facilitates short dialogues between the coaches (or one coach) and the user to support these coaching sessions. The coaches could initiate advice, reminders or short coaching dialogues when there is, according to the system, is need for such an intervention. Users of the system should be able to contact their coach for advice or a short coaching dialogue when they want to on their mobile device. The user interface and interaction with the mobile application will be based on familiar paradigms of mobile applications such as notification mechanisms, text messaging services or chat applications.

Different modalities for the representation of the coaches could be used in the mobile application. In Section 4 we have seen different ways of presenting the coaches in the home UI. For the mobile UI we have to take into account the characteristics and limitations of mobile devices. In the following sections we will discuss two different modalities, text and embodied conversational agents.

## 5.2 Text-based UI

The mobile UI could be a text-based UI. This UI can follow a similar approach to chat applications, such as WhatsApp or Facebook Messenger. The coaches could be represented by an avatar. In a dialogue, users can select one of a set of predefined answers or type in an answer themselves. An example of such an interaction is the Woebot[1]. Woebot is an embodied conversational agent who helps you monitor mood and learn about yourself via the Facebook chat (see Figure 6).

[1] https://woebot.io/

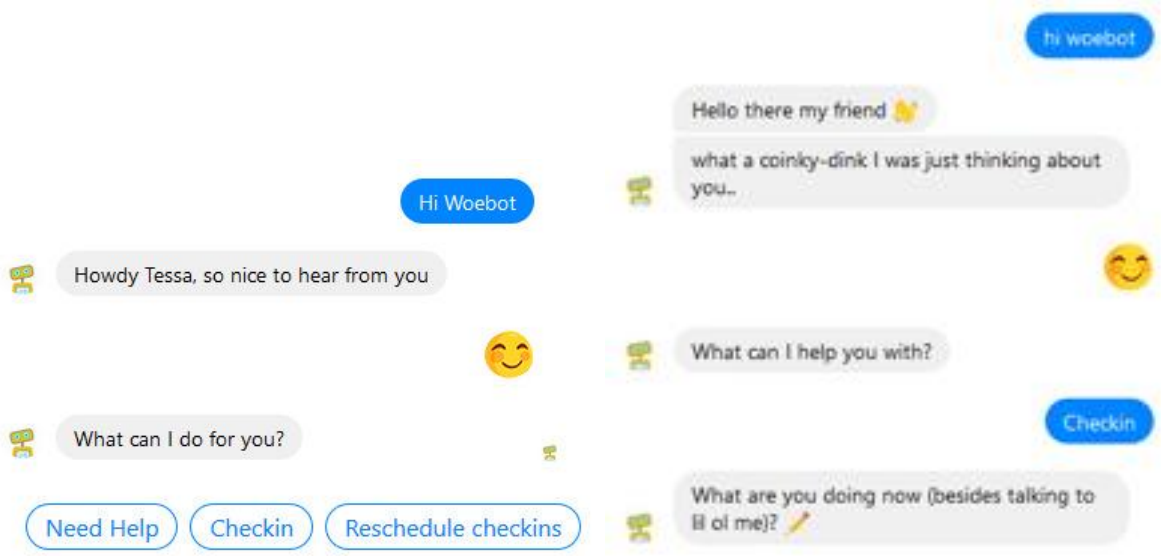


**Figure 6: Interaction with Woebot via the Facebook chat. On the left: the user can select one of the predefined answers. On the right: the users can type anything to answer the question asked by Woebot.**

## 5.3 Embodied agent based UI

This section will discuss two different platform that are developed in earlier projects that can be used to integrate embodied conversational agents (ECA) in the user interface of the mobile user interface. We will discuss the ASAP PictureEngine and the 2D agent developed by RRD.

### 5.3.1 The PictureEngine

Another modality for the mobile UI is to use an embodied conversational agent (ECA). Research by e.g. Bickmore (Bickmore, Mauer, Crespo, & Brown, 2007) showed that personification of the user interface of coaching systems can have positive effects on the effectiveness of the coaching program. Real-time animations do have a positive effect on the user experience. In order to take the full advantage of the power of embodied conversational agents (ECAs) in user interfaces, it is important to support real-time, online and responsive interaction with the system through ECAs. The ASAP system, introduced in D6.1, is a platform to generate real-time verbal and non-verbal behaviour for virtual humans. A full 3D embodiment of the ASAP platform is not suitable for a mobile device. Not only do such devices lack the processing power to render this kind of environment, but displaying a full scene including a full body ECA on the relatively small screen of a mobile device is quite impractical. The displayed size of the ECA would make it so small that its expressions would hardly be visible. The high processing demands would also drain the device's battery quickly. In order to avoid all these problems, ASAP could use a different graphical embodiment on the Android platform, the PictureEngine (Klaassen, et al., 2013).

The PictureEngine (see Figure 7 and Figure 8) is a lightweight graphical embodiment that uses a collection of 2D images in order to display the ECA. While having a 2D image embodiment does present some limitations, it also has its advantages. First of all, it has low demands in terms of processing and memory. It also allows for great variation in the design of ECAs. One could for example design a cartoon figure ECA, an ECA based on more lifelike illustrations, an ECA based on prerendered 3D images, or even an ECA based on photographic images of a real person. The ASAP picture engine is already integrated in different coaching systems (op den Akker, Klaassen, & Nijholt, 2016), (Wiernga, 2012).

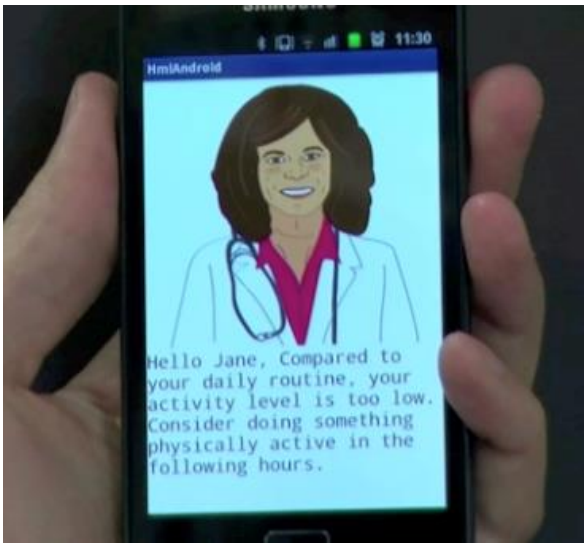


**Figure 7: The PictureEngine embodiment of the ASAP system on an Android smartphone.**

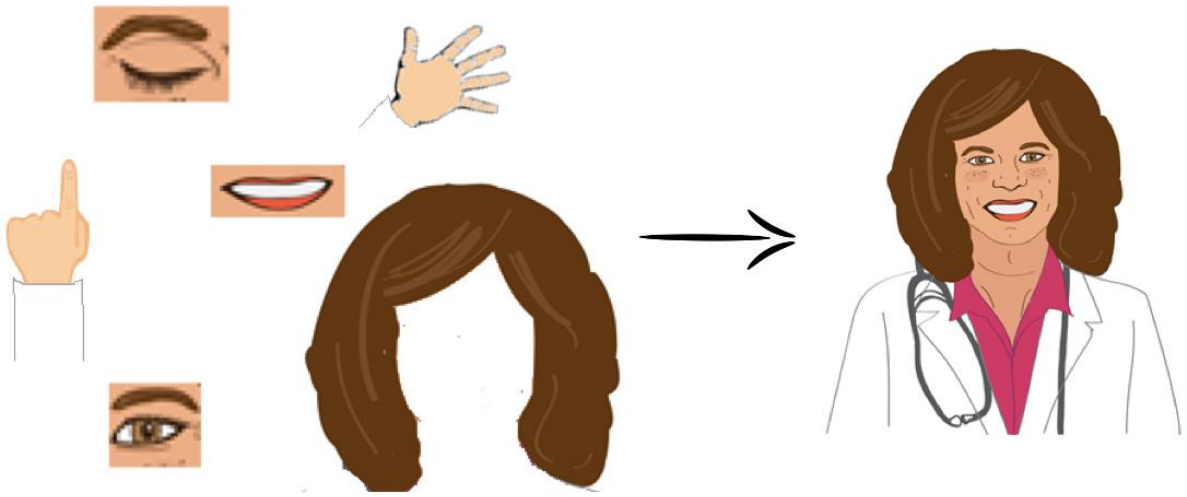

**Figure 8: Different layers of the PictureEngine embodiment will form a 2D ECA with ASAP.**

### 5.3.2 2D Agent (RRD)

Roessingh Research and Development (RRD) is developing a 2D embodied conversational agent as part of the ActivityCoach. The ActivityCoach is an Android application which is connected to a Fitbit and provides users with information about their physical activity. The agent, a small robot, is developed to motivate users to perform physical activity. A small image of the agent is always be present in the bottom right corner of the application (see Figure 9). The users can initiate a dialogue by clicking on this image. In addition, the system can initiate a dialogue, for example to provide the user with reminders. Then, the dialogue screen opens (see Figure 9). The agent asks the user which topic he or she is interested in. The user is provided with a set of predefined answer options. By selecting an answer, the next dialogue step is loaded. The screen is updated with a new agent message and a new set of predefined answers. The application contains a client-server implementation. When the user selects an answer, the client requests the next step in the dialogue from the server. The server keeps track of the dialogue status.

RRD developed a similar agent for a web-based application to support COPD patients in performing self-management (see Figure 10).

In the COUCH project a similar approach could be used. The user could perform small dialogues with (one of) the coaches by a question-answer system containing a set of topics with an agent message and a set of predefined answers. The user can interact with the coach(es) by selecting an answer via a button.

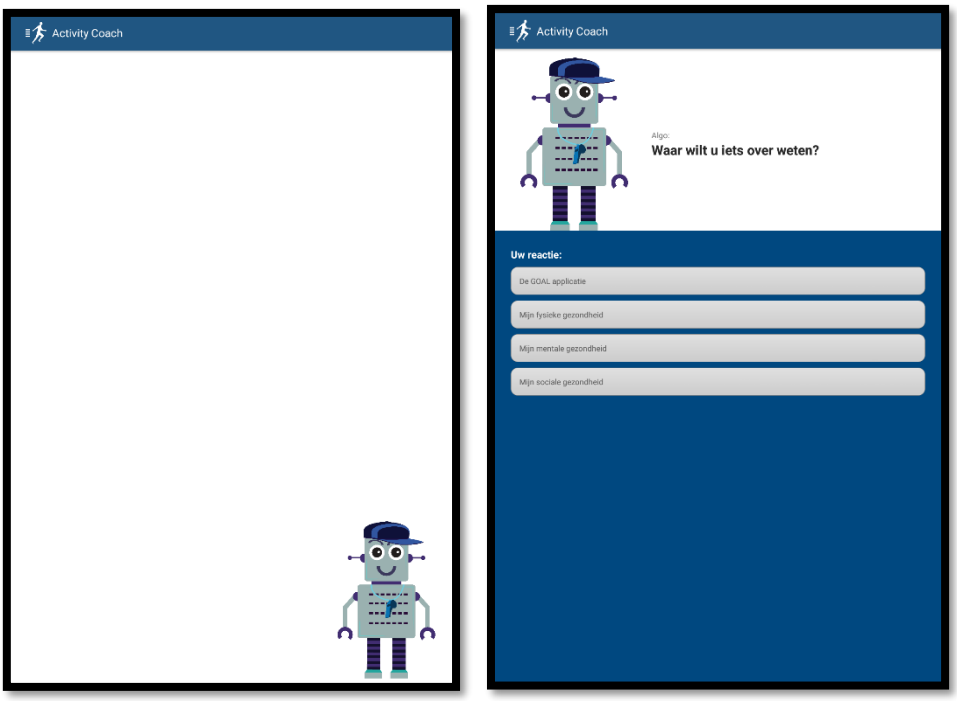


**Figure 9: Implementation of a 2D agent in RRD's ActivityCoach. On the left: a small image of the agent is always present in the bottom right corner of the application. Users can click on the image to open the dialogue screen. On the right: the dialogue screen containing the agent message and a set of predefined answers. When the users selects an answer, the next dialogue step is loaded.**

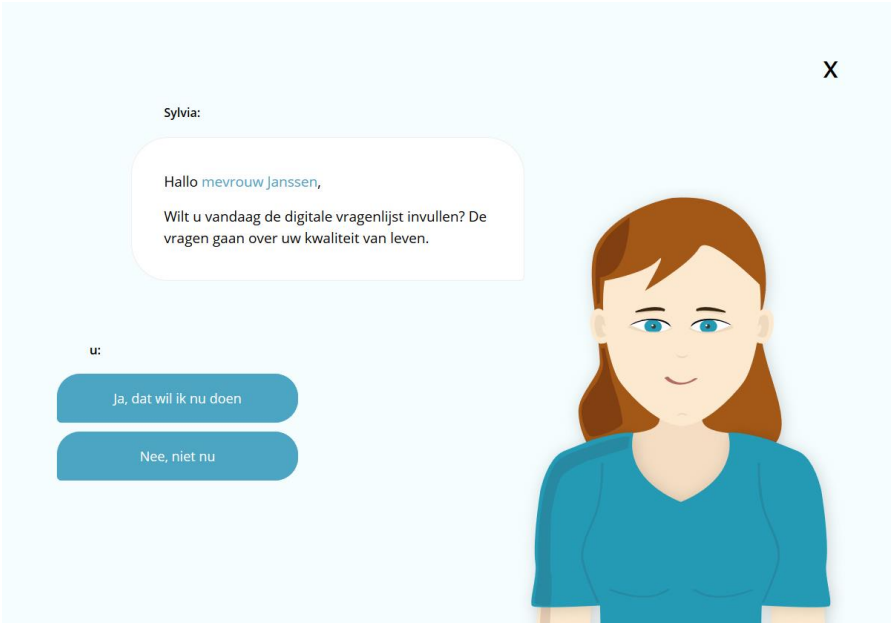


**Figure 10: The web-based version of the 2D agent by RRD. The user can perform a dialogue similar as in the Android application.**

## 5.4 Conclusion

In this Section we discussed the possible user interfaces for the mobile companion application of the Council of Coaches application. We discussed the possibilities of text-based user interfaces and showed the example of the Woebot application. Two different platforms for mobile embodied conversation agents, developed in previous project, were described. For designing the user interfaces of the mobile app of the Council of Coaches application we have to keep in mind that these two different possibilities are different and can serve a different purpose in the use of the system. Results of earlier studies (e.g. (Mazzotta, Novielli, & De Carolis, 2009) and (Klaassen R. , 2015)) showed that feedback messages in the health and lifestyle domain were better evaluated when they were presented by a virtual human compared to feedback messages presented in text. Text messages were easier to understand, but messages presented by the virtual human were perceived as more persuasive and reliable. Mazotta, et al. conclude by saying that text messages are better suited for simple information given tasks, while more persuasive messages (reflecting the social and emotional intelligence of the virtual human) could be presented by a virtual human to increase the effectiveness of the persuasive strategies. When we start implementing the user interface of the mobile app, we should think about the way we want to present the messages to the users.

# 6 Conclusion

In this deliverable we presented the work done so far in the design and development of the user interfaces and user interaction of the home and mobile applications of the Council of Coaches system. We presented the work done on the personality and character design of the coaches in the system and translated them into visual character designs. Thoughts and concepts of the user interfaces of the home and mobile user interface are presented and discussed. These concepts were based on the well-known applications such as Skype or WhatsApp or are based on previous work studies. We also present the user interface of the first functional prototype. In parallel with the development of the first functional a technical demonstrator is developed in which core components (e.g. the argumentation framework (DGEP), dialogue manager (Flipper), holistic behaviour analysis framework (HBAF)) of the Council of Coaches applications are integrated and scenarios and personalities designed in this deliverable. A video of the Technical demonstrator can be found on the Council of Coaches YouTube channel[2]. The first functional prototype is showcase the concept of a multi character coaching session where users can experience an interaction with multiple coaches. The first functional prototype (in in certain extent also the technical prototype) can be used for user evaluations. The result can be input for the further development of the system.

[2] https://www.youtube.com/channel/UC8zfyTRCqMsXmGJGLUcrjlQ

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