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Ayla | Fulfilling Psychological Needs through Interacting with Artificial Intelligence

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Abstract

With the growth of Artificial Intelligence(AI), Human-AI interactions and Wellbeing it has become essential to investigate our relationship with AI. Wellbeing has not been explored to a great depth with AI, such as the possibility to fulfil our needs with it, especially the ones that improve our wellbeing. But with the increasing presence of AI in our daily activities, it is essential to design Human-AI interactions with Wellbeing in mind, as well as understand the potentials of AI to fulfil our needs during these interactions. Relatedness has proven its importance to our wellbeing, which has been shown especially during the COVID-19 pandemic, therefore the research has been to a degree focused on fulfilling the relatedness need with AI among other needs. Consequently, this research has been conducted with the aim to explore how should an AI be designed like in order for a human to be able to fulfil needs with it. Specifically, to feel related to an AI during a shared interaction or an activity. To explore and validate this goal, a study was conducted using a research through design, a combination of User, Human-centred design and Design for Wellbeing approaches. As per the results, fulfilment of needs with AI is possible as well as feeling related to it. Therefore, a model of need fulfilment was proposed and evaluated mainly for relatedness during an interaction or a shared activity with AI.

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1. Introduction

Hassenzahl et al. (2013) understands wellbeing as a result of engaging in positive experiences on a day-to-day basis. What makes these experiences positive is the fulfilment of fundamental psychological needs, such as autonomy, competence, relatedness, popularity, stimulation, and security. These experiences could be intentionally designed in order to fulfil the needs in these daily activities with the help and shaping of the material, which Hassenzahl et al. defined as the "tangible arrangement of technology".

Artificial Intelligence (AI) has been throughout the twenty-first century growing rapidly and transforming all industries around the world, this placed AI at the forefront up to the point of calling it the fourth industrial revolution (Ghimire *et al.*, 2020). Alan Turing defines AI as a machine that is hidden behind a curtain and is able to communicate with us, during this interaction the human would not be able to differentiate between this interaction and a human interaction (Dobrev, 2012). Based on that definition and the possibility for this interaction to fully mimic a human interaction up to an indistinguishable degree. This interaction will naturally entail the same outcomes of a human interaction, such as emotions and feelings.

This raises an exciting but challenging question, what does an AI need to behave and be designed like, in order for a human to fulfil needs with and improve our wellbeing during a shared interaction with it. For the sake of this research project, the project was focused on relatedness as a need to be fulfilled with AI. Relatedness has been defined as "the interpersonal dimension, reflecting the extent to which a person feels that one is connected to others, has caring relationships, and belongs to a community" (Martela and Riekki, 2018). To contextualize the project further and because of the intriguing nature of group mindfulness as an activity, Yoga was chosen as the shared activity between the AI and Human.

To address this question, a study was planned using a research through design approach. The research process was started with an examination of work related to the areas of AI, Mindfulness and Wellbeing as demonstrated in section 2. Followed by an in depth exploratory research process about the practice (Activity), target audience and their goals in section 3. In section 4, I present the ideation process using a co-design approach to form a deeper understanding about the research question and design possibilities. The process of transitioning the research results and ideated solutions into design implications that were further prototyped is demonstrated in section 5. After that, evaluation of the designed prototype is presented in section 6. Finally, limitations that were encountered during the study, takeaway of the research paper and possible future work are outlined in section 7.

2. Related Work

This chapter gives an overview of the previous work in the areas of mindfulness in Extended Reality, Artificial Intelligence mediated mindfulness, group mindfulness and wellbeing. Firstly, positive psychology, wellbeing as a design approach and need fulfilment are defined and presented. Secondly, state of the art in the fields of mindfulness and virtual reality are presented. Finally, research related to need fulfilment with AI was discussed.

2.1. Psychological Needs and Design for Wellbeing

Positive Psychology

Psychology started with four main goals which aimed to describe, explain, predict and thus change the behaviour of an individual. For a long time, the main foci were on negative emotions, mental illnesses and emotional disturbances. Until the growing field of positive psychology emerged, which is best described by Sweeny et. al (2008) as "The scientific study of what makes life most worth living". With this shift in focus and the close relationship between psychology and design, positive psychology influenced and made possible the emergence of wellbeing as a design approach.

Wellbeing is abstractly defined as "positive mental health, and not only the absence of mental illness, but also the presence of positive psychological functioning" (Thieme et al., 2011). Throughout the literature, wellbeing and quality of life were in a broader sense used interchangeably, to refer to design approaches that aim to improve people's health by bringing satisfaction, enjoyment and positivity into their everyday activities. Furthermore, wellbeing could also be categorized into objective and subjective wellbeing. While objective wellbeing relies and is affected by the external factors affecting the individual, subjective wellbeing relates to the peoples own assessment of their emotional wellbeing, levels of happiness and fulfilment (Costanza et al., 2007)

With the pervasiveness of technology in our lives, our everyday interaction with technology and the fact that our wellbeing is greatly affected by our daily interactions and activities, it was inevitable that wellbeing made its way into design and technology. With this attitude towards design, various design frameworks and methods emerged. Some of which define design for wellbeing more broadly as a cross-disciplinary process that combines research approaches, innovation and art in a collaborative integrative process (Aalto University, p. 9). Other design frameworks and methods focus more on an individual subjective level, such as the psychological needs and their fulfilment.

Need fulfilment

Even though an agreement on wellbeing as a concept in the design field has not been reached (Desmet and Pohlmeyer, 2013), many researchers agree that the fulfilment of psychological needs leads to achieve or reach a person's own full potential (Maslow, 1954). Other researchers connect needs with improvement of an individual's wellbeing, such as stated by the Self-Determination Theory which argues that the fulfilment of the three psychological needs (Autonomy, Competence and Relatedness) is essential for wellness (Deci and Ryan, 2012). More elaborately Hassenzahl et al. (2013), defined positive experiences and wellbeing as a result of fulfilling psychological needs, such as autonomy, competence, relatedness, popularity, stimulation, and security. While different researches list different set of needs, relatedness is for the most part at the forefront, and is one of the salient needs that contribute to our wellbeing. Throughout this research wellbeing has been considered and understood as defined by Hassenzahl, Diefenbach and Göritz (2010) as having contact on a regular basis with people who care about you rather than feeling alone.

With the importance of activities and practices for our needs fulfilment and wellbeing, as well as the importance of artefacts to these practices, hence understanding the relationship between the materialistic aspect of an activity with the meaning behind it, is indeed very important. Practice Theory offers this new lens to look and have a new understanding of the activity. As a response to the need to address the materialistic aspect of our lives and the doings related to it, Practice Theory witnessed large interest

and growth during the 21st century (Schatzki, 2002). What makes Practice Theory valuable to design is its ability to address the complicated change process that takes place in our daily lives and practices. As well as being able to address the socio-materiality aspect of our communities and social structures Hyysalo, S. (2013). Shove et al. (2012) defined in The Dynamics of Social Practice three elements of a practice: materials, competences and meaning, where the authors highlight the importance of the material to a practice. As well as the changes associated to these elements, such as the emerging of a new meaning with the change of a material.

Klapperich, Laschke and Hassenzahl (2018) highlighted the importance of designing technology with wellbeing and stated that wellbeing should be one of the ultimate goals of designing technology. The authors suggested arranging the meaning around fulfilling psychological needs, which would enable designing or linking an everyday practice to wellbeing. The authors introduced the Positive Practice Canvas as a tool that would help designers in identifying opportunities to include wellbeing in design.

Overall, it can be concluded that need fulfilment is indeed essential for our practices and activities to improve our wellbeing. As well as relatedness being an important cornerstone of human needs.

2.2. Group Mindfulness and Virtual Reality

Group Mindfulness

Shapiro and Carlson define mindfulness as a practice and a way of life, and state that in order for a person to become mindful, they have to practice mindfulness (Shapiro and Carlson, 2017). As for Bishop et. al (2004) a narrower two component definition was proposed, of which the first component is self-regulation of attention for an experience, and the second one is reflecting on a person's own experience in the present moment. In Bishop's paper Group Mindfulness is defined as performing a mindfulness related activity within a group. When it comes to mindfulness, we often perceive it as a personal individual activity, because it is presented mainly as an activity that it is performed for the associated

psychological health benefits and an individual's own reflection about his thoughts. Needless to say there are also many other reasons, such as improved physical health. Therefore, group performance of mindfulness, presents an interesting perspective on the activity. Alongside the additional benefits to performing this activity in a group setting, as there is a synergistic relationship between exercising and socializing (Nagargoje, Maybach and Sokoler, 2012).

That being the case it is interesting to view and understand the practice of meditation from the perspective of a group activity (will be discussed later in section 4.2) and to explore a transformative new practice design with the introduction of new tools.

Mindfulness in Virtual Reality

Virtual Reality (VR) is a very promising growing medium, that provides interesting 'benefits' that were observed in a preceding research. For instance, as a way to escape from reality, be isolated and be immersed. Despite reality being in the name, it offers a new medium that in many cases does not convey reality. More interestingly due to the full control of the developer over the world and lack of real life restrictions, VR can transcend our reality and transform our practices into new unforeseen possibilities. Work that connects meaning behind the addition of new material 'VR' was not present in the literature. Much of the work done in this domain 'VR' just transfers our practice into this new virtual medium.

Andersen et.al. "Experiences of Mediation in Virtual Reality", investigates only the difference between Audio or guided meditation in contrast to Virtual Reality facilitated meditation. The paper claims for the most part there is no significant difference or value to doing meditation in Virtual Reality in contrast to real life. Social Yoga Mats which is a study about designing for exercising and socializing that allows bringing a yoga class into homes, also just transfers the Yoga practice to VR with the added sociability factor (Nagargoje, Maybach and Sokoler, 2012). In RelaWorld neurofeedback was combined with virtual reality to provide an experience for people new to meditation. Other works in virtual reality explored VR social interaction in comparison to real life, such as Moustafa and Steed (2018) in their research to support existing groups to migrate into socializing

in VR. Firstly, they have stated that VR provides strong natural tendency for group members to be engaged and present with each other. Secondly, they have stated that emotional states experienced in VR are broadly similar to experienced ones in face to face interactions. Thirdly, social group dynamics are transferable to VR interactions (Moustafa and Steed, 2018). In a study by Navarro-Haro et. Al (2017), the value of VR mindfulness was limited to a better feeling of presence and "being there". As well as the value of being able to control Virtual Reality resources, like sound and video which will prevent distractions from the real world.

Artificial Intelligence

In 2020, there were around 4.2 billion AI powered assistants being used in devices. It is estimated that by 2024, this number will grow to a staggering 8.4 billion units, meaning the number of AI devices will already be higher than the world's population (Sujay Vailshery, 2021). With the rise of Virtual Reality as well, new possibilities for AI have arisen. VR does not only provide a medium for humans, but it could also provide a world where AI can take shape and exist in visible form. This will change our AI interactions drastically and open up many new possibilities to our relationship with AI. Due to this increasing importance, this section explores where Artificial Intelligence stands in the literature regarding mindfulness and wellbeing.

Inkster et al. (2018) evaluated an AI empathy driven smartphone app conversational agent called "Wysa" to improve wellbeing of two groups of users that have self-reported depressive symptoms. In this application AI reacts to emotions expressed by the users in the conversation and psychologically intervenes using practices such as cognitive behavioural therapy. As for the main objective of the study, which was to determine how effective a conversational text based AI fosters and delivers mental health and wellbeing. The study concluded that users who had higher scores on the Patient Health Questionnaire reported better average improvement score in the PHQ-2 test compared to less severe cases.

In a cross sectional study inquiring whether Artificial Intelligence can help elevate meditation for the higher level consciousness (Kinkhabwala, 2020). The author starts by

defining natural intelligence, as the type of intelligence that is in the humans' unobtrusive vitality system which AI cannot develop or have. Afterwards the paper proceeds to list what Artificial Intelligence cannot do. The study argues that Artificial Intelligence will struggle in satisfying human needs past the bottom two levels (Psychological needs and Safety Needs) in Maslow's pyramid. The author backs up their claim using examples, stating that AI "can't be holistic mentors that require a comprehension of human sentiments and feelings". Other wrong claims made by the author are "They can never deliver the imaginative and creative work of artists", which is not factual or reasonable as Artificial Intelligence generated art exhibitions happen at large scales and at major institutions such as the Barbican Arts Centre (Barbican, 2019). In opposition to the authors claims, many people consider Artificial Intelligence's art more artistic and moving than human work (see Ahmed Elgammal's work). The paper concludes that Artificial Intelligence "cannot consider anything past the mechanical", which arises the questions, does it matter what happens inside of an AI, or how we perceive them and how they affect our lives and make us feel.

In conclusion there are many studies concerning wellbeing, needs fulfilment, Virtual Reality based meditation and Human AI relationship. However, to the best of the researcher's knowledge there is a gap and lack of research between need fulfilment and artificial intelligence specifically relatedness.

3. Research

In this chapter, the research process that followed literature review is discussed. At this phase of the project, the interest and goals were to have an understanding of the practice, users and Virtual Reality as a medium.

3.1. Participant Observation

As a first step, it was essential as a researcher to bridge the gap between the context and design. As well as having an understanding of the practice, activity and target users. Fine (2003) states that ethnography provides the best results, when a researcher observes the target group being studied, in a setting that provides the researcher with the ability to explore the organized routines of behaviour. Accordingly, a Yoga Studio in Jerusalem (Inspire Jerusalem Studio) was chosen as the best place to observe the target group, and have an understanding about the social aspect, and why the participants decided to engage in this activity in the form of group. The participant observation plan included specifying the researcher role, which due to the pandemic situation (COVID-19 Pandemic 2020) had to be as a complete observer without the possibility to interact with the participants. Everything was observed and as noted by Tannenbaum (1980) during the observation cultural behaviour, artefacts, and knowledge have to be considered.

Figure 1 shows part of the notes taken during the participant observation. Most important observations were: Firstly, even with the social distancing regulations after the class, participants gathered in a circle and talked about their respective experiences while maintaining distance. This shows that connecting with the other participants is an important factor for a group activity. Secondly, the relationship between the Yoga Teacher and students was more than simply showing the poses. The instructor knew the names of all the participants, corrected the students poses and guided the class. This also demonstrates the importance of the relationship between the instructor and the students, which was observed to be more of guidance rather than tutoring.
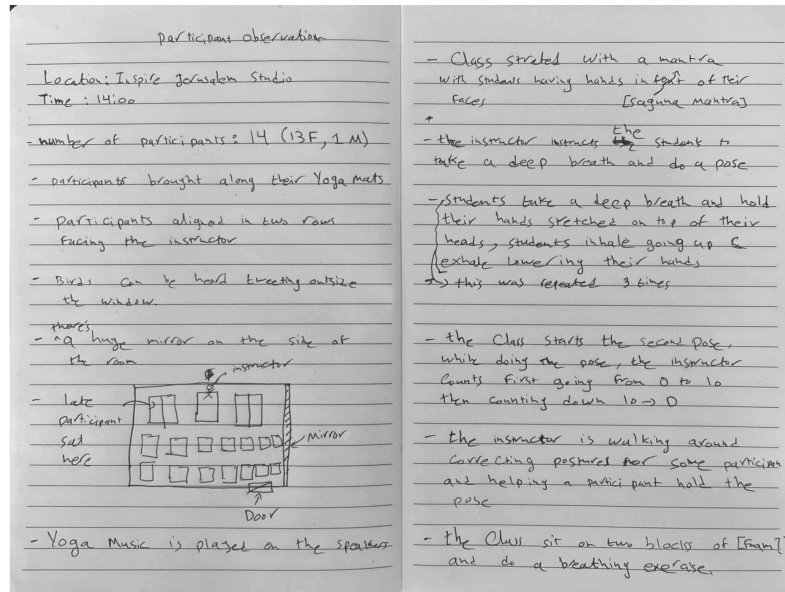
Figure 1 - Participant Observation: Observation Notes

3.2. Interview

After conducting a session of participant observation in the real context, some valuable information was collected, but many questions have arisen. Because of the COVID-19 pandemic it was very difficult to follow up on these questions with the observed participants. Therefore, an interview as a follow up to the contextual inquiry with a subject matter expert (SME) was planned. An SME could offer domain expertise, valuable information and knowledge. Accordingly, this subsection discusses and demonstrates the carried interview and results of the aforementioned interview.

Foundation

Since the research was mainly concerned with investigating how Artificial Intelligence (AI) could play a vital role in our wellbeing, by fulfilling our needs specifically relatedness, design for Wellbeing was the most fitting approach to validate this hypothesis. Therefore, throughout this research I adopted a design for Wellbeing approach inspired by multiple researchers and authors in the field.

Hassenzahl (2013) argues convincingly that a meaningful life and wellbeing are the result of having daily positive experiences. Hassenzahl believes that needs are an essential

component of wellbeing and set the stage for designing an experience, more specifically a positive experience. Thus fulfilling needs results in a positive and personally meaningful experience.

Klapperich et al. (2018) suggest a method and a tool PPC (Positive Practice Canvas), as an interview guideline. PPC structures the process of gathering instances where it focuses on an activity or a practice that it is performed in a meaningful and enjoyable way. The paper also proposes a hands-on model of social practices based on Reckwitz and Shove et al. This model links an activity or a practice with technology and tools. The hands on model is based on three interlinked critical elements: meaning (goals and motivation behind performing a practice), competencies (knowledge and expertise needed to perform the practice) and material (mediating tools that are used to perform the practice). Due to the nature of this design project, which involves a drastic change in the elements constituting the social practice. It was deemed essential as a designer to have a holistic understanding of the already existing relationship between the elements of the practice. As well as the associated changes with the newly designed practice, mediated by technology.

PPC Interview Results

The interview was carried in 4 sections, first section involved collecting information about the participant, followed by 3 sections each covering a practice element (meaning, material and skill). The interview participant was a female Yoga instructor (Kathrin Choyka, Kat Nam Raum für Yoga, Achtsamkeit) aged 32, the interview lasted about 1 hour 15 minutes, and revolved around understanding the practice, and when it is performed in an enjoyable way.

The main meaning behind the practice for the participant changed over the years, it started with the motivation as stated by the participant "When I first started doing yoga it was to be calm and finding peace it was about doing something for myself and body, workout and development over the years", additionally "to discover myself, be aware of

my feelings, meeting my needs, to see what feels good, adjust life and to get in contact with myself", which was clearly about fulfilling the physical thriving need.

When the participant was asked about the needs and how they felt performing the activity in a group, they stated the following:

"*I feel a sort of energy with other people, when you are together with other people and, I don't know how to precisely describe it with words, I mean you are doing meditation yourself, I'm talking about energy and if you are sitting together with I don't know maybe 20 people but not touching each other but you are feeling that you are in this group, good thoughts in the room, everyone with the same intention, you feel some sort of vibration between the group. And it is easier to get in contact with yourself or being more aware of what's happening it feels just good to be with other people*".

The participant interestingly, realized during the interview that performing the practice in a group makes it a completely different activity that changes the meaning behind it:

"For me the benefit or I don't know if it is a benefit but what makes it good to be in a group, is that you have energy with the other people together and can have a conversation afterwards and yeah. I guess it makes it kind of different, there are two different things, like now they're just two different activities and you feel different performing one or the other".

"During the practice uh, you have the feeling of being connected with the group of people you are doing it with, I mean in the end it is your own practice and you are doing it with your own and on your own but this connection is there anyhow".

With the addition of other people to the activity, the whole meaning and needs fulfilled are changed. Where now even though the activity still revolves around fulfilling the physical thriving need, relatedness as a need is now strongly present. This observation sparked interest in also looking at the practice as a network, as well as the different development

phases the activity evolved through. To understand the evolvement of Mindfulness as a practice, cultural-historical activity theory (AT) and actor-network theory (ANT) were employed. AT and ANT have provided an important view of the coevolution and interaction of social entities in this activity, that is presented in the upcoming section (Miettinen, 1999).

Accordingly, Figures 2 to 4 demonstrate evolvement of the activity, which was inspired by AT and ANT. Figure 2 demonstrates the activity when performed on an individual level and the associated practice elements. Figure 3 demonstrates the activity when performed in a group. Finally, Figure 4 questions how the activity and practice will transform when introducing AI and VR as tools and mediators. Interest also lies in knowing if there will be a new meaning behind the activity, when performed with an AI and will this AI be able to fulfil relatedness need.
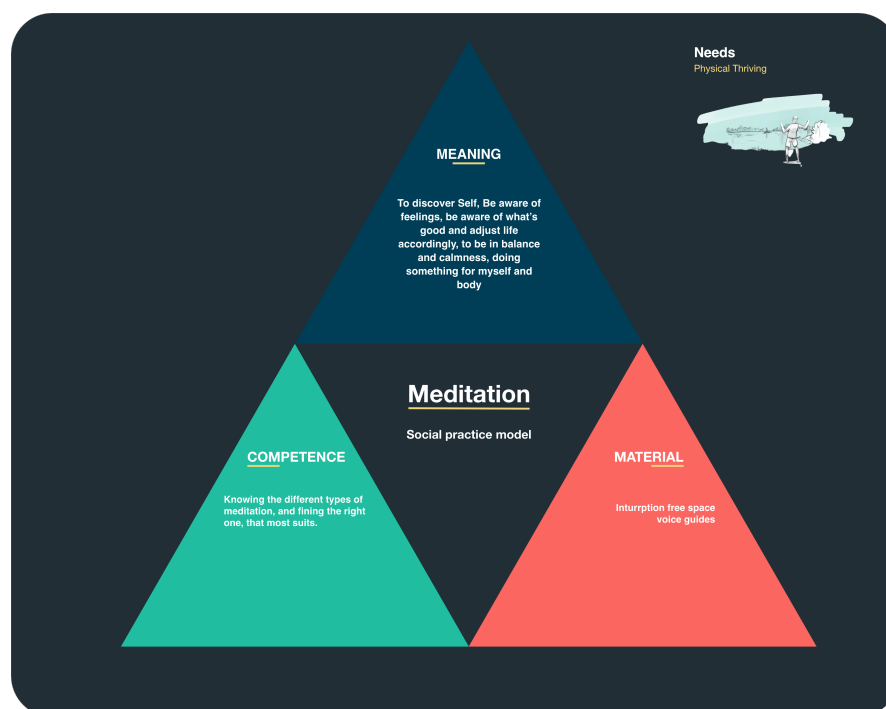
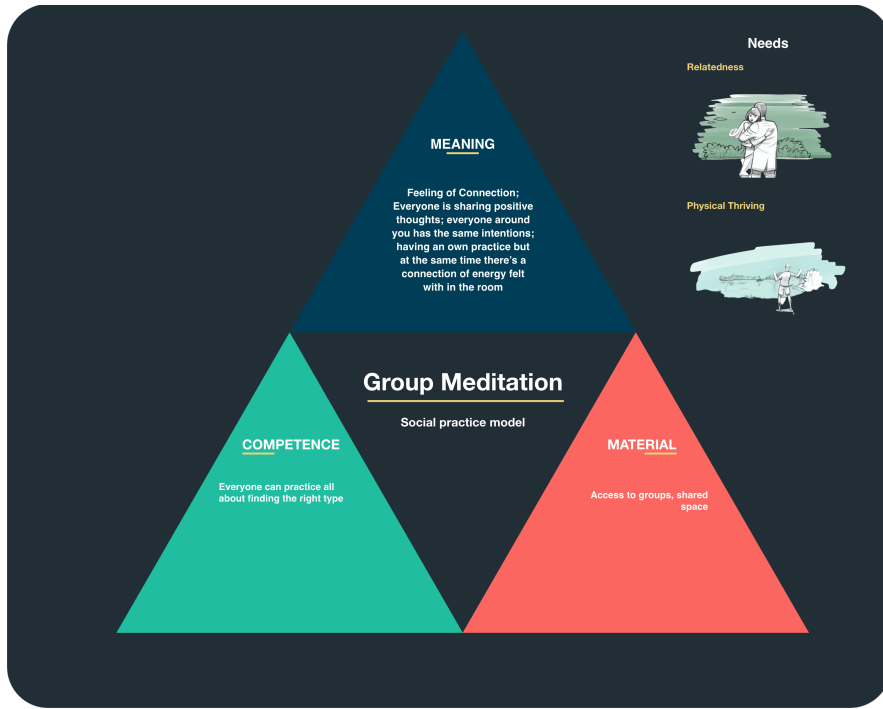**Figure 2 Social Practice Model: Meditation**

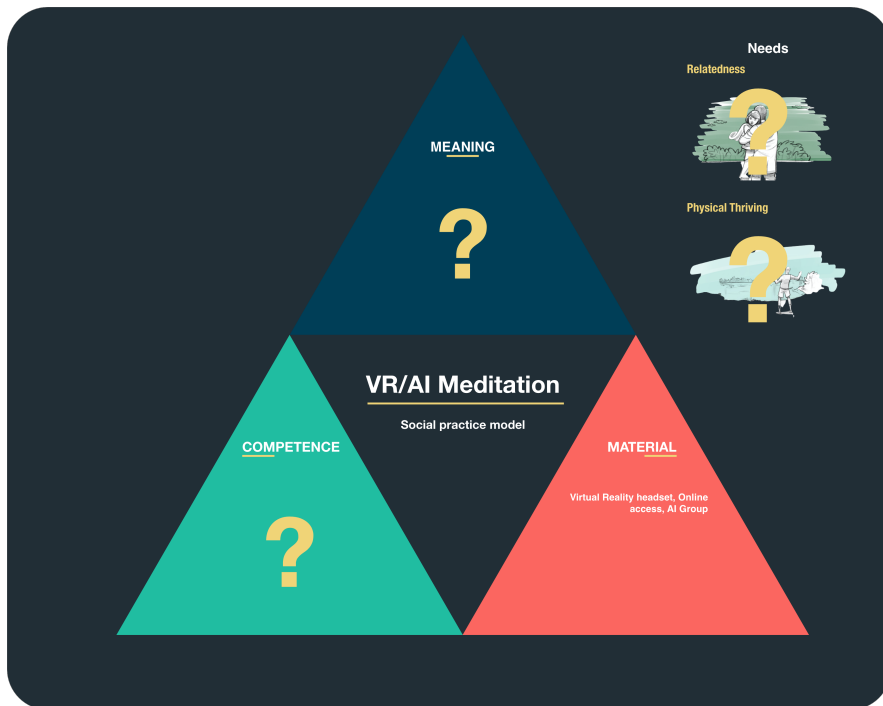**Figure 3 Social Practice Model: Group Meditation**

Figure 4 Social Practice Model: Mediated by VR and AI

During the last part of the interview the interviewee described a routine, that is essential for performing this group activity, even when the activity is performed with complete strangers "before you just start with meditation or yoga practice to, have a quick conversation with the other participants and saying hi how are you and seeing with whom will I be together in this group. I think this makes a big difference". The participant highlighted how this routine was transferred to an online medium during the Covid-19 Pandemic. The participant stated how the activity was performed over zoom, and highlighted the importance of knowing the participants once again "This makes a big difference having the camera turned on to yeah maybe it's not so much about the camera on during the class it's more about before you start and after the class that you see each other and share a few words I think this makes the biggest difference".

The participant described how they approach the activity. They stated "usually I start by first planning when I have the time to attend a group yoga or meditation session, and after that when everyone arrives we have a chat with some people there just over normal things and not basically or necessarily about meditation or yoga stuff. Just having a good conversation hi how are you and stuff like that. Then when we are in the group of course the teacher talks a little bit before we start, giving instructions talking about the topic and yeah then the meditation starts. Then after afterwards sometimes we have tea together and talk about our experiences".

Hassenzahl et al. (2013) suggested "experience patterns" as a result of abstracting or more precisely in the authors words "distilling the essence of an experience for inscribing it into artifacts". In this projects context this seemed as a fitting tool to have an experience pattern, not only as a way "for inscribing it into artifacts", but additionally to investigate whether this pattern is essential in fulfilling needs especially relatedness, and whether this can be transformed into a new context with Artificial Intelligence. Figure 5 demonstrates the experience pattern of performing a mindfulness activity within a group. The figure shows important factors, from the research and the interview such as the importance of knowing who you will be participating in the activity with and sharing a

conversation at the beginning, which starts a connection between the participants, and at the end either talking about the experience or just saying farewells.
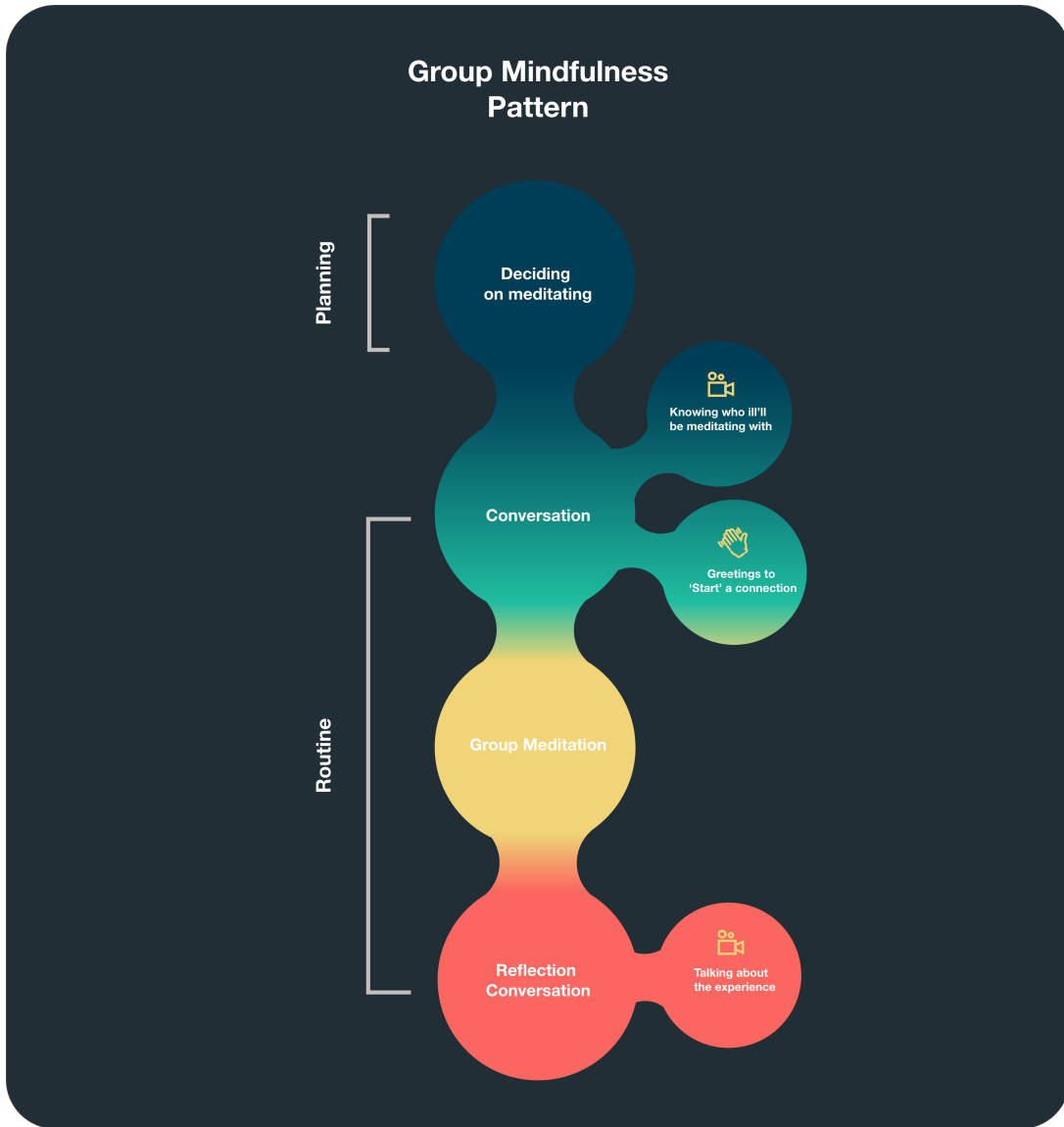

Figure 5 Experience pattern: Group mindfulness pattern

3.3. Survey and Co-Design Workshop

After having sufficient information about the practice, activity, experience and needs. Some information was still missing, such as design implications for the Virtual Reality World, the relationship between people and AI and most importantly what factors would

make you feel related to an AI. For this reason, and the possibility to reach a global more diverse audience, a survey was planned, followed by a co-design workshop. This transitioned the research phase into Ideation, and made sure to truly allow the users to be an active part of the design and development processes. At the time of analysis, the results from both methods were combined in an affinity and concept maps, which is the reason behind reporting both of the methods in the same section.

Survey

With the aim of gathering design implications and potentially addressing the question of what would make you feel related to an Artificial Intelligence, a survey was conducted as described in the upcoming section.

Survey Design

The survey was divided into three sections (Summarized in Table 1). The first section consisted of a mixture of open and close ended questions. This section was concerned about collecting demographic information with questions about age, gender and experience with mindfulness. As well as their objectives of doing this activity and their experience with mindfulness in a group. The second section using open ended questions, was concerned with understanding people's relationship with AI and how they envision AI as a friend that could fulfil the relatedness need. This section subdivides into two subsections depending on the participant's answers, if they use an intelligent assistant on a regular basis or not. If the participants answered positively to the question, they would be redirected to a section more focused on what they perceive as positive when interacting with their assistants. Or redirected to a section focused on addressing what concerns and reservations they have towards Artificial Intelligence. The third section that also employed open ended questions, asked the participants questions relating to imagining a new Virtual Reality Experience. The questions revolved around if they had no restrictions and can fully use their imagination to envision a new world. The other questions were targeted about how the AI character should look like and what would make the experience memorable. The reasoning behind envisioning memorable experiences, is based on research findings stating that heightened states of emotion

during an experience, makes the experience far more memorable (Hopkins, 2007). (see Appendix A for the complete questionnaire).

Table 1

Section Number	Questions Type	Questions Topic
Section 1	Close Ended Questions	Age
		Gender
		Experience with Mindfulness
Section 2	Open Ended Questions	Human-AI Relationship
		Envision AI as a Friend
		Current AI Relationship
Section 3	Open Ended Questions	Imagining a new VR World
		Imagining a Memorable VR Experience
		Imagining an AI character

Survey Participants

Since the research question was being addressed in the context of Yoga and Mindfulness. Therefore, the best target group for the survey were, people who practice or have practiced Yoga and Meditation, or who participated in related communities or groups. Due to the reason, that some of them should have already experienced the relatedness need being fulfilled in a group during the activity. The target group were contacted through online communities on Discord (instant messaging and digital distribution platform designed for creating communities). With no incentives or rewards offered the survey was posted in the following Discord Communities Yoga for Health, Transformational Meditation Group, Integral and Meditation Mind, and some participants were directly contacted with the survey through direct messaging.

Survey Results

A total of 35 participants completed the survey. Of those 35, 18 were female, 17 were male. The participants' age ranged between 18 and 63 years with age mean of 34.62 years (SD = 11.99). The participants practiced Yoga or Meditation between 1 month and 348 months (29 years), with a mean of 89.4 months (SD = 96.5). The participants were asked: When you are engaging in this Yoga / Meditation with others, do you feel like experiencing something new? where 82.8% answered with Yes, 14.3% No, 2.9% with sometimes. The participants were asked if they have ever participated in a group mindfulness session, 82.9% answered with Yes, and 17.1% with a No. Of the participants who participated In a mindfulness session , 60% have tried an online format, and 40% have only practiced mindfulness in a physical format. Lastly relating to the participant's relationship with Artificial Intelligence in their daily lives 54.3% use an Intelligent Assistant such as Siri/ Google Assistant/ Amazon Echo etc., and 45.7% do not use. Due to the other questions being open ended, the data was combined with the data from the co-design workshop and analysed using a qualitative approach as shown in chapter 5.

4. Ideation

In this chapter, the process of transitioning from research to ideating solutions and design implications is outlined. A co-design workshop was conducted, followed by Affinity and concept maps that were used for gathering, organizing and sense making of the large amount of data collected from surveys and the co-design workshop.

4.1 Co-Design Workshop

Co-design is rooted in user- centered design and participatory design, which is defined by Muller and Druin (2002) as the set of methods and practice which are backed by theories that are related to involving users fully in the activities that lead to designing a product. With the aim of challenging my assumptions as a researcher, thus involving the real potential users and enabling people with a very broad range of experience and expertise to not only have informational input but also a creative one. Lastly tapping into the rich "third space", which is in the context of Human Computer Interaction defined as the hybrid experiences that take place at an intersecting region, where the designer presumably has more technical and design knowledge in one region and the participants have diverse knowledge about the practice. This is vital and interesting as it leads to "learning reciprocally". Additionally, Co-creation allows the participants and designer to create new shared ideas (Muller and Druin, 2002). With this attitude and approach towards design the workshop was planned and conducted as follows.

Workshop Design
The workshop was planned with the researcher assuming a co-design manager role, taking the responsibilities of organizing, managing the process and providing the connections between the participants. Additionally, three activities were planned, namely understanding and awareness; imagining the experience, practice and participants; and finally role playing, these activities are discussed below.

Understanding and awareness

The first activity was aimed at collecting user stories, which have been instrumental for the design field. Stories could be defined as a thread or knitted events, or actions that form experiences, and these experiences as a whole form a meaningful story (Feldman et.al, 2004). This proves valuable in design, where collecting and analysing user stories can help provide insights about the users' true needs for their practice and help to generate ideas (Pucillo et al., 2014). This approach was chosen in contrast to following a persona approach, where in many cases the designers formulate imaginative stories in with hope of keeping the process user centred. But rather this approach allows true user stories collection, therefore keeping the process truly user centred by deviating from assumptions.

In order to incorporate story collection in the participatory co-design activity, new methods were created. To the authors best knowledge, a concrete method that approaches story collection in a structured and participatory way could not be found in the literature. Therefore, a co-design story collection activity based on participatory design theoretical foundation was planned. Where it meets all of the core fundamental aspects of participatory design as stated by Halskov and Hansen (2015). Firstly, *politics*, that states "people who are affected by a decision or an event should have an opportunity to influence it". Secondly *user*, where the users should be considered as experts in their activities or work life. Thirdly *context*, that the activity or as the literature states "computer based application" should be viewed in context. Fourthly *methods*, which should provide users with the means to gain influence in the design process. Finally, *product*, which aims to involve the user in designing alternatives that improves their quality of life.

In light of these core fundamentals the activity was planned. Conforming to the politics fundamental, a stakeholder analysis was conducted to select the workshop participants, where the people affected or would be affected by this "product" have an opportunity to influence it. Conforming to the second principle of users, the users were given total freedom, but directed and provided the means to share their stories as seen in Figure 6.0. As for the context principle, the activity was initially planned to take place at a Yoga

studio. At the studio, boxes that have empty labels at the front, with instructions on how to proceed with the activity, by asking the participants to share their own stories by writing it on one of the boxes. Then the user can vote as well for the already written stories (by using voting coins inserted into the box) indicating how they feel about them. This fulfils the fourth principle as well, by not leaving the judgement about the stories to how the designer views them, but instead it involves the users truly in decision making. Due to the ongoing COVID-19 pandemic and safety regulations at the time of this project, the activity and whole workshop had to be converted into an online format, in which the first part of can be seen in Figure 6.
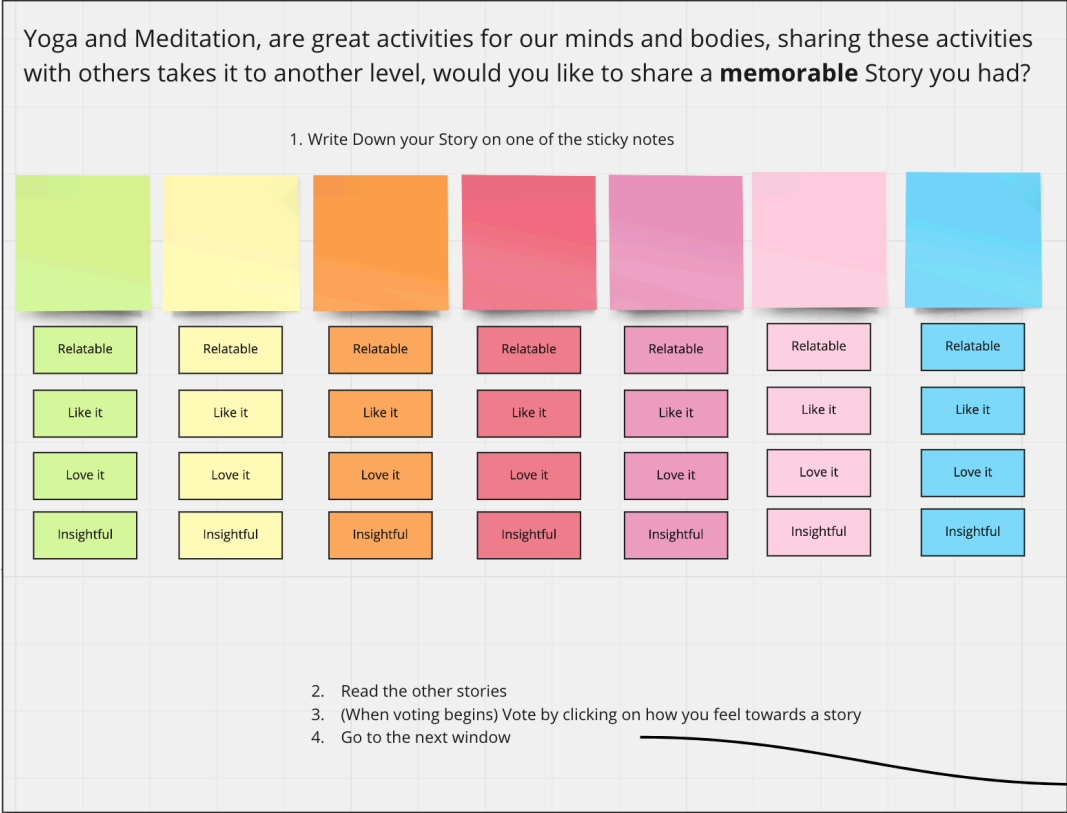
Figure 6 Co-Design Workshop: Story sharing

Imagining the Experience, Practice and Participants

The second activity's goal was to ideate on how the entire experience could look like. Specifically, to gather design implications related to how the participants would imagine a memorable experience that is not bounded by real world limitations. As well as how would they imagine a virtual world, the practice and finally themselves and the Artificial Intelligence partner avatar.

As a co-design manager it was essential to design this activity, in a way that enables the participants creatively, in order to release their imagination. Therefore, an interesting fitting theoretical foundation is Invisible Design. Invisible Design is based on scenarios in films where the participants discuss concepts they have never seen before. This method as a workshop technique is used for generating ideas and design insights early on in the design process. What makes this technique great and fitting, is that it can help create a critically and creatively enabled space for a participatory concept development.

Invisible Design enables incorporating creativity in the process by leveraging ambiguity in design. In turn ambiguity could be leveraged or used at three different levels, namely informational, contextual and relational levels. At the informational level "Informational Ambiguity" where the ambiguity is in the artifact itself. At the contextual level "Contextual Ambiguity" relates to the location and sociocultural information that are used to interpret this artefact. Finally, at the relational level "Relational Ambiguity" which is the relationship between the technology and user (Briggs et al., 2012; Gaver et al., 2003).

Inspired by Mad Libs, which is a template word game, that asks a player to substitute blanks in a pre-written story with a word, before reading it aloud for the other players, which results in a 'funny' story. This inspired the ability to provide the participants with a pre-filled scenario or a story that has been contextualized by the designer, focused on the activity, environment and the interaction. Arguably it also solves some major problems such as Writer's block, where people when presented with a blank page are unable to generate new ideas or work, and might creatively be slowed down.

The activity that combined Invisible Design with the idea of Mad Libs, is shown in Figure 7. It was designed so that the participants would be asked some demographical information on the right side of the paper. On the left side they would write how they envision the new experience when they are not restricted by limitations. Starting with questions regarding how they imagine the environment, followed by questions relating to the experience, how they imagine their character and the partner character; and finally the interaction.

Figure 7 Co-Design Workshop: imagining a new story

Role Playing

Macaulay et al. (2006) highlighted the transformation and shift of how people interact with computers during the rise of ubiquitous and tangible computing. This change inevitably affected how interaction designers should approach and think about the new interaction possibilities. These new interaction possibilities namely "performative interactions", that include body movements rather than strictly screen interactions require methods that expand the attention beyond ergonomics. Therefore, should include attention to understand body movements. Hence performance and theatre related methods are increasingly adopted in the development of interactive systems.

Accordingly, the third activity of the workshop was planned as shown in Figure 8. The activity was based on the three phases from the group experience pattern discovered in the interview (section 4.2). Continuing with the participants previously written stories, the participants were asked to role play their previously written stories, and how they imagine the yoga experience would unfold.

Figure 8 Co-Design Workshop: Role playing script

Workshop Results

A total of 5 participants were recruited for the workshop, using convenience sampling through social media and instant messaging groups. Of those 5 participants, 3 were female and 2 were male, the participant's age ranged between 25 and 34 years with a mean of 28.4 years (SD = 11.99). The participants practiced Yoga or Meditation for a duration of few months up to 7 years.

The role playing activity was recorded. As a result, 'experimental' video data was produced that captured the participants' role playing their scripts and how they imagined the interaction. Furthermore, the videos were analysed using a hybrid approach combining descriptive analysis and coding. Some of the main outcomes of this activity that have been translated as design implications are: Firstly, the participants preferred the partner to start the conversation. Secondly, the participants preferred to be called by

their real names when interacting with their mindfulness partner. Due to conducting the activity online, it was hard for the participants to fully engage in the activity. This has been further elaborated on in the limitations section.

An exploratory coding approach was employed to understand what causes people to feel related to each other, to find related and important information to the research question and to look for themes that could clarify the idea while remaining open for new information. A combination of deductive and inductive approaches was used as coding method. Some themes that could be associated with how people feel related to each other during an activity were emerging. One of which was how group yoga participants see their meditation partner, in which they imagine their partners looking a lot like them or what they aspire to be. Additionally, and interestingly even though mindfulness is a "silent" activity, conversation was an emerging theme, which solidifies it as an important part of the activity. The other coded data and information mainly from deductive coding were combined and transferred to be analysed using affinity and concept maps in the upcoming section.

4.2 Affinity and Concept mapping

After conducting a survey and a workshop as a researcher and designer, I was left with a large amount of data, that includes user generated ideas, information about the practice, possible design implications, as well as information that addresses the main research question about feeling related to an Artificial Intelligence. Consequently, it was essential to find a way to organize and find connections and patterns within the data in order to synthesize research results into design implications. Therefore, two ideation and sense making activities namely, Affinity mapping and Concept mapping were performed and are discussed in the upcoming subsections.

Affinity Map

Affinity mapping or diagramming is a method that is used to cluster research data and observations. As well as externalizing insights from research to make sure that I, as a

designer stay grounded in the research data (Martin and Hanington, 2012). Additionally, Affinity Mapping provides insight into user ideas, helps to discover embedded patterns and importantly break old patterns of thinking. This will be achieved by forming new relationships that are the result of sorting and clustering language-based information (Hoeppner and Scharf, 2004). Therefore, it was deemed as the best approach to tackle the ideation phase. The process started by collecting all the coded data from the previous research into a Virtual Whiteboard (Miro), then objectives of the activity were stated to stay aligned to the task. Finally, the notes holding the coded information were grouped up. The results of the activity are displayed in Figure 9 to Figure 13.
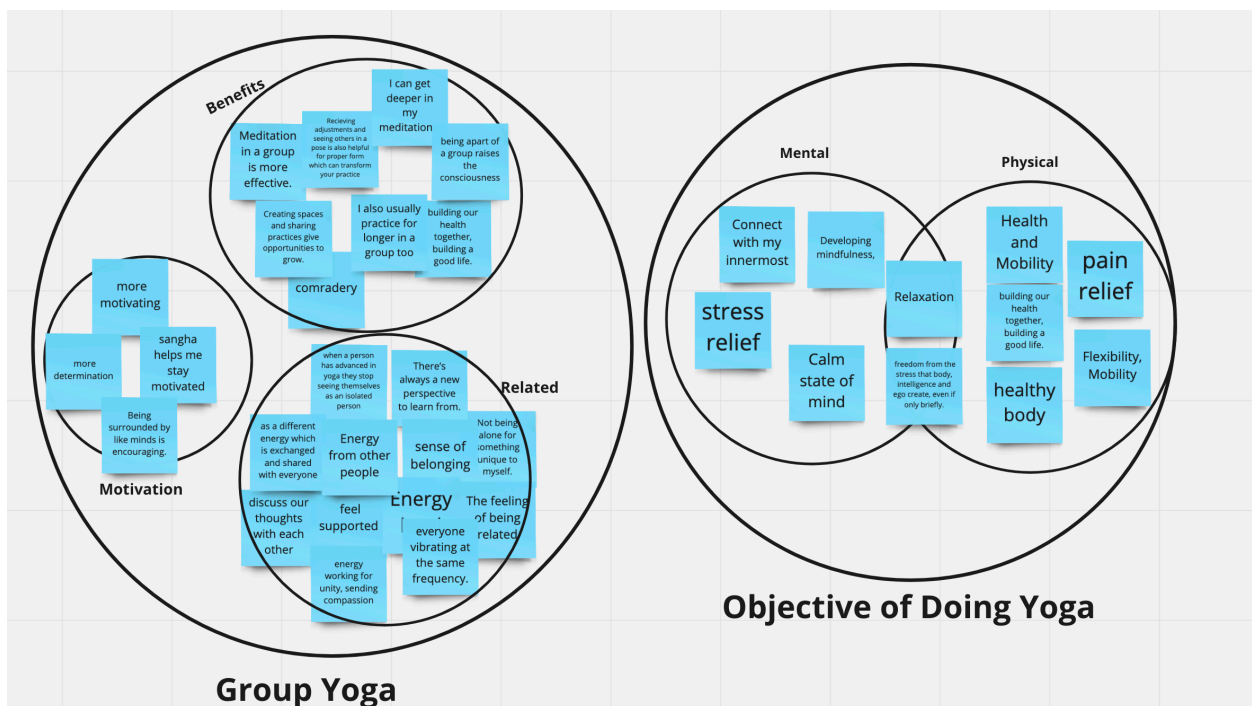
Figure 9 Group Yoga: Objectives and motive

Figure 10 Group Yoga: Negatives

Figure 9 and 10 demonstrate general information about performing the practice in a group setting, whereas expected people generally perform the activity for either physical or mental benefits, and perform it in a group for extra benefits such as effectiveness and motivation, or to fulfil the need to feeling related.

Figure 10 demonstrates some of the negatives people face in a group activity. That are spilt into two areas. The first one related to time management in a group activity. The second one related to how people feel around others. Both drawbacks could arguably be addressed using technology and specifically Virtual Reality.

Figure 11 Relatedness: What would make you feel related to an AI

Figure 11, shows key findings related to the research question, of what would make you feel related to an AI, where a relationship and pattern already started to form in the data findings. What seemed very important for people to feel related to an Artificial Intelligence, firstly is the AI's ability to hold a conversation that is not static or as stated by a participant "doesn't repeat the same sentences all the time". Secondly the ability of the AI to reference past conversations "keeping up with what I tell it, that it mentions it back in a future discussion, this way I would feel like talking to a friend". Thirdly the AI should show a believable personality that also demonstrates growth and not being perfect "Being

imperfect, and experience self-doubt and failures or anxieties" and "Its ability to change, grow". Finally, the AI's ability to show empathy and support "If they can give kindness to us and make us feel supported".
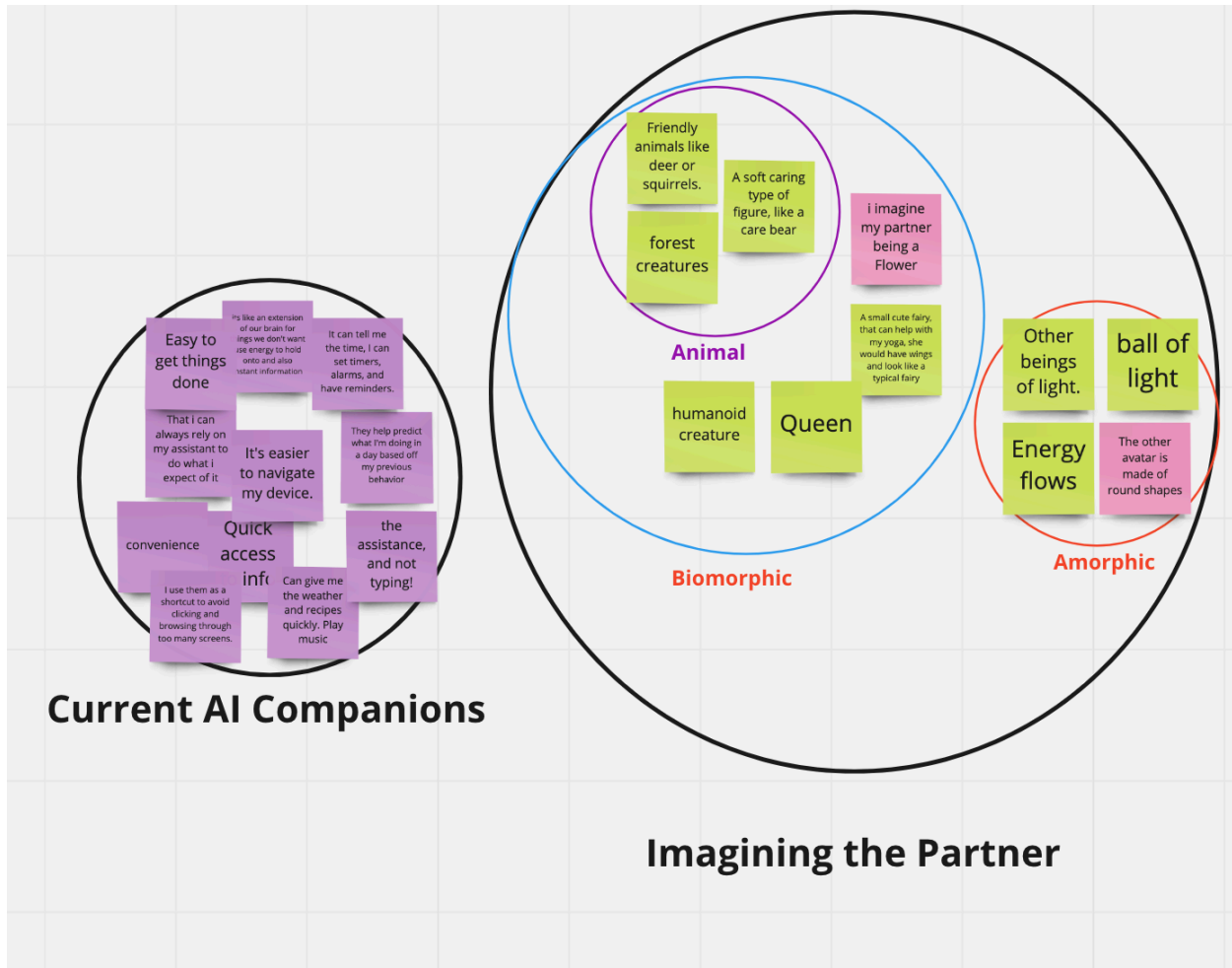
Figure 12 Artificial Intelligence: Current and Imagined companions.

Figure 12, demonstrates how the participants of the survey and workshop currently view AI and how they imagine an AI practice partner would look like. Interestingly the study participants perceive AI as an information source or as a participant stated "Quick access to info" and an extension to their brain, where they define their relationship with AI as a helper that follows their commands and helps them with their daily tasks.
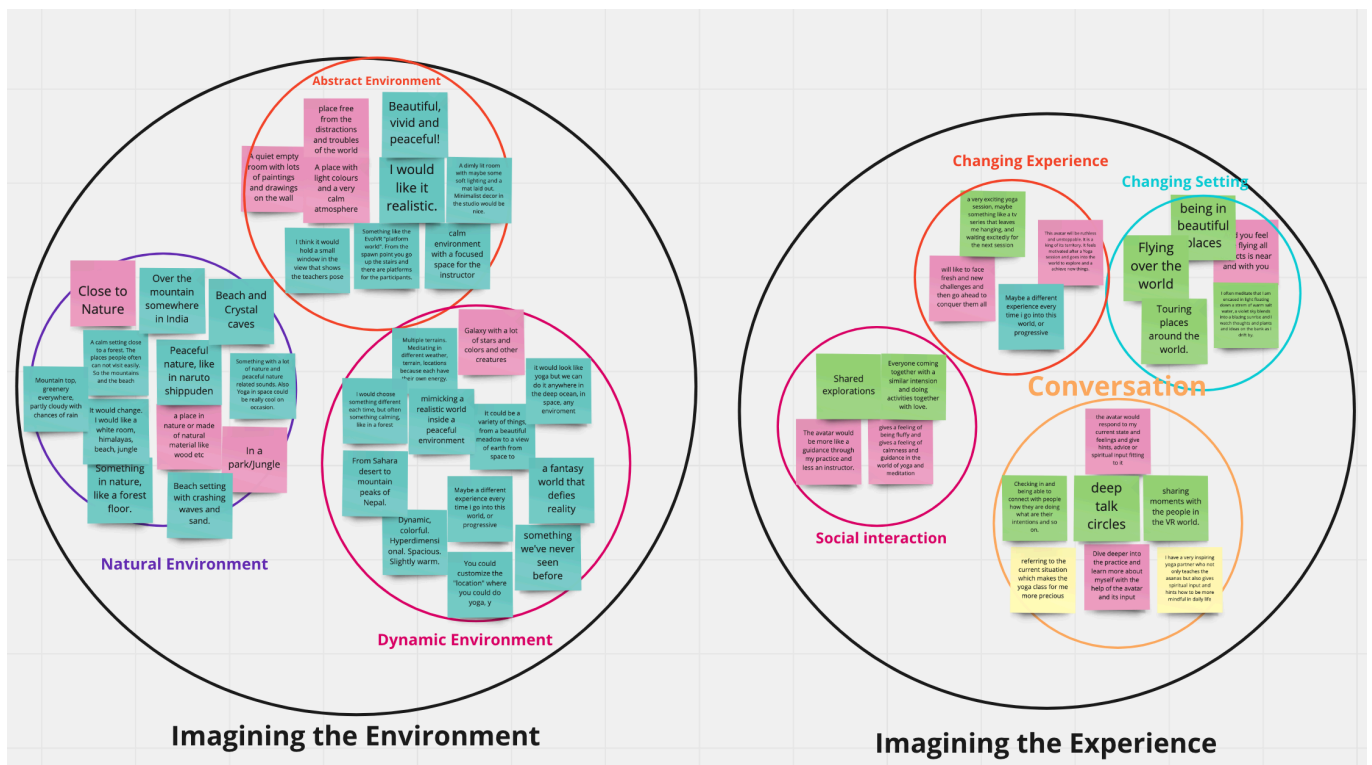
Figure 13 Affinity Map: Imagining the Environment and Experience.

Finally, when the participants were asked to imagine a virtual experience (Figure 13), in which they would be in a virtual world that doesn't share real life limitations. The participants imagined different environments that were mainly categorized into three types of environments: firstly, a natural environment "a place in nature or made of natural material like wood etc.". The second environment type is a dynamic environment where it changes every time "Maybe a different experience every time I go into this world, or progressive". The last categorized environment is an abstract environment that just evokes a certain feeling such as calmness or peacefulness as described by the participants "Beautiful, vivid and peaceful!", "calm environment" and "A place with light colours and a very calm atmosphere".

Concept Map

"Concept mapping is a visual framework that allows designers to absorb new concepts into an existing understanding of a domain so that new meaning can be made." (Martin and Hanington, 2012). After having clustered the research data, a lot of new concepts

and ideas emerged, and a method that allows to make sense of large number of ideas and events was needed; hence a concept mapping activity was carried to synthesize the research findings.

A key first step in constructing a concept map is articulating the correct focus question that makes sure the map stays within the context and also the question provides structure to the map. Therefore, the first concept map related to Artificial Intelligence with the focus question of 'What would the Avatar look like?'. Accordingly, the concept map shown in Figure 14 was constructed, where it reflects the relationship between the avatar and the user. As many participants prefer the relationship to be set up as an experience sharing between the avatar and themselves, the relationship was built on guidance rather than tutoring. As for the appearance of the avatar. Responses were split between amorphic and biomorphic, that were further split into real and fictional. Real avatar reflected life like creatures and fictional avatars reflected unreal characters.
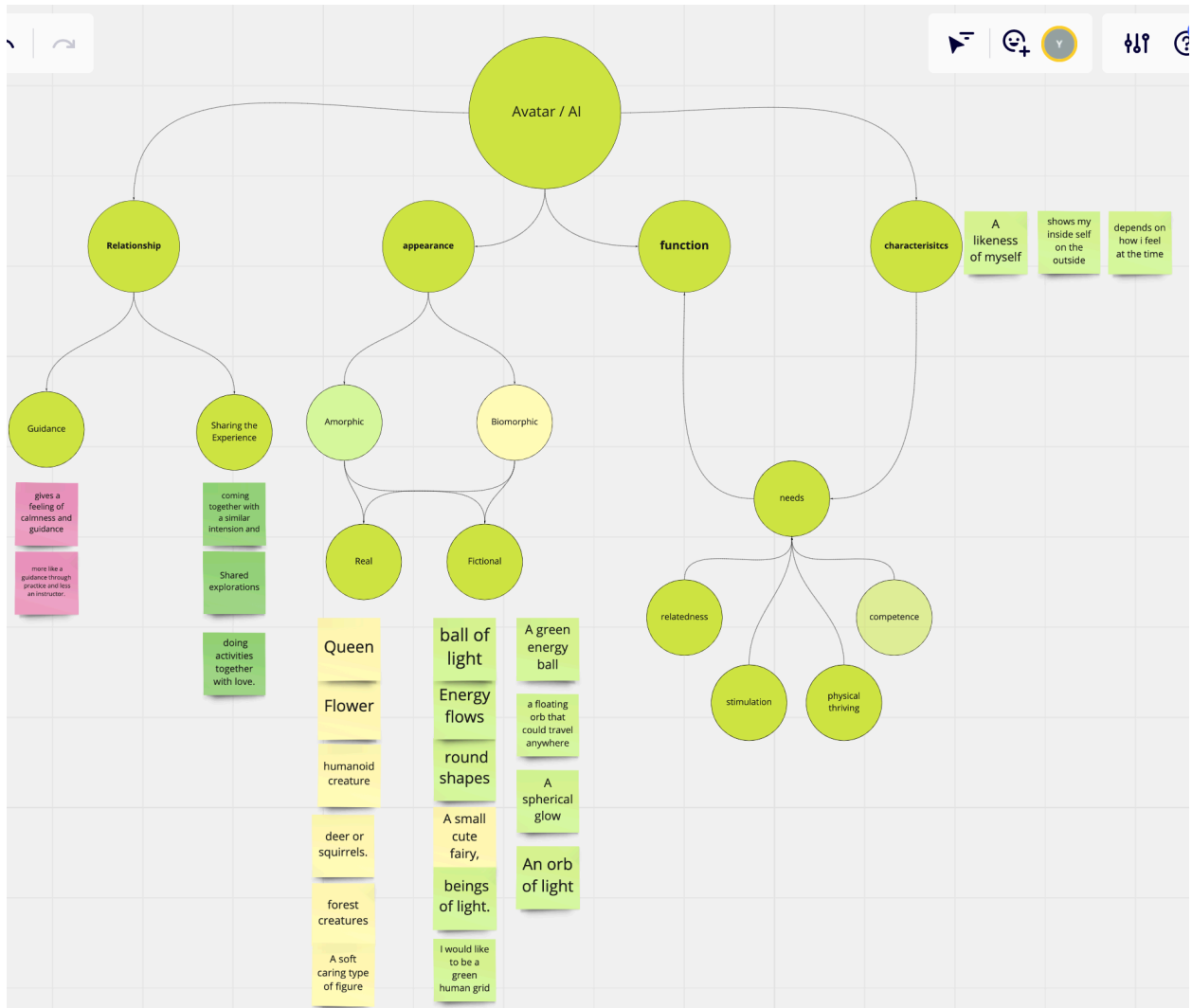
Figure 14 Concept Map: Avatar Concept

The second concept map was constructed to answer the focus question of 'What would the context and environment look like?'. Figure 15 shows the result of constructing the aforementioned map, where according to the results, the context should serve the function of a distraction free, calm and peaceful environment, and the environment would mimic a realistic place close to nature.
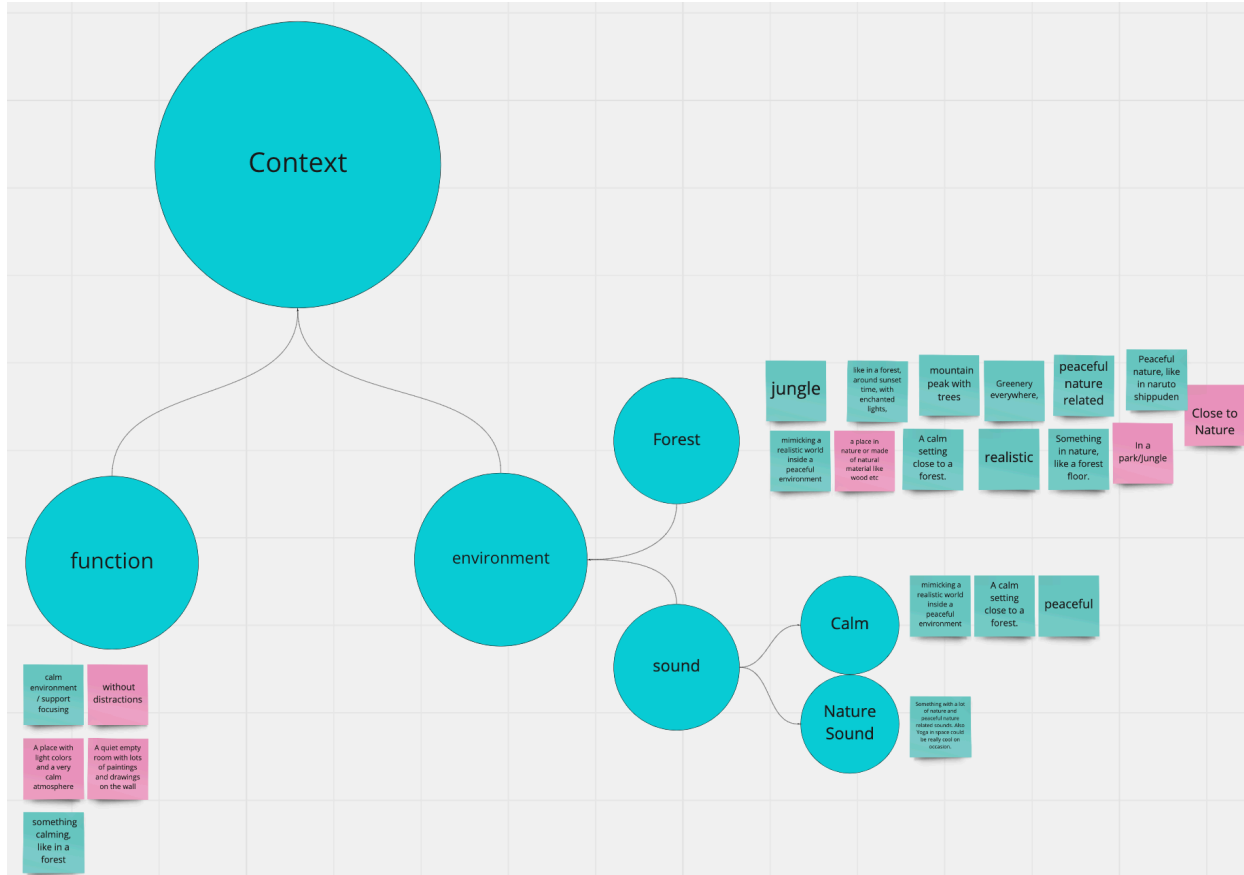
Figure 15 Concept Map: Context and Environment

The third and final concept map shown in Figure 16, Is directly related to the research question. It was constructed to answer the focus question of 'What would make you feel related to an AI?'. The map demonstrates that in order to feel related to an AI during a shared activity, essential aspects must be incorporate in the experience. Firstly, the experience must include a conversation, in which the AI greets the partner and uses their name. This conversation should also progress overtime as stated by a participant "keeping up with what I tell it, that it mentions it back in a future discussion, this way I would feel like talking to a friend". This also connects once again to the past connection, where seemingly from the data people feel more related when the other conversation partner knows past details about them and remembers these details. Another important aspect that the AI needs to demonstrate during the conversation is a believable personality. This personality must demonstrate growth capability, such as "the ability to change" and "ability to show curiosity".

The AI should also be able to demonstrate personality traits such as trust, which a lot of participants in the context of technology defined as "truly knowing their data is not being used for corporate benefits". The second trait synthesized was support, where participants wished that the AI could support them by showing kindness, and making them feel supported. Lastly and most importantly empathy. According to the research data presented, empathy is deemed an important factor in feeling related to someone. Therefore, the AI need to demonstrate their ability to show empathy towards the user. this was best defined by a participant as "The abilities to observe my inflections and expressions, and then to respond with empathy in a way that encourages me to be like my ideal self" and "emotional insight". This suggests that the AI should be able to interpret people's emotions and respond accordingly.

Figure 16 Concept Map: Relatedness

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4.3 Analytic Storylining

After the research phase was concluded. A method that truly reflects the data and doesn't contain assumptions to summarize the findings along the visual results of the relatedness map was required. Additionally, what was needed is a method to help transition the ideation phase into prototyping, to which video prototype was deemed most fitting for reasons that will be discussed later. Accordingly, an analytic story line seemed most fitting as its best used when "there is a story with conditions and consequences to be told from and about your data" (Saldaña, pp. 257). Following is the resulting Analytic Story:

*Psychological well-being **involves** fulfilling Psychological needs. Of which relatedness is a keystone one, **it means and** is fulfilled while being **involved in an activity** with people who you feel related to.*

*The fulfilment of this need with an AI **happens when** this AI has a personality that is distinguishable from current AI's. The AI should show a believable Personality that demonstrates growth, by its ability to change and show curiosity. Another important factor the AI's personality needs to demonstrate "personality traits". These traits should **involve** most importantly empathy. Empathy **means** the ability to observe inflections and expressions, and then to react empathetically.*

*Other important factors of personality traits are support and trust. In an AI case support and trust mainly **mean**, how the users data is being handled.*

***Another** important aspect the AI should have to fulfil this need is the past connection. The AI should demonstrate a past connection with the partner. The AI should **not only** remember the details told to it, **but** should also bring them back up in future conversations. Hence having details about the user is essential to establish this connection. Therefore a progressive experience and conversation **contributes to** the fulfilment of the relatedness need.*

5. Design

After having sufficient understanding as an outcome of the research phase. Specifically, of the user needs, behavior, attitude, practice and technology. As well as generating the hypothesis, that *Relatedness as a need can be fulfilled with AI in a shared activity, if the AI can hold a conversation in which it shows during a personality that has empathy, support, trust, growth traits, and is able to show a past connection with the human.* As a result of the research process, Video Prototype was determined as the best approach, to prototype and validate the research results. Because of the nature of information, that unfolded as a story, with events, actions and consequences. As well as the added complexity of prototyping an Artificial Intelligent agent inside a virtual world. Accordingly, in this chapter the process of designing empathy in an AI is outlined, followed by the design process of the environment and avatar. Finally, the video prototyping process is outlined.

5.1 Empathy Design

"Empathy is seen as the capacity to perceive, understand and experience others' emotions". Since empathy is all about understanding emotions, and has been a major factor in humans' social interaction, it has gained traction as a topic and many researchers have been investigating ways to perceive and react to user's emotions (Paiva, 2011). Due to the fact that empathy in this paper is considered an important factor to feel related to an AI. A framework to implement this in a computational agent was crucial, hence the model 'Empathy in Social Agents' that is suggested by Pavia was chosen. Pavia defines five set of constructs that should be considered in the empathic process:

1. Observer: which is the person that observes and reacts to emotions of others
2. Subject: is the person associated with the emotional state
3. Event: is the incident the subject goes through, that could be directly or indirectly witnessed by the observer
4. Emotion: what the subject experienced, and which the observer reacts to

5. Situation/Context: indicates an event that has led to an emotional reaction In the subject, this context includes aspects such the past situations between the observer and subject (Their relationship)

Pavia outlined two ways empathy could be present in an agent and human interaction. Where the user or agent could be the empathizer, meaning the one who triggers an empathetic response in the other. In the context of this paper the latter is the more desired case, where the research results showed that people want an empathizer AI, that could react to their emotional states. The computational model by Pavia suggests that there are two stages in the empathetic process, an empathic appraisal and an empathic response. Where in short the empathetic appraisal involves appraising of an event, where the subject has an emotional state, that was triggered by an event and has emotional cues attached to it. As for the empathetic response it involves perceiving the emotional state and empathic emotion and generating an appropriate reactive behaviour.

5.2 Avatar Design

Referring back to the Avatar concept shown in Figure 12, two different avatars have been designed, the avatar that will be used in the prototype is demonstrated below.

Character Appearance

From the research results many participants wished for an amorphic avatar that could be spherical or rounded in shape and is composed of light and energy rays. Accordingly, the following characteristics were outlined:

Appearance:
1. Rounded / Spherical Character
2. Glowing Eyes that could show empathetic reaction
3. Mouth that could reflect emotional states and reaction
4. Blueish rays

Figure 17 shows an initial digital sketch design of the avatar.

Figure 17 Avatar Design: Initial Sketch

An already developed character was found in a video engine (Source 2 engine) that would make the prototyping process faster and more rapid, accordingly the character in Figure 18 in the game engine was utilized and edited to represent the designed avatar.

Figure 18 Avatar Design: Default look (Captured inside Source 2)

Character Behaviour

The computational model described above 'Empathy in Social Agents' provides an abstract model, that describes how empathy is formed between the relation of the observer and subject. What the model is lacking, was representation of the reactive behaviour, meaning how will the reaction represent a selected emotion. What could address this gap was Plutchik, R. (1988). Building up on Plutchik's work, the colours demonstrated by the avatar behaviour should appropriately reflect an emotional reaction from the avatar.

Behaviour:

1. Changes colour to react and reflect emotions and emotional state. Colours that reflect different emotional states according to Plutchik:

    - Fear: Dark green
    - Acceptance: Light green
    - Joy: Yellow
    - Anticipation: Orange

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- Anger: Red
- Disgust: Purple
- Sadness: Dark blue

2. The Avatar Reacts to emotions by body movements and conversation

3. The Avatar Reacts to user conversations with sounds

Figure 19 demonstrates a designed empathetic reaction, where in this case, it is shown how the avatar would react to a joyful elicited user event.

Figure 19 Avatar Design: Reaction to a Joyful event

5.3 Environment Design

From the research results, three different contexts or environments were synthesized. The first reflecting a fantasy world that defies reality. The second an abstract context such as a room or a studio. The third being a natural environment mimicking a realistic world, mainly a place with trees such as a forest.

For the purpose of this study and the fact that it was the most occurring environment, a natural environment context was chosen. This environment will serve the function of being a distraction free calm environment. The following environment characteristics were outlined:

Environment characteristics:
1. Trees
2. River
3. Subtle nature related sounds
4. Mindfulness spot on a mountain peak surrounded by trees

The environment consists of a starting point at a river surrounded by trees as shown in Figure 20.

Figure 20 Environment: Starting Point

The second part of the environment is the 'Mindfulness Spot', In which the participant and the partner AI will walk to the spot in order to practice the mindfulness activity. Figure 21 shows the aforementioned mindfulness spot.

Figure 21 Environment: Mindfulness Spot

5.4 Prototype

The translation of design implications and research results to a digital or physical product, presents an important stage in the development phase of a product. According to Tim Brown (2009) "Prototypes speed up the process of innovation, because it is only when we put our ideas out into the world that we really start to understand their strengths and weaknesses. The faster we do that, the faster our ideas evolve". Therefore, after the extensive research and ideation processes, it was important to rapidly prototype the generated hypothesis and design decisions that are summarized and outlined in the upcoming subsection.

5.5 Design Implications

This section lists the synthesised results of the research and ideation processes, as these design decisions are important to be addressed in the design. The listed design implications are considered important and key to the research question of fulfilling the relatedness need specifically with an AI. Hence the design implications do not list low level functionalities or design decisions but rather cover higher level design decisions, that are essential to the experience.

Experience pattern

The results of the interview highlighted the importance of the pattern participants go through. This pattern consists of three different phases essential for the group experience:

1. Conversation: in which the participants share some words together and great each other
2. Group Meditation: is the phase where the participant and AI join in to perform the activity
3. Reflection Conversation: in which the participant and AI talk about the experience and send-off

This pattern specifies how the experience shall unfold, and the steps AI engages with the participant in this activity.

Artificial Intelligence Behaviour

The results of the role play, workshop and survey demonstrated that the overall behaviour of the AI is very essential. Firstly, the AI as a partner should start the conversation and be engaged in it. Secondly, the AI should address the user using their real name. Thirdly, the AI should be more of a partner than as a tutor, as well as incorporate the four elements deemed essential to feel related to the AI which are:

1. Personality: the AI demonstrates a growth oriented personality, that changes overtime, shows curiosity and is able to change
2. Relating to the past: The AI should be able to relate to the participants past, through demonstrating that it knows about the participant. The experience should progress over each interaction and encounter, in order to develop this attribute that allows the AI to relate to the user's past
3. Conversation: The AI should be able to hold a non-static conversation, that incorporates all of the above mentioned elements
4. Empathy: Even though empathy was listed as part of the personality, but in this research it was shown as a cornerstone in the interaction. The AI should understand user emotions and feelings and react accordingly. The reaction would consist of two parts, a conversational reaction in which the AI reacts by words and the other part is a behavioural reaction in which the AI would demonstrate physical change. This overall reflects the AI's capacity to perceive, understand and experience the user's emotions

Interestingly the conversation ties everything together, and solidifies its importance in the experience, even for a mindfulness activity that being silent during is a core aspect. This as well connects with the experience pattern that revolves around two conversations at the beginning of the activity and at the end.

5.6 Storyboard

Storyboarding is a common technique in HCI, that originates from the live-action film industry. Storyboarding demonstrates how the story will flow, whether the concept will work or not and as a way of organizing the shots. Commonly in user-centred design it is employed as a way to describe the future use of a system or a concept. This makes Storyboards an essential part of the creative process (Elemental Media, 2020). In order to capture the concept on screen, the process of storyboarding was visualized by splitting the video prototype into two parts that are demonstrated below. Firstly, Product Need that

demonstrates the needs this product fulfils. Secondly, Product Use which shows the product in use.

Product Need

For the purposes of demonstrating the need behind the concept, the first part of the video was dedicated to show on where the product would fit in the user's life and why this product is needed. Figure 22 demonstrates the first part of the video with Jason as the user. The scene starts by showing the user disconnected during a pandemic, in which he doesn't have regular contact with people who he cares about. Followed by a time lapse scene that was aimed at showing the long-time of disconnection and same routine. In the third scene Jason receives a message on his phone about lockdown extension for another two weeks. The third and the fourth scenes were aimed at showing how essential it is to fulfil the relatedness need. Finally, in the fifth and sixth scenes the product is introduced, and it shows Jason receiving the product and then putting the VR headset on to transition into the VR world and next part of the video 'Product Use'.

Jason comes back into his room, works on his computer,checks his phone, there are no new messages	Jason goes to sleeps, wakes up eats works on computer 'Time lapse' same routine.	Jason receives a notification on his phone, there's notification of Covid lockdown extended for another two more weeks.
Jason goes to sleeps, wakes up eats works on computer 'Time lapse' same routine.	Jason comes back into his room, unboxes a VR headset	Jason puts the VR headset on

Figure 22 Storyboard: Product need

Product Use

After demonstrating where the product would fit in the user's life and why it is needed. The second part of the video shown in Figure 23 was dedicated to show the experience and the AI. This scenario and storyboard revolves around the three phases of the group mindfulness pattern. Representing the first conversation phase, the experience starts with Ayla greeting Jason. Followed by Ayla and the user introducing themselves. In the second scene Ayla asks Jason if he wants to join her for a Yoga session. In order to show that the AI can relate to the past and remember details about the user, Jason replies that he cannot, and that he has to cook online with his grandmother. Ayla remembers these details and asks him about his experience the second time they meet. In the sixth scene continuing the conversation phase of the activity Jason talks excitedly about the cooking

experience he had with his grandmother. Ayla reacts joyfully to his story, which demonstrates Ayla's ability to perceive emotions and react accordingly, as well as a way of demonstrating empathy. In the seventh scene, demonstrated in yellow borders, represent the second phase of the activity. This phase is the group mindfulness activity where Jason and Ayla walk together to the mindfulness spot to start the activity. In the eighth scene Jason starts doing Yoga while Ayla helps by providing guidance and support. Finally, in the ninth frame bordered in red, the last reflection part of the experience is demonstrated, in which Jason has a conversation with the AI and reflects on his experience with Ayla.
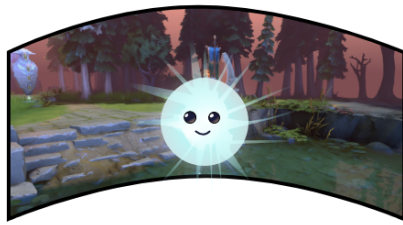
Ayla greets Jason and introduces herself

Ayla Asks Jason if he wants to do yoga
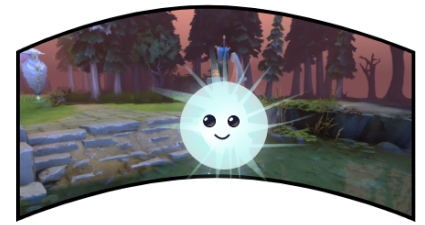
Jason, replies that he cannot today because he is excited to cook online with his grandmother and just wanted to try the headset today
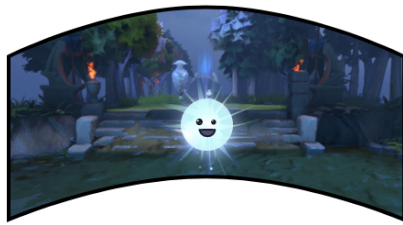
Jason Comes back and Ayla appears next to Jason at the river, Ayla greets Jason by name

Ayla asks about how did it go with his grandmother

Ayla reacts by changing color a joyful yellow

They both walk to the Yoga shrine

Ayla guides Jason during Yoga

At the end Jason and Ayla talk about the experience

Figure 23 Storyboard: Product need

5.7 Video Prototype

Prototyping is an important crucial phase in almost all of the widespread design processes and approaches such as Design Thinking and User-Centred design. It is a very important phase for demonstrating novel and innovative concepts Diefenbach and Hassenzahl (2017). Additionally, it is only through collecting feedback throughout an iterative and

interactive process that involves the real users' products can be refined (Abras et al. , 2004).

Video prototypes can be a great medium to demonstrate and focus the attention to what users are able to achieve and accomplish using a technology, rather than the technical challenges faced during implementation that could hinder and shift focus from the experience. Video prototype proves valuable because of its ability to focus the testing on the experience and the attention of the viewers on specific scenario and moments in the concept. Because of the aforementioned reasons, video prototype was deemed best fitting. The process and reasoning behind the scenes and creation process are demonstrated in this subsection.

The video demonstrated below is based on the synthesized research results throughout the project. The whole experience revolves around the group activity pattern and other design implications. The character shown in the video has been slightly altered, by removing the facial features due to technical limitations at the time of implementation, as well as user's initial feedback from the storyboards. The video starts with an unboxing clip shown in Figure 24 that was aimed at showing the experience happening inside a Virtual Reality World. The VR headset is placed on the user's head from a first person point of view and the video transitions to the second clip "Inside the virtual world". The second clip shown in Figure 25 shows the AI 'Ayla', waving and greeting the user or namely in the video 'Jason', as well as introducing herself. Ayla was narrated by a female voice, while Jason was narrated by a male voice.

Figure 24 Video Prototype: Unboxing

Figure 25 Video Prototype: Ayla Waving

For an opportunity to demonstrate the AI's ability to remember past encounters and relate to the user, the encounter between Ayla and the user in the video was split into two times. In the first encounter after they introduced themselves, Ayla asks Jason if he would like to do a group yoga session today, to which Jason responds that he is busy and cannot do Yoga today because he has a personal event to attend and that his intentions were only to try the headset today.

Figure 27 demonstrates Ayla and Jason's second encounter, for an opportunity to showcase that the AI is able to remember past encounters and referring back to Analytic Story Line in section 5.3. 'The AI should not only remember the details told to it, but should also bring them back up in future conversations', hence having details about the user is essential to establish this connection. Therefore, Jason is back for the second time in this world and Ayla greets him and asks about the personal event and how it went. Jason replies that it went great and proceeds to talk about that experience.
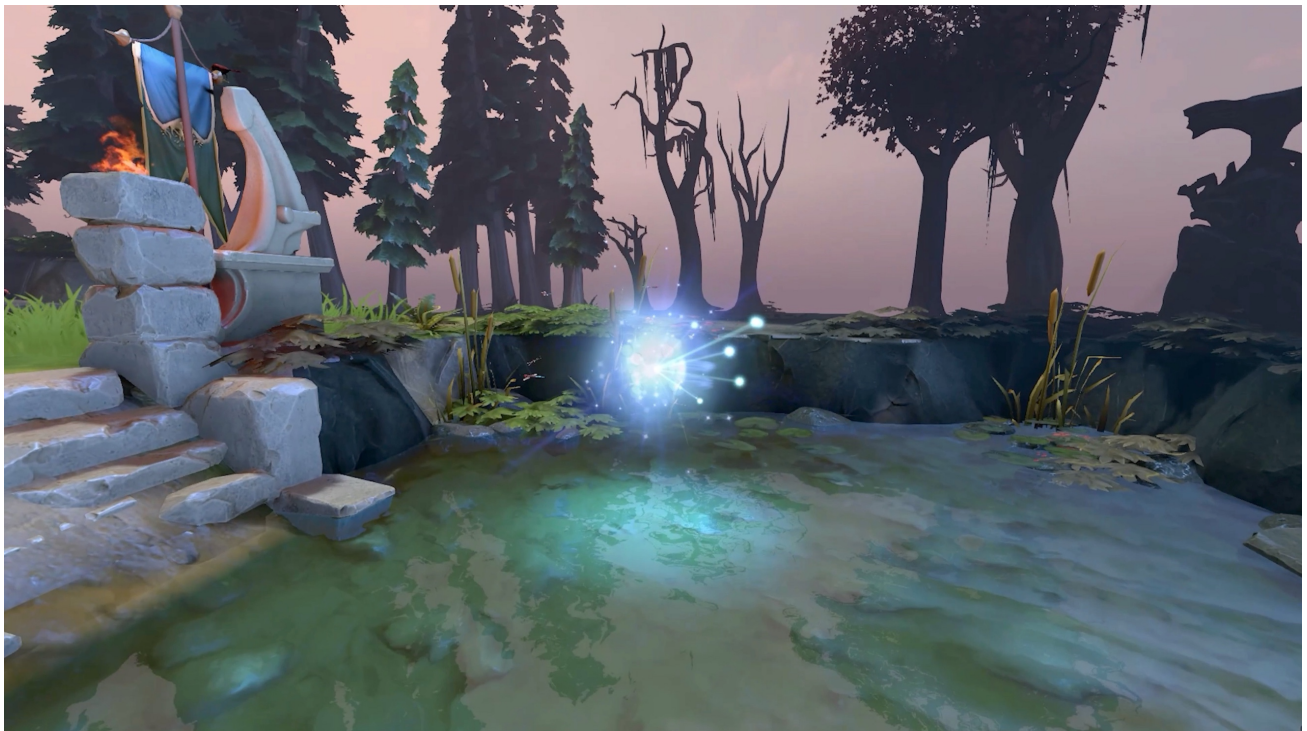
Figure 26 Video Prototype: First Conversation

Figure 27 Video Prototype: Second Conversation

During the second conversation, an empathetic reaction is expressed by Ayla and is shown in Figure 28. For the purpose of demonstrating the designed empathetic reaction, it was essential to show that Ayla is able to understand Jason's emotions and narrated events, as well as being able to react in an empathetic way. For these reasons Jason talked about his experience, in which he underwent a joyful event which he tells Ayla about, Ayla reacts by changing its voice to an excited tone and changes her colour to yellow that reflects a joyful emotional state as can be seen in Figure 28.

Figure 28 Video Prototype: Ayla Empathetic Reaction

After having the conversation and concluding the first phase of the group activity pattern, Ayla asks Jason if he would like to do yoga with her, to which Jason responds positively. Therefore, Ayla leads the way (as can be seen in Figure 29) to the Yoga spot, where Ayla and Jason would start the next phase in the activity.

Figure 29 Video Prototype: Ayla Leading the way to the Mindfulness spot

At the Mindfulness Spot shown in Figure 30, Ayla and Jason proceed to partake in a group Yoga session. In this session Ayla acts as a friend and guidance rather than an instructor. Ayla asks Jason to close his eyes and to take a deep breath. Afterwards Ayla reminds Jason to stay focused on his breath, and provides Jason with a countdown to how long he still has to hold his pose. Sound of Ayla taking a breath has been added to the video in order to demonstrate that Ayla partakes in the user activity and is not a tutor, but rather a friend and an activity partner.

Figure 30 Video Prototype: Mindfulness Spot

Finally, demonstrating the last phase of the group activity. In this phase Ayla and Jason reflect and talk about the experience. The last phase starts with Ayla asking Jason how did it go, and how he feels. Jason replies that he feels refreshed and relaxed. In turn Ayla reacts empathetically again by replying with an excited voice tone and by changing her colour to a joyful yellow, to reflect a joyful emotional state as demonstrated in Figure 31.

Figure 31 Video Prototype: Second Joyful Reaction

6. Evaluation and Results

The evaluation of designed and researched artefacts is an important step to validate research contributions. Incorporating evaluation results helps to redefine the problem, improve user understanding and inform the next product design iteration. In HCI traditionally and mainly the focus in this phase was on evaluating and improving usability. Whereas in sustainable HCI, health, and wellbeing the focus is naturally different to reflect these distinct design decisions. These design decisions could relate to the experiential part of the product, therefore evaluation requires different methods and approaches (Remy et al., 2018).

In this thesis the main research question revolves around investigating whether human needs such as relatedness, can be fulfilled with an artificially intelligent agent. Therefore, the following hypothesis was synthesized:

When an AI demonstrates a personality that shows empathy, able to hold a conversation and 'could remember and relate to the past'. In this case a human will feel related to it.

As needs are an important aspect of the hypothesis, measurement and evaluation of need fulfilment is an essential aspect for the evaluation. Hassenzahl suggests a questionnaire "Attrakdiff.de" that offers measurement of the perceived hedonic and pragmatic quality of the product. Pragmatic quality describes usability aspects, i.e. efficiency, effectiveness and task related product aspects. Hedonic quality describes quality aspects, which are not directly related to the task, i.e. pleasure, needs (Hassenzahl, 2001). Therefore, Attrakdiff was chosen as a first evaluation step to have an understanding and evaluation of the product's nature. Understanding whether the participants perceive the experience as meaningful deemed essential. A scale was adapted from Huta and Ryan (2010), to measure whether the experience was perceived as meaningful. Furthermore, affective experience is also employed for an assessment towards subjective wellbeing (Anthony et al., 1999). A short version of positive affect (PA) and negative affect (NA) questionnaire was included. As a final measure, a feedback capture grid was employed to provide a

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structured yet enabling free evaluation. This allows the participants to fully reflect on, the elements they love, the questions that have arisen throughout the experience as well as criticism. Additionally, it allows the researcher to view the experience through a new lens. In the upcoming section, an overview of the participants as well as the procedure are described, followed by evaluation results.

6.1 Participants

Twenty individuals participated in the evaluation (10 females, 10 males, age mean= 27.05, std= 5.7, min= 14, max= 40). The participants were randomly selected using a random and snowball sampling combination. The participants received the evaluation in the form of an electronic survey. The survey asked the participants key demographic information, and informed them about the project as well as data privacy. In the first section of the survey the participants were shown a scenario, followed by the video prototype. In the second section they were redirected to AttrakDiff, and they answered a survey of the type 'AttrakDiff-Short'. The third section of the survey consisted of Fifteen questions covering the aforementioned meaning, needs, affective experience. Finally, a feedback capture grid was incorporated in the survey which consisted of four sections, namely Likes (Positive Feedback), Criticism (Negative Feedback), Questions (Questions Raised during the Video) and Ideas (Suggestions).

6.2 Results

A Mixed methods analysis approach was used to analyse the collected data. Firstly, quantitative data from Attrakdiff, Wellbeing, Affective Experience, Meaning and Need fulfilment scales were analysed using various quantitative approaches. Secondly, Qualitative data from the feedback capture grid and open ended questions, were analysed using qualitative methods. The upcoming section describes the analysis process and results.

Attrakdiff

Attrakdiff employs and categorizes two different ways that the user might perceive a product. The first is hedonic quality which refers to pleasure or enjoyment of a product's usage and ownership, related to psychological needs fulfilment. The hedonic quality was measured using a seven-point scale of the following items: quality: stylish – tacky, premium – cheap, creative – unimaginative, and captivating – dull. The second category employed by Attrakdiff is Pragmatic quality (PQ). PQ relates to a products ability to support 'do-goals'. PQ is more related to a usability aspect, and was measured using a seven-point scale of the following items: simple – complicated, practical – impractical, predictable – unpredictable, and clearly structured – confusing.

Figure 32 represents one of the results generated from Attrakdiff 'Portfolio-Presentation', which classified the product as either a self-oriented or a desired product. Hassenzahl et al. (2003) defined a self-oriented product as a product that binds the user more strongly. Self-related goals are usually more persistent and personally more relevant, confirming that the product is related to achieving personal goals. Therefore, the product and the video prototype managed to portray an experience related to fulfilling a personal goal, with the presence of an AI. Additionally, as expected the product possess a higher hedonic quality factor, confirming the presence of need fulfillment in this product.

Portfolio-presentation
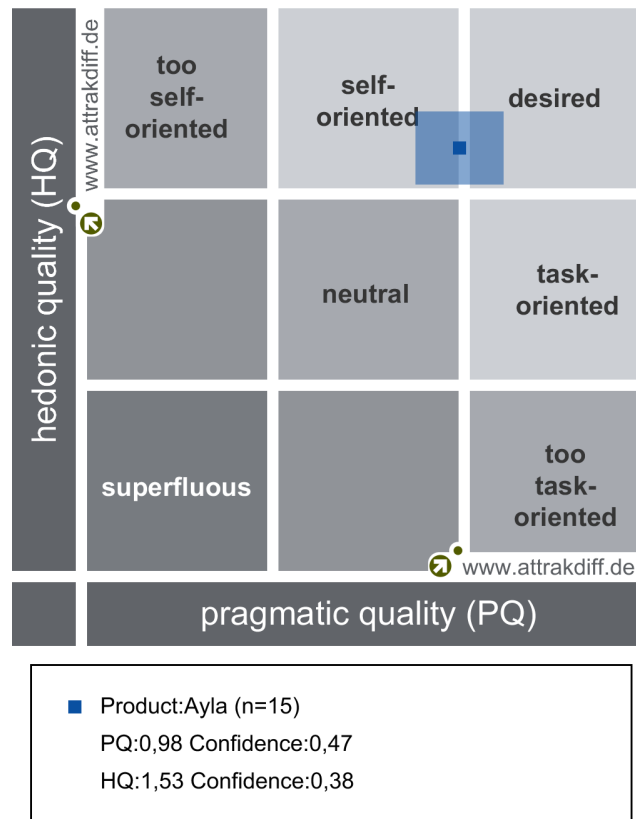
Figure 32 Attrakdiff: Portfolio-presentation

Description of word-pairs (Figure 33) was also generated using Attrakdiff, which presents the mean values of the words during the evaluation. Interestingly the product was perceived as simple and practical to use to a high degree. The product was perceived as neither predictable nor unpredictable, this is interpreted in this specific product as a good factor, due to the importance of Ayla not being predictable and always changing. From the other word pairs, the product was perceived as creative captivating and overall good.

Figure 33 Attrakdiff: Word-pairs

Wellbeing, Affective Experience, Meaning and Need fulfilment

Bradburn (1969) has provided evidence that subjective well-being is the construct of two separate feelings namely positive and negative affect. In order to measure happiness these two "relatively independent" feelings have to be incorporated. Therefore, two Likert scale questions based on a seven-point scale ranging from "not at all" (1) to "extremely" (7) were included: "While watching the Video, I felt Positive" and " While watching the Video, I felt Negative". In this analysis, due to the fact that the data is ordinal, spearman's rank correlation was employed to calculate the relationship between Negative Affect and Positive Affect. It showed a medium negative correlation $r(20) = -.49$. For further insight for these questions an affect balance was calculated by subtracting Negative Affect from Positive Affect. the values of the calculation were all positive with an affect balance mean

of 3.75 (SD = 1.41). The values had a median of 5.5 and a Mode of 6. This demonstrates that the participants felt significantly more positive than negative.

The fulfilment of psychological needs was measured using eight questions on a five-point scale ranging from "Strongly Disagree" (1) to " Strongly Agree " (5) adapted from (Sheldon et al., 2001). The questions measured four psychological needs, namely Physical Thriving (PT), Relatedness(RD), Pleasure-Stimulation(PS) and Security(ST). Relatedness was deemed one of the most significant needs for the research question and was measured using three questions. The questions were "I felt a sense of contact with Ayla, and that she cares for me, and whom I care for.", "Close and connected to Ayla." and "A strong sense of intimacy with Ayla" (RD). Other questions related to other needs such as physical thriving were important as well, due to the nature of the activity shared with Ayla such as: "While watching the video, I felt a strong sense of mental well-being." and "While watching the video, I felt a strong sense of physical well-being." (PT).

The Likert scale questions were analysed on two levels. Firstly, they were considered as individual questions, therefore Modes and Medians were deemed appropriate. Secondly they were considered as scales that when combined described a personality trait or attitude. The scale data were combined into four variables as shown in Table 2, so that the questions related to each need were combined together. As expected overall the product and experience fulfil several needs. Interestingly physical thriving showed lower statistical measures compared to the other needs in terms of Mode and Median. This could be attributed to the nature of the prototype i.e. Video Prototype. Therefore, evaluation of this need would require a functional prototype that could be tested over a longer period of time. Security demonstrated the Highest Mode value, which could be interpreted as the products ability to structure the participant's life, and provide them with a set of routine and habits. Moreover, Pleasure and Stimulation demonstrated higher values, that could be interpreted as the products ability to provide stimulation and evoke new sensations as an activity. Finally, Relatedness was a salient need fulfilled in the product, therefore further analysis was carried out (shown in Figure 34). The results of the further analysis showed that 42.1% of the participants answered with strongly agree

the question "I felt a sense of contact with Ayla, and that she cares for me, and whom I care for"; 36.8% answered the question with Agree; There were no neutral answers; 15.8% answered the questions with disagree; and only 5.3% answered the question strongly disagree. As for the second question "Close and connected to Ayla", 25% of the participants answered the question with strongly agree; 40% answered the question Agree; 20% answered the question with neutral; 10% answered the question with disagree; and only 5% answered the question with strongly disagree. This demonstrates that most of the participants felt cared for by Ayla, in return they cared for Ayla and they felt close as well.

Table 2 Needs Statistical Analysis

	Mode	*Median*	*Mean*	*Standard Deviation*
Physical Thriving	3.50	3.50	3.58	0.82
Security	4.50	3.75	3.48	0.92
Pleasure & Stimulation	4.00	4.00	3.63	1.00
Relatedness	4.00	4.00	3.85	1.13
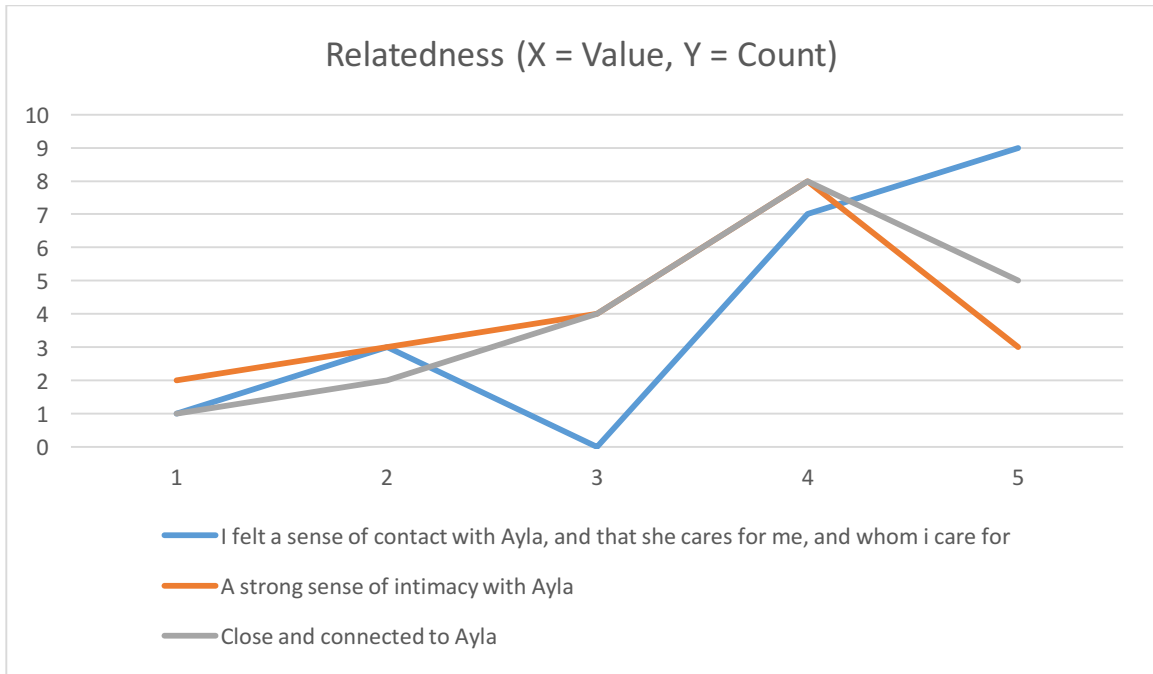
Figure 34 Relatedness

Finally, to measure whether the participants viewed the experience with Ayla as meaningful. A scale that was proposed by Huta and Ryan (2001) was adapted. The participants were asked to what extent the experience with Ayla seemed "meaningful," "contribute to various aspects of myself", " Ayla would be part of something bigger". A seven-point Likert scale ranging from "not at all" (1) to "extremely" (7) was used. The internal consistency associated with the meaning construct was calculated. The internal consistency was measured as Cronbach's α = 0.86. Because of the high internal consistency, the scale value of the construct for meaning was calculated by averaging all items (M = 4.81, SD = 1.66).

Qualitative Analysis

The last part of the survey consisted of an open ended question "What would make you feel closer to Ayla?". This question was included to possibly generate insights about what elements the video prototype might have failed to demonstrate; as well as the possibility of synthesizing new insights. Additionally, a feedback capture grid was used to collect information regarding four areas of the product. Firstly, to provide the participants with the

ability to freely reflect on the product. Secondly, collect insights about elements they love. Thirdly, functions or presentations that didn't make sense. Fourthly, the problems or issues that they faced. Figure 34 demonstrates, a collection of the coded insights.
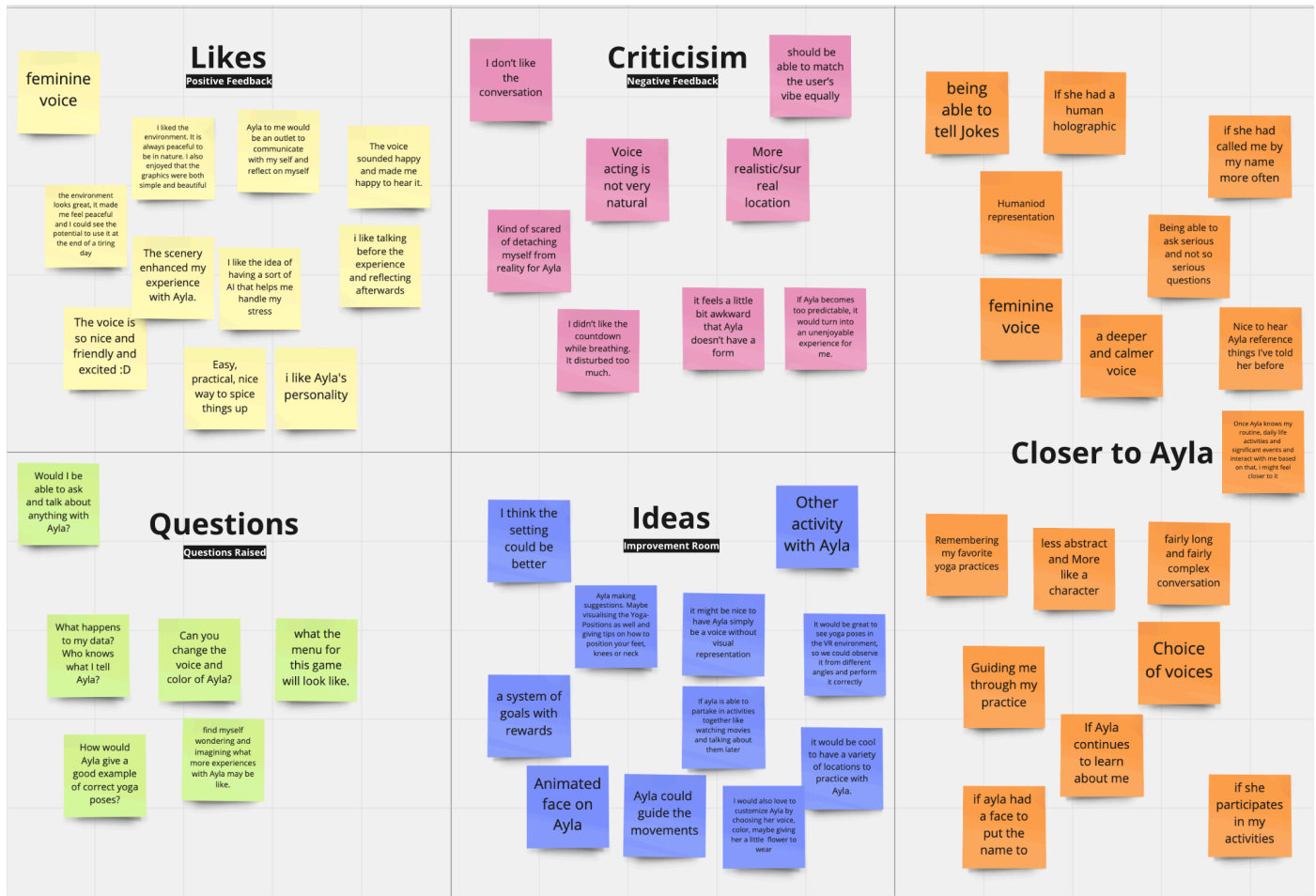

Figure 35 Qualitative Analysis: Coded Question & Feedback Capture Grid

As a first analysis step, the sticky notes were clustered relative to their overarching topic (Figure 35).

Firstly, Feedback from what the participants *liked* about the product was clustered, and further categorized into product and concept related feedback. Product related Feedback showed that many participants provided positive feedback towards the avatars voice. Some feedback that was categorized as *adaptation,* was already demonstrating how the participants could appropriate the product into their lives, as one participant stated "Ayla to me would be an outlet to communicate with myself and reflect on myself".

Secondly, *Criticism* and *negative feedback, that* were mainly targeted towards the avatar and the environment, this demonstrates not only the importance of these elements, but the subjectivity towards preference of the form and appearance of the avatar.

Thirdly, two main themes were synthesized from *the questions* section. The first reflected either a *demonstration failure* in the video prototype for some of the participants. Some elements were included in the video, but some participants didn't perceive them. One of these questions was "Would I be able to ask and talk about anything with Ayla?". This was demonstrated in the video by Ayla talking freely and human like. Additionally, the point that "the AI should be able to hold a complex conversation", was deemed essential in the design implication. The other theme revealed new possibilities. One possibility that could be incorporated in the product in further iterations, is *customizability.* Some participants asked "Can you change the voice and color of Ayla?". Another possibility is involving Ayla more in the practice "How would Ayla give a good example of correct yoga poses?".

Fourthly*, Improvements* towards the concept and product provided feedback towards the interaction that was categorized as *AI/User Relationship*. Part of this feedback was classified as "failed to demonstrate", because these elements were already part of the research. But this feedback acts as a confirmation of the research results. such as "Ayla could guide the activity" and "Ayla making suggestions or maybe visualizing the Yoga-Positions as well and giving tips on how to position your feet, knees or neck". Some of the feedback was categorized as *feature suggestions* that could be incorporated in the research and design process in further iterations.

Finally, with direct relation to the research question, the participants were asked "What would make you feel closer to Ayla?". The feedback from this question was categorized into Firstly, *Experience*, which grouped feedback targeted towards the overall experience. Secondly, *Avatar Appearance* that grouped feedback that relates to how the avatar looks like. Thirdly, *Voice* which has been emerging as a very important element that was unforeseen in the research, therefore requiring more investigation. Lastly, *Learning About the user,* this could be considered as validation to the importance of showing a past connection. As well as the AI's ability to learn about the user, in order for the user to feel related to the AI. This demonstrates as well that the AI should be able to show that they are continuously learning about the user. From the research results, this could be in the form of "Remembering my favorite yoga practices", "Once Ayla knows my routine, daily life activities and significant events and interact with me based on that, I might feel closer to it" and "Nice to hear Ayla reference things I've told her before".
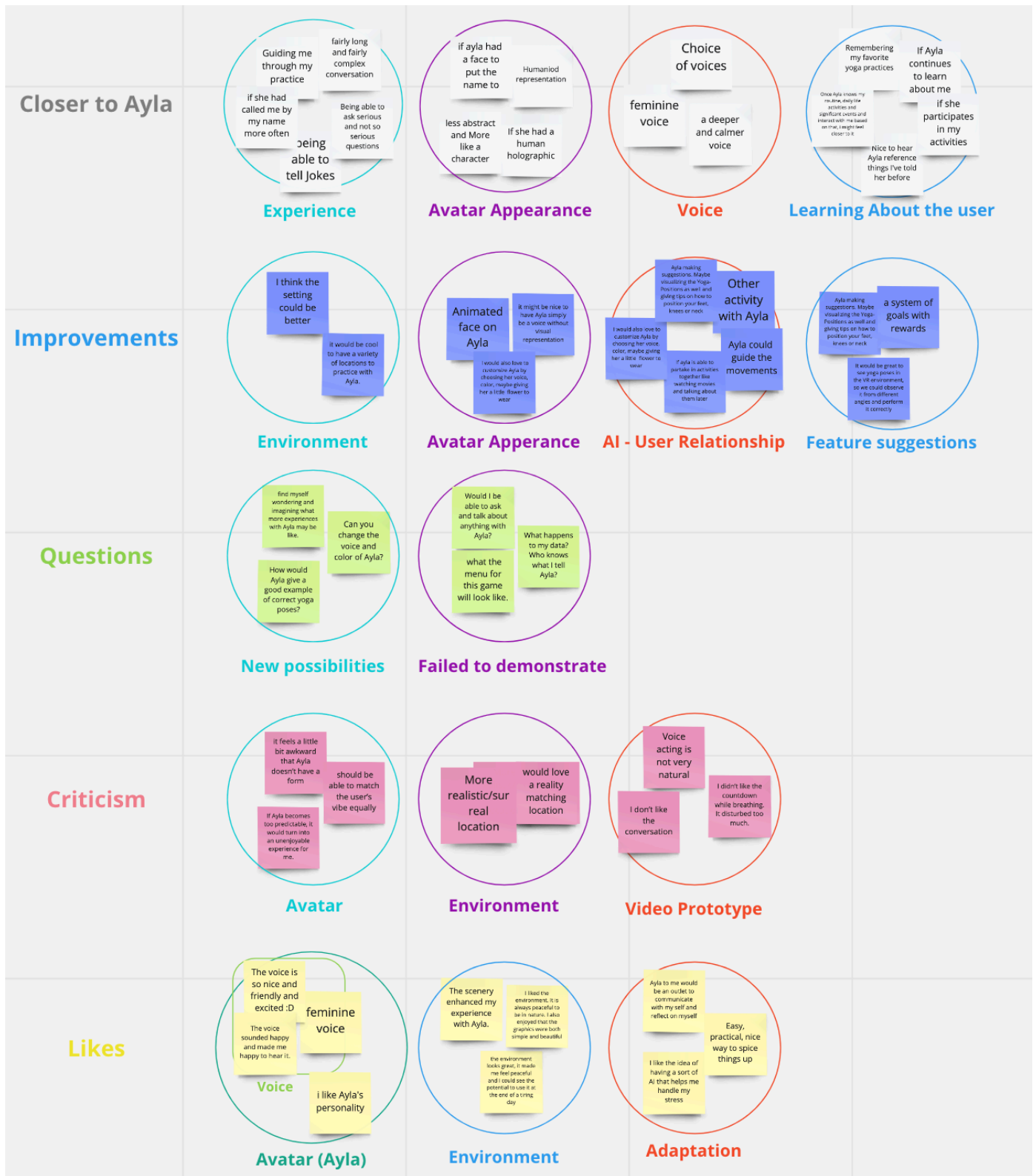
Closer to Ayla

Experience
- Guiding me through my practice
- fairly long and fairly complex conversation
- if she had called me by my name more often
- Being able to ask serious and not so serious questions
- being able to tell Jokes

Avatar Appearance
- if ayla had a face to put the name to
- Humaniod representation
- less abstract and More like a character
- If she had a human holographic

Voice
- Choice of voices
- feminine voice
- a deeper and calmer voice

Learning About the user
- Remembering my favorite yoga practices
- If Ayla continues to learn about me
- Once Ayla knows my routine, daily like activities and significant events and interest with me based on that, I might feel closer to it
- if she participates in my activities
- Nice to hear Ayla reference things I've told her before

Improvements

Environment
- I think the setting could be better
- It would be cool to have a variety of locations to practice with Ayla.

Avatar Apperance
- Animated face on Ayla
- it might be nice to have Ayla simply be a voice without visual representation
- I would also love to customize Ayla by choosing her voice, color, maybe giving her a little flower to wear

AI - User Relationship
- Ayla making suggestions. Maybe visualizing the Yoga-Positions as well and giving tips on how to position your feet, knees or neck
- Other activity with Ayla
- I would also love to customize Ayla by choosing her voice, color, maybe giving her a little flower to wear
- if ayla is able to partake in activities together like watching movies and talking about them later
- Ayla could guide the movements

Feature suggestions
- Ayla making suggestions. Maybe visualizing the Yoga-Positions as well and giving tips on how to position your feet, knees or neck
- a system of goals with rewards
- It would be great to see yoga poses in the VR environment, so we could observe it from different angles and perform it correctly

Questions

New possibilities
- find myself wondering and imagining what more experiences with Ayla may be like.
- Can you change the voice and color of Ayla?
- How would Ayla give a good example of correct yoga poses?

Failed to demonstrate
- Would I be able to ask and talk about anything with Ayla?
- What happens to my data? Who knows what I tell Ayla?
- what the menu for this game will look like.

Criticism

Avatar
- it feels a little bit awkward that Ayla doesn't have a form
- should be able to match the user's vibe equally
- If Ayla becomes too predictable, it would turn into an unenjoyable experience for me.

Environment
- More realistic/surreal location
- would love a reality matching location

Video Prototype
- Voice acting is not very natural
- I didn't like the countdown while breathing. It disturbed too much.
- I don't like the conversation

Likes

Avatar (Ayla)
- The voice is so nice and friendly and excited :D
- feminine voice
- The voice sounded happy and made me happy to hear it.
- Voice
- i like Ayla's personality

Environment
- The scenery enhanced my experience with Ayla.
- I liked the environment. It is always peaceful to be in nature. I also enjoyed that the graphics were both simple and beautiful
- the environment looks great, it made me feel peaceful and I could see the potential to use it at the end of a tiring day

Adaptation
- Ayla to me would be an outlet to communicate with my self and reflect on myself
- Easy, practical, nice way to spice things up
- I like the idea of having a sort of AI that helps me handle my stress

Figure 36 Video Prototype: Joyful Reaction

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6.3 Qualitative Results

The previously clustered results were further clustered down, to summarize and ease the sense making process of the results. Figure 37 demonstrates the clustered improvements. The feedback collected from the participants has been classified into improvements towards the *Video Prototype* and improvements towards the *Experience and Relatedness Model.* These improvements that could be integrated in the research in a further iteration are discussed below*.*

Improvements toward the Video Prototype

1. Learning about the user: it was shown as an important point in the research, that the AI should be able to learn about the user. Two steps are involved in this process, the AI should remember and make sense of what the user have told it. Afterwards, the AI should demonstrate that they know about the user and remember these details in the future. This could be done in various forms, such as simply mentioning it again. Therefore, this should be shown more clearly in the video prototype.

2. Relationship: The relationship between the AI and the user, is considered an important factor. From the research results, it was shown that the users prefer to have a relationship based on guidance and not tutoring. This should be incorporated in the video prototype in a better way, in which more details regarding the activity should be demonstrated.

3. Personality: In order for the participants to feel related to an AI, this AI needs to demonstrate a distinguishable personality. This personality could be shown on different levels; an important identified level is conversation. Personality is also connected to a new found element "Adaptability", where the AI's personality should to some degree match the user's personality.

Improvements toward the Experience and Relatedness Model

1. Security: Throughout the project, security was always a concern for many of the participants. Therefore, it is deemed as an essential factor in the relationship and interaction between users and the AI.

2. Customizability: On account of the diverse feedback received regarding the Avatar's appearance and voice. Customizability and the ability to choose the avatars appearance and voice, is considered an essential factor for the user to feel related to an AI. Although this requires further research to conclude a direct relationship.

3. Adaptability: The AI's ability to adapt and match a user's personality is a newly emerged factor that is worth investigation. Participants of the survey stated that the AI should be able to match their energy levels and adapt to how they are feeling. As well as being able to adapt to their favourite activities. This could be attributed to the random distribution of the survey, and that some of the survey participants were not interested in Mindfulness as an activity, that was used to contextualize the research.
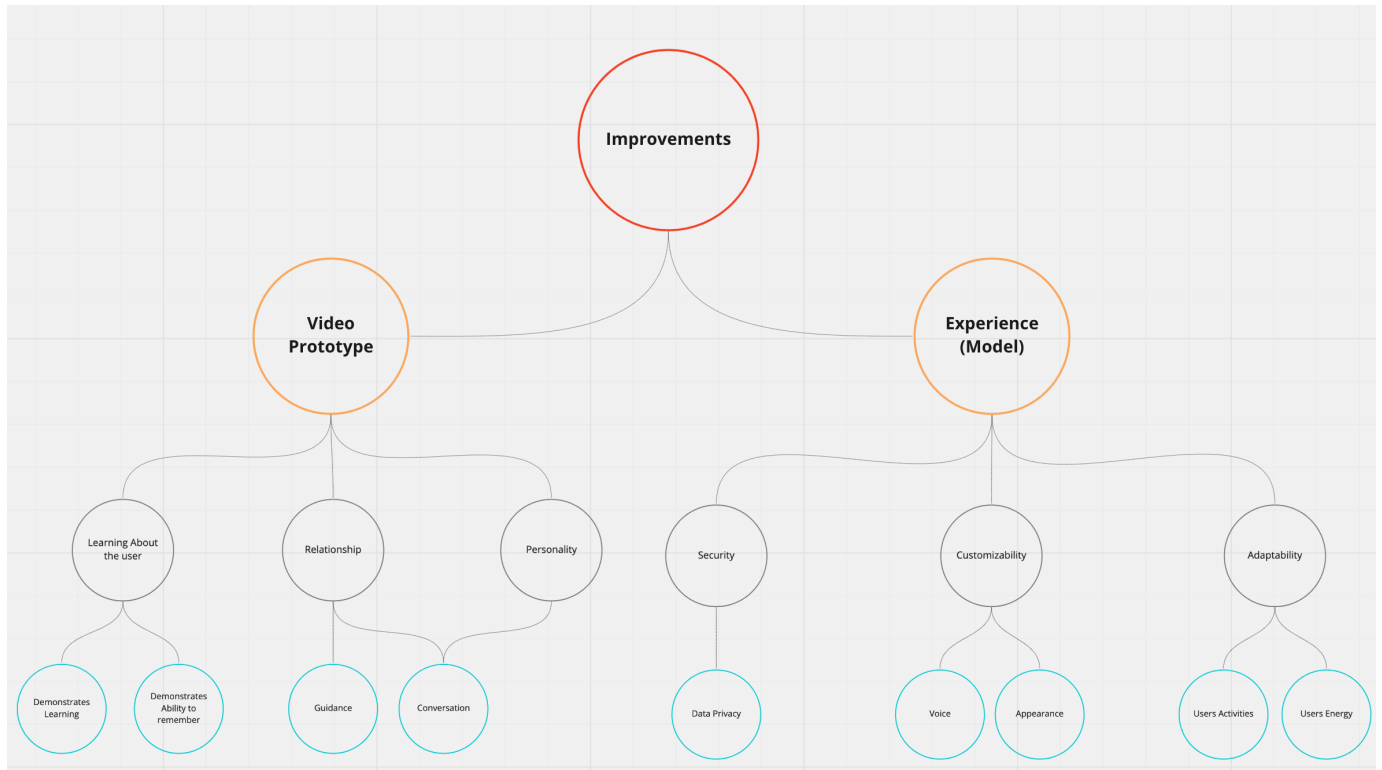
Figure 37 Improvements: Experience Model and Video Prototype

Conclusion of the Results

Overall from the qualitative and quantitative results a claim can be made towards the possibility for an AI to contribute to human needs fulfilment; Specifically, for a human to feel related to it. As described by the Positive and Negative Affect Schedule, high need fulfilment leads to a positive experience, which was clearly present in the results e.g. Attrakdiff results. There are several conclusions that could be drawn from the results. The human will feel related to an AI, when this AI is able to: Firstly, hold a conversation that progresses overtime in which the AI Is able to relate to the humans past, by remembering what it was told, and referring to it again in a conversation. Secondly, by being able to show empathy towards the human. Thirdly, having a personality that demonstrates growth and change. Fourthly, The AI needs to address the human need for security, such as when interacting with the AI in terms of data privacy, and what happens during the interaction. Fifthly, the AI should be customizable to the user's preferences in terms of voice and appearance. Finally, the AI should adapt and match the human in terms of mood, energy and activities.

7. Limitations and Conclusion

7.1 Limitations

Sample size

Limited sample size for the quantitative part of the survey, is contributed to the inability to offer incentive for participation. Therefore, recruitment of enough participants in time to represent the population was not possible. Furthermore, regarding the qualitative methodology used in this research. The ability to conduct the workshop in a physical presence format was critical. The online format hindered participation, some participants showed lack of interest or hesitation to participate, especially during the role playing activity.

Time Constraint

Some essential activities could not be performed because of time constraints, that were also affected by the pandemic. Such as a second iteration of the whole process, where a lot of feedback, improvements and questions emerged that could be incorporated, evaluated and addressed in a further iteration.

Pandemic Constraint

Because of the COVID-19 pandemic, a lot of the planned work could not be actualized, such as a follow up interview to the contextualized observation of the participants. The contact regulations affected the participatory design activities. These activities were already planned to take place in presence at the real context, but were changed to an online format. This definitely affected the nature of data being collected and therefore the research process as a whole.

7.2 Conclusion

This research aimed to investigate Artificial intelligence's (AI) ability to contribute to human needs fulfilment, with a focus on relatedness fulfilment between AI and humans. Based on the results of this research project, quantitative and qualitative evaluations, it can be concluded that humans can feel related to an AI. Humans can feel related to an AI when Firstly, it demonstrates a *believable personality* that can grow, *growth* can be shown through curiosity and ability to change. Secondly, the AI needs to be *empathetic* through the interaction by observing inflections and expressions and reacting empathetically. Thirdly, the experience needs to unfold *progressively*, in which the AI demonstrates its ability to remember and show a *past connection*. Finally, other factors that emerged through the evaluation, and will require further research are *security*, *customizability* and *adaptability.*

In addition to the AI's behaviour and design, the unfolding of the experience emerged as an important aspect for relatedness. The experience revolves around three phases an *initial conversation* before the activity. Followed by the *activity* and then a final '*reflection'* *conversation* about the experience. The conversations around the activity allow the participants to connect and experience the activity differently.

This paper contributes to the fields of wellbeing and Artificial Intelligence. Need fulfilment is the foundation of a positive experiences and wellbeing; and this paper provides a starting point or a framework towards designing relatedness as a need to be fulfilled with AI. These contributions are important to the field of interaction design; this field is concerned with the design of interactive systems. Therefore, this framework provides structural and behavioural design concerning interactions with AI from a wellbeing standpoint.

As for possible future work, especially with a focus on Human Computer Interaction, it is logical to investigate the factors that should be considered when designing an AI that can help fulfil other needs. With a focus on mindfulness in Virtual Reality, specifically, Yoga it

would be of interest to investigate how to better support this activity. An example could be the effects of a virtual world on proprioception (kinaesthesia) which is the sense of self movement and body position. Interoception which is the sense of the internal state of the body could also be of interest. These senses might be of value for this practice, consequently overall satisfaction, need fulfilment and wellbeing.

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9. List of figures

10. Appendix

Appendix A

Virtual Yoga

This work is part of a Masters Thesis Project at Universität Siegen,we would like to include you in the Design of a Virtual Reality Yoga Application, and understand your relationship with Yoga and Technology.

You will be answering this form anonymously and all the data collected will be strictly used within this study at the university, and thus are subject to data privacy laws at the University. for more information about data privacy concerning this project you can contact the researcher at:

yazan.aljaloudi@student.uni-siegen.de

Thank you for your participation!

Demographics

What is your gender?

Male

Female

Other

How old are you?

How long have you been practicing Yoga or Meditation for?

_____

_____

What is your main objective that you want to achieve doing Yoga?

_____

_____

When you are engaging in this Yoga / Meditation with others, do you feel like experiencing something new?

    Yes

    No

Have you ever participated in a group Yoga session?

    Yes

    No

Do you prefer to do Yoga in a group? and why?

_____

_____

What makes group Yoga special for you?

_____

_____

Have you ever tried to do Yoga online (Online Class / through Virtual Reality / etc...)?

_____

_____

Relationship to Artificial Intelligence

Do you use an Intelligent Assistant (like Siri/ Google Assistant/ Amazon Echo/ Nina/ SILVIA/ etc...)?

Yes

No

When Yes

How often do you use an intelligent assistant?

_____

_____

What do you like about intelligent assistants?

_____

_____

What do you wish intelligent assistants can do or be like?

_____

_____

What factors would make an intelligent assistant a good companion and possibly a friend to you?

_____

_____

When No

What concerns do you have about Intelligent Assistants?

_____

_____

Is there a reason behind not using an Intelligent Assistant?

_____

_____

Could you describe an intelligent Assistant you would use?

_____

_____

Imagine a Virtual Reality Experience

Imagine in the future you won't participate in a physical yoga class. You will put on a VR-Headset and dive deeply into a virtual world. Could you describe what the VR world would look like?

In this virtual world you won't find other human beings, and probably even yourself won't be a human being, what would you wish to look like?

Who would you wish to be in this virutal world with you? and what would they be or look like?

What would be a memorable VR experience that you would wanna have regularly?

What would make an artificial intelligence character make you feel related to it?

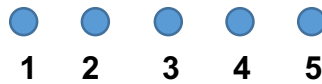During your regular Yoga Practice what problem do you encounter? or what do you wish you can do?

How strongly do you agree or disagree with the following statements

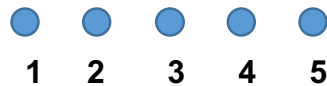When i practice Yoga with others i feel a sense of contact with people who care for me and i care for

I strongly disagree   ● ● ● ● ●   **I strongly agree**
                                  1 2 3 4 5

When i practice Yoga with others i feel close and connected with other people who are important to me

I strongly disagree   ● ● ● ● ●   **I strongly agree**
                                  1 2 3 4 5

When i practice Yoga i felt like i was becoming who i really am

I strongly disagree   ● ● ● ● ●   **I strongly agree**

                                  1 2 3 4 5
When i practice Yoga i feel a sense of deeper purpose

I strongly disagree   ● ● ● ● ●   **I strongly agree**
                                  1 2 3 4 5

When i practice Yoga with others i feel that i am experiencing new sensations and activities
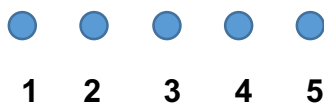
I strongly disagree   ● ● ● ● ●   **I strongly agree**
                                  1 2 3 4 5

When i practice Yoga i feel that my life is structured

I strongly disagree   ● ● ● ● ●   **I strongly agree**

                                  1 2 3 4 5
When i practice Yoga i feel that i have a comfortable set of routines and habits

I strongly disagree   ● ● ● ● ●   **I strongly agree**
                                  1 2 3 4 5

Confirmation

Hereby I confirm that I have composed the present thesis independently. I only used the sources and means specified in this thesis. Especially from the internet, I only have used the denoted references. I have taken note of the section in the examination regulations concerning attempts to cheat. I confirm that the electronic version of the thesis which I deliver is identical to the printed version with respect to the content. I agree that an electronic version of the thesis will be stored for purposes of inspection of plagiarism.

Date: 11.09.2021   Signature: _Yazan_