The Future Potential of Virtual Reality in Paramedic Care

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I. Introduction

The Virtual Reality Society (n.d.) states that healthcare is one of the biggest adopters of virtual reality technology. In the past decades, virtual reality has started to make a big appearance in healthcare, for both the patients and the healthcare professionals. It is currently already being widely used to help treat patients in the fields of psychology, physiotherapy, rehabilitation, dentistry, nursing and much more (Foley, 2016). It is also being used to educate and train healthcare professionals, as well as assisting them with better diagnosing, and medical procedures such as surgeries (Mantovani, Castelnuovo, Gaggioli & Riva, 2003).

Virtual reality is defined by the Virtual Reality Society (n.d.) as follows: "Virtual reality entails presenting our senses with a computer generated virtual environment that we can explore in some fashion". However, the term is widely used, and includes various types of virtual reality. In order to better understand the purpose and results of this research, it is important to be familiar with the terminology and to be able to differentiate between these different types of virtual reality technology. Milgram & Kishino (1994) have introduced the "reality-virtuality continuum", a spectrum that encompasses different degrees of mixed reality. Additionally, virtual reality can be either immersive or non-immersive. These classifications are summarised in figure 1.

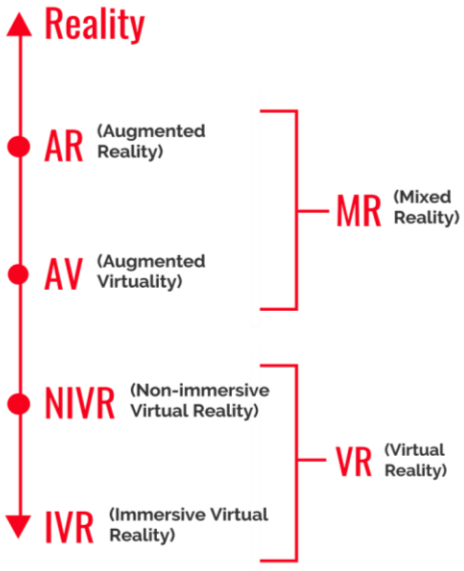

Figure 1: Types of virtual reality

Augmented reality and augmented virtuality are both forms of mixed reality, where physical and digital objects are combined and interact with each other. Augmented reality places digital objects in the world of reality (e.g. the Microsoft HoloLens), whereas augmented virtuality places physical objects, for example the user, in a virtual environment (e.g. flight simulations). Augmented virtuality is much less common than augmented reality. Virtual reality places the user in a completely digital environment, where no physical objects are part of the experience. This can either happen in an immersive way, or a non-immersive (or semi-immersive) way. Immersive VR completely fills the user's field-of-view (e.g. Oculus Rift), whereas non-immersive VR only fills a limited area of the user's field-of-view (e.g. Nintendo Wii). In this paper, the entire spectrum of virtual reality technology will be referred to as "MR/VR technology".

Many uses of virtual reality in healthcare have been proven effective, strongly implying the relevancy and promising future potential of this technology. For example, research has proven that virtual reality can help with conditions such as post-traumatic stress disorder (Difede & Hoffman, 2002), phantom limb pain (Murray et al., 2007) and autism (Papathomas & Goldschmidt, 2017). Also, the technology is already of good use in the paramedic field, by helping patients with phobias, e.g. kinesiophobia (Botella, Fernández-Álvarez, Guillén, García-Palacios & Baños, 2017), stress management (Shah et al., 2015), pain management (Jones, Moore & Choo, 2016), post-surgery rehabilitation (Gokeler et al., 2014) and neurological rehabilitation (Chen et al., 2016). However, there are also some perceived negative sides to virtual reality technology, mainly because of how relatively new the market is. For example, one study assessed the staff resources needed to implement virtual reality in physiotherapy for burn victims. The clinical staff described the needed training for using VR as burdensome. They also found there to be a lack of on-site technical support for equipment troubleshooting (Markus et al., 2009). Research also shows that in healthcare the implementation of technology from pilot to common practice is where problems often arise, such as a lack of trust from healthcare employees, a lack of funding or a lack of technological knowledge and skills from healthcare employees (ZonMw, 2013).

Krijgsman et al. (2013) perform a yearly eHealth monitor, which reveals that the use and development of technology in healthcare will increase fast in the near future, especially regarding labour saving technologies and technologies to help with self-management of patients. Birch Consultants (2015) predict that many technologies will shift from being assistive technology to labour replacing technology, specifically in the field of paramedic care. The Dutch government also predicts the impact of technology on healthcare to grow bigger than it has ever been in the past (RIVM, 2011). It is important to note that the development of this technology may happen at a much faster rate than is often estimated. Also, the development of big data and machine learning technology is expected to considerably speed up future technological development. Research shows that the rate of our technological progress is rapidly increasing (Kurzweil, 2010), in fact it seems to be exponential. This exponential growth often feels counterintuitive, putting us at risk of being confronted with the societal challenges that this technology brings when we are not yet prepared for them.

The European Commission (2014) recognizes the use of new and upcoming technologies in healthcare as one the *main* societal challenges to come for the European Union. There is reason to believe that MR/VR technology will be one of these technologies which will greatly impact healthcare. Goldman Sachs (2016) predicts healthcare to be one of the first next markets (after gaming) to be disrupted by virtual reality technology.

Overall, literature shows promising signs for the future of MR/VR in paramedic care as well as many threats and obstacles, in different fields (medical, technical, social, financial). However, there seems to be one clear consensus among these different studies and government reports. This consensus states that MR/VR, among many other technologies, will soon have enormous impact on every aspect of healthcare, including paramedic care. More research will be needed as the technology further develops. The purpose of this study was to acquire and analyse professional opinions from different experts in MR and VR technology. They were asked about their opinion on the future potential of this technology with respect to paramedic care, as well as the obstacles it appears to be facing. The study was concluded with certain themes, suggesting directions for future research, because in this rapidly changing environment it is important to focus future research efforts on the topics most relevant for paramedic care, to ensure time-efficient scientific progress.

II. METHODS

A. Study design

This study had a qualitative study design, due to its open and explorative nature. Participants were interviewed to acquire their professional opinions. The interviews were semi-structured, to let participants answer freely and to prevent suggestive questions as much as possible.

B. Participant recruitment

Participants were mainly recruited through the personal networks of the researcher. Otherwise relevant technology companies in the south of the Netherlands were all contacted. Participants were initially contacted through phone, or email when unavailable. When they were willing to participate, the information letter (Appendix A) and informed consent form (Appendix B) were sent and an appointment was made. The aim was to keep interviews going until saturation was reached, but with a maximum of 7 participants to prevent unrealistic workloads. Inclusion criteria was that the participants must be working on development of virtual reality technology. Preferably only participants with background knowledge in paramedic care were be included, however, this criteria turned out to be too specific, and so paramedic care was briefly explained during the introduction before every interview. The participants' demographics as well as their educational background can be found in Appendix D. It also includes the main activities of their workplace and their positions in these companies.

C. Data collection

The location of the interviews was determined together with the participant, finding a location that suited both the participant as well as the researcher. The interviews were all performed in Dutch. An interview schedule is included as Appendix C. This schedule contains topics based on the relevant literature and was also constantly adjusted to previous interviews. The interviews were recorded with a powered voice recorder, borrowed from the university library, so they could later be transcribed and analysed. The transcripts were also summarised and sent to the participants for a member check within 10 working days after the interview, to avoid misinterpretation and misrepresentation. After transcribing, the transcripts were made anonymous.

D. Interview topics

As mentioned in the introduction, literature reveals several opportunities as well as obstacles for using MR and VR in paramedic care. Due to the explorative nature of this study, the interviews started by openly asking about noteworthy examples from their own experiences. However certain topics, such as these opportunities and obstacles, were all asked about in the interviews. These are the following topics:

1) Evidence shows that people increasingly experience a loss of control over their data (Vayena & Blasimme, 2017), and so in the age of big data, privacy issues were one of the topics discussed in the interviews. The possibilities offered by blockchain technology was later added as topic, based on the first interviews.

2) Research shows that healthcare is becoming more patient-centered over time. With the increasing importance of self-management technologies, such as smarthomes in elderly care (Majumder et al., 2017), the participants were asked about the future potential of MR/VR becoming one of those assistive technologies.

An important part of smart-technologies assisting in self-management of patients is the Internet of Things, which refers to how all kinds of devices and objects equipped with sensors are connected to each other, exchanging data (Kumari, Lopez-Benitez, Lee, Kim & Minhas, 2017).

3) Certain other upcoming technologies prove to be promising, and will likely affect the development of all other fields of technology, including MR/VR. Participants were asked about how they think these technologies will influence the future of MR/VR in paramedic care. These technologies, with relevant literature, are as follows:

- Big data refers to large sets of data which can be analysed and used to make predictions about patients (Murphy, Castro & Mandl, 2017).
- Artificial intelligence is a field of computer science where intelligent machines can assist in the analysis of such complex big data (Krittanawong, 2017).
- Brain-computer interfaces are a field of technology where the brain is directly connected with an external device (Carelli et al., 2017).

4) Dascal et al., (2017) noted that many studies lack data about the current cost-effectiveness of implementing virtual reality in paramedic care. Participants were asked about their experiences with this, as well as how they think this will change in the future. The lack of technological knowledge and skills by paramedic professionals being a factor was specifically asked about.

5) Due to this accelerating rate of technological improvement (Kurzweil, 2010), it is important to put predictions on a timeline, as it seems to be unpredictable. Throughout the interviews, the participants were asked regularly to label their predictions with a certain year.

6) Milgram & Kishino's reality-virtuality continuum (1994) shows different types of MR/VR technology. Participants were asked which types they think have most potential for paramedic care, and why.

7) Research shows that social acceptance can be problematic during implementation of technology (Ahmadi, Mehrabi, Sheikhtaheri & Sadeghi, 2017). Participants were asked about their view on social implementation of MR/VR technology.

E. Data analysis

Once the transcripts were made anonymous, they were first analysed with open coding. During open coding, only topics which are of relevance to answering the research question were highlighted. This was the first selection, which was supposed to filter out everything irrelevant for the purpose of this research, however interesting it may be. Next, highlighted words and sentences were grouped together into relevant themes through axial coding. Certain themes were then grouped together into bigger themes, creating a certain hierarchy of topics based on recurrence. Topics which are mentioned most often were considered most important, as recurrence indicates consensus.

F. Ethical paragraph

To ensure privacy for the participants, the recordings and transcripts were permanently deleted when the study was completed. During the study, the audio recordings were deleted as soon as the participant had returned the member check. They have received this within 10 working days after the interview took place. Participants have also signed an informed consent form before the interview. A confidentiality statement was signed between the student and university. Participants also had the opportunity to ask any questions before signing and starting the interview.

III. RESULTS

After analysing the data, 27 main categories were found. These have been broadly divided into 3 different comprehensive themes: Technology, Policy and Future perspective. 'Technology' includes all aspects of different AR/VR technologies and how these will likely develop. 'Policy and ethics' is about the legal, financial and ethical consequences of these technologies, and 'Future perspective' aims to place all these ramifications in a more practical context. Quotes made by participants are placed throughout the text when relevant.

A. Technology

Technology typically gets smaller, faster and cheaper, which is a trend that will likely apply to MR/VR technology too. As this trend continues VR will become increasingly immersive, possibly to a point where it responds to biofeedback and neurofeedback. One participant predicts this to happen within the next 5 years. Participants also expect a type of Augmented Reality interface in the form of regular daily glasses to be developed, with predictions ranging from 7 to 10 years from now. Technology in the form of contact lenses is put from 5 to 13 years. Participants also predict development of technology in the form of brain implants with predictions ranging from 5 to 10 years. This will likely spark some ethical discussions though, due to its invasive nature. It is important to not underestimate how big MR/VR could potentially become, considering the fast rate of technological advancement. This could feel counterintuitive to people meeting it with conservatism and skepticism.

"VR technology is currently where the first Nokia 3310 was in mobile technology"

"In terms of relevance and skepticism, AR/VR is like how the internet was in the 90's"

As technological progress is being made, the price of these technologies typically decreases. However, as one participant pointed out, the societal demands are often increasing at the same time. This is also why, for example, smartphones have not really been getting cheaper over the past decade. The diversity in price range does increase as a result of this. Amongst participants there was some disagreement on whether cheaper MR/VR solutions on smartphones or high-end solutions on immersive systems are more promising.

MR/VR applications which are made to work on smartphones have the advantage of building on a bigger existing infrastructure, as more people own smartphones than MR/VR systems. A downside is that the technological possibilities in terms of interaction and feedback are much more limited. Technology will however continue to develop these possibilities.

During every interview it was mentioned that the development of MR/VR will be influenced a lot by other major emerging technologies. Examples include artificial intelligence, blockchain technology, quantum computing, 3D printing and robotics. It is therefore difficult to examine MR/VR as an isolated example. These technologies will complement each other, and in some ways merge with each other.

Some participants favoured Virtual Reality over Augmented Reality, and vice versa. However all participants agreed that it very much depends on what it is used for. As VR is able close you off from the real world and bring you to an entirely different environment, it was often mentioned to be more useful for training purposes, whereas AR is better for 'on the job' support by providing an extra layer to real life.

"For training purposes, VR can put you in an environment where it is safe to learn and still be incompetent"

VR is generally further than AR in terms of implementation as well as social acceptance, due to the fact that it has been hyped a lot more. Some participants stated that AR has big potential and a wider range of possibilities because it is more connected to real life, but VR is more specifically promising for paramedic care. Participants also agreed that the difference between VR and AR will blur and get smaller as next generation hardware will be developed, likely supporting both realities. Eventually participants predict technology to advance to a level where it will be indistinguishable from reality. Timeline predictions for this range from 5 to 20 years, often indicating brain implant technology to be critical for this.

"The difference between AR and VR is mostly in marketing and terminology. Technological differences are temporary"

B. Policy and ethics

When innovation is implemented very fast into sensitive parts of life such as healthcare, a lack of social acceptance of technology can cause progress to slow down. All participants agree that social acceptance is a slower process than technological progress, and a majority of participants think that this will ultimately be the factor that determines how fast we progress. Widespread social integration of MR/VR in paramedic care can be expected between 7 and 15 years, according to participants.

"The rate of progress will be as fast as the people accept it to be"

Several participants pointed out that MR/VR is currently still in the 'early adoption' phase for paramedic care, according to the diffusion of innovations theory (Rogers, 2005). It is key to make sure the added value of MR/VR in paramedic care is evident in order to gain widespread acceptance. When looking at the hype cycle of Gartner (n.d.), several participants estimated we are still in the 'peak of inflated expectations', which would mean that there is still a phase of disappointment ahead of us. This can best be explained with Amara's law (Ratcliffe, 2016): We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run. When we reach the disappointment, it is important to keep going and not give up on this innovative technology.

Three participants pointed out that financial resources are the more likely to be the limiting factor for progress. It is only possible to introduce MR/VR to the public when financially facilitated to work on innovation, which is not typically the case in paramedic care. One participant noted that more national - perhaps international - collaboration between institutions could greatly improve the cost efficiency of investing in MR/VR.

"The real problem is allocation of economic resources"

"Without the means, like a budget and an infrastructure to demonstrate, my ideas cannot develop into something more"

Emerging technologies such as MR/VR also pose some privacy and security risks in the field of paramedic care because a lot of user data will be produced. Big data is often utilized by bigger corporations for financial gain. Although most participants point out the ways in which big data can be used to improve paramedic care, they also acknowledge the importance of proceeding with caution.

"Whether technology is good or evil depends on the intentions of the people behind it"

A few participants pointed out the promising potential of blockchain technology being used for validation of data. It is important that patients have ownership over their own data, which a decentralised system through blockchain can provide. It also allows for more transparency in what happens to your data.

MR/VR has great potential to connect people, which could ultimately lead to a situation where patients do not physically visit paramedic professionals anymore due to practical and financial efficiency. This would then have to lead to a change of our healthcare system, as entirely new business models will emerge. In every interview it was mentioned how important appropriate policy is, whether it is financial, ethical or legislative. Participants agreed however that policy is usually behind on topical matters.

"Government policy is usually a little behind on these things"

C. Future perspective

The older generation of paramedics often lacks a certain needed technological background. This makes them less able to work with innovation and apply it in their jobs. A solution to this problem will come from two sides. On one side, multiple participants have noted willingness as well as initiative to learn coming from the paramedics. Their education level is high which is beneficial when learning and adapting. On the other side, developers are working on the usability of technologies such as MR/VR. By making the usability work more intuitively, less technological skills will be needed. These skills will come more natural to the new generations of paramedics, as they will likely grow up with innovations such as MR/VR.

"Technology is becoming increasingly more human-centered"

The increasing level of technology being integrated into paramedic care will ask for educational reform. It is important that students have basic competencies regarding technology, as well as the ability to apply new innovations in their jobs. Due to the rapidly changing labour market, it is also important that we focus on the individuality of students.

"We should prepare students for a very unpredictable labour market by focusing on their individual interests and their unique added value"

MR/VR technology offers a lot of potential for the self-management of patients. Several participants outlined a digital environment in Virtual Reality where patients could take the first steps in healthcare independently. With help of artificial intelligence the technology could make diagnosis and even help with standard treatment of basic pathologies. When this fails, it would refer the patient to the appropriate paramedic professional. The work of paramedics would become much more specialist by functioning as a first screening. This would however also require a change of our healthcare system, as new business models would emerge from this too.

"A digital environment could operate like referring practitioners, essentially cutting out the middleman"

As technology improves and helps patients with their self-management and independent healthcare, increasing amounts of tasks would be taken over. Artificial intelligence is also expected to provide a more human-like interaction. Most participants expect a situation where paramedics will become entirely obsolete to happen eventually, with predictions ranging from 20 to 50 years from now. However in the near future MR/VR will mostly just serve as a supportive tool along with other innovations.

"VR is a tool for healthcare, the paramedic gives value to that tool"

IV. Discussion

Investigating the future of MR/VR technology in healthcare has proven to be very complex than it appeared to be from literature. It is hard to isolate the development of only this technology as it is part of a larger innovation movement and its development will be influenced by other major emerging technologies. Additionally, the development of this technology is also influenced by complex matters mentioned in the "Policy and ethics" theme.

There are several matters on which all the participants agree. The first agreement being that the discussion on whether AR or VR has more potential seems to be less relevant than expected based on literature. Participants also agree that the technological progress will likely go faster than we can socially, ethically en legally keep up with. Literature shows that growth of technology is in many cases even exponential (Kurzweil, 2010). Another agreement between participants is the great potential that MR/VR has in providing patient-centered healthcare. The yearly eHealth monitor by Krijgsman et al. (2013) reveals a similar movement. It is also clear that innovation of this size is going to eventually require big changes in our healthcare system as well as our educational system. Eventually, as part of a bigger innovation wave, MR/VR will also contribute to the labour saving innovation movement. This is one of the reasons why the European Commission (2014) refers to the use of new and upcoming technologies as one the main societal challenges to face.

The most commonly mentioned limiting factor for progress is the social acceptance of the people. To improve this, it is key to prove the added value of MR/VR for paramedic care to people. In order to do this, paramedic institutions will need the financial resources to work with MR/VR, which is a policy matter.

Privacy issues, often related to big data, should be looked at from two sides. Sacrificing privacy also aids to improve the quality of the paramedic care we provide. Blockchain technology could potentially offer a way for decentralised transparent data validation. A study conducted by IBM (2016) reports 16% of healthcare institutions already using a form of blockchain validation.

Validity and reliability

Several issues have to be mentioned regarding the validity of this study. Due to its explorative purpose, the interviews were generally very widely oriented, with little opportunity to go into depth on certain topics. The complexity of these topics has made it very difficult to remain concise in the writing of the results. Also, because of the researcher's background in physiotherapy - which was mentioned during the introduction - the participants were often tempted to relate most questions to physiotherapy rather than paramedic care as a whole.

The population size was initially planned to be a minimum of 8, which was already relatively small, and reducing it to 7 has made the population even less likely to be representable. As the majority of participants are stakeholders at companies which benefit from hyping MR/VR technology, there could be a conflict of interest as they have reason to be more optimistic in their prediction. The same goes for the argument of Augmented Reality versus Virtual Reality, where one is likely biased to favour their own company's work field.

This study took place in the Netherlands, and all participants were native Dutch. The Netherlands performs above-average in the European benchmark of ICT use for eHealth purposes (European Commission, 2008). Especially the area of Eindhoven, where most interviews were done, is known for its innovative mindset. Therefore the participants are not entirely representative for experts worldwide. However, scientific bodies are mostly international, as is scientific consensus.

Another weakness would be the fact that the study was conducted in Dutch but written in English. To minimise misrepresentation due to translation, participants were asked to check the translations of their quotes in the member check. Also, at least one of the anonymised transcripts has been coded and analysed by a fellow researcher.

V. Conclusion

MR/VR technology - especially in combination with other emerging technologies - has great potential to revolutionise paramedic care, but as the impact grows, there will be several barriers that need to be overcome in terms of society, ethics, economics and policy. Due to this, the suggestions for future research is to focus on proving the added value of using MR/VR in paramedic care.

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APPENDIX A – INFORMATION LETTER

Dear Participants,

As a part of my study physiotherapy at Fontys University of Applied Sciences, I am conducting a final thesis in the area of technology and healthcare. Specifically, I will be interviewing experts who are working with virtual reality about their professional opinions regarding the future this technology. Participating in this study is completely voluntary. If you have any questions after reading this letter, please contact me. My contact details are mentioned at the bottom of this letter.

Purpose of this study
The purpose of this study is to gather professional opinions and future predictions from different experts working with virtual reality. These opinions will be compared, and certain recurring themes will be formulated. Based on these recurrences, recommendations on what to focus future research on will be presented. In a world where technology is rapidly advancing, this focus is of great importance.

What will happen
Participating in this study means that you will be interviewed by me. The questions which will be asked are centered around certain topics, which current literature shows to be relevant. Before the interview starts, you can also ask me any remaining questions before signing the informed consent form. The interview will take approximately 30-45 minutes, and will be recorded using a voice recorder. These recordings will later be transcribed and anonymously processed. After this, the voice recordings will be deleted. Within 5 working days you will then receive a summary of our interview, on which you can comment to prevent miscommunication and misrepresentation. At any point during this study, you can choose to retreat and stop your participation, without consequences.

Contact
In case you have any questions or feedback, feel free to contact me by phone at +31655937089 or by email at e.soetens@student.fontys.nl.

Thank you for showing interest in my thesis study.

Kind regards,
Esli Soetens

Informed consent participant

I volunteer to participate in a research project conducted by Esli Soetens from Fontys University of Applied Sciences. I understand that the project is designed to gather information about academic work. I will be one of approximately 8 people being interviewed for this research.

1. My participation in this project is voluntary. I understand that I will not be paid for my participation. I may withdraw and discontinue participation at any time without penalty.
2. The interview will last approximately 30-45 minutes. Notes will be written during the interview. An audio tape of the interview and subsequent dialogue will be made. If I don't want to be taped, I will not be able to participate in the study.
3. I understand that all information I provide for this study will be treated confidentially. The researcher will not identify me by name in any reports using information obtained from this interview, and that my confidentiality as a participant in this study will remain secure. This will be done by changing my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about. Subsequent uses of records and data will be subject to standard data use policies which protect the anonymity of individuals. I understand that disguised extracts from my interview may be quoted in this study.
4. I understand that signed consent forms and anonymised audio transcripts will be retained on the researcher's computer and the cloud service of Fontys University of Applied Sciences until this study is over. The original audio recordings will be deleted after I have received and returned the member check, which I will receive within 10 working days after the interview.
5. I understand that under freedom of information legislation I am entitled to access the information I have provided at any time while it is in storage as specified above. I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

Name	**Date**	**Place**	**Signature**
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Informed consent researcher

By signing this form, I confirm that I have properly and completely informed the participant about the abovementioned research. If any circumstances might change the participants consent during the research, I will contact the participant about this timely.

Name	**Date**	**Place**	**Signature**
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APPENDIX C – INTERVIEW SCHEDULE

Topics	Questions

Introduction	• Explanation interview
	  ○ Purpose of the study, duration, privacy rights, informed consent
	• Explanation paramedic care
	  ○ Medical professions besides doctor and dentist, such as physiotherapist, podiatrist, medical imaging specialist, speech therapist, occupational therapist, dietitian, etc.
	• Asking general information
	  ○ Age and nationality
	  ○ Education
	  ○ Profession
	  ○ Area of expertise
	• Answering questions from participant, if there are any

Open start	• How do you see the future potential of MR/VR in paramedic care?
Privacy and implementation	• Do you think privacy will play a big role as this technology further develops, and how? • Do you think Big Data will have a big role in this, and how? • How do you view the opportunities offered by blockchain technology? • What is your view on the current and future social acceptance of these technologies in paramedic care?
Other technologies	• How do you think artificial intelligence (AI) technology, possibly in combination with Big Data, will influence the future of MR/VR in paramedic care? • Do you think brain-computer interface technology will influence the future of MR/VR in paramedic care, and how?
Economics	• What is your view on the current and future cost-efficiency of implementing AR/VR in paramedic care? • Do you think the level of technological knowledge and skills of care professionals will play a role in this, and how?
Reality-virtuality continuum	• On the spectrum of different types of virtual reality (AR, AV, IVR and NIVR), where do you think is most future potential, and why?
Self-management	• We notice that healthcare is becoming more patient-centered. What opportunities/risks do you see in MR/VR as assistive technology for patient self-management? • Do you think the Internet of Things will influence this, and how?
Timeline	Throughout interview: • When do you predict/estimate we can expect such a development?

APPENDIX D – PARTICIPANT DATA

#	Age	Gender	Nationality	Education	Company	Position
1	45	M	Dutch	Innovation management + Design Academy	Web-based VR development	Founder / CEO
2	44	M	Dutch	Psychomotor therapist	Mental health institute	Project manager innovation E-lab
3	34	M	Dutch	Tax law and economics	Interactive VR development (B2B)	Founder / CEO
4	23	F	Dutch	International lifestyle studies	Augmented reality design	Concept design
5	50	F	Dutch	Documentary photography and film	Network of MR/VR companies	Founder / CEO
6	44	M	Dutch	Data science + innovation entrepreneurship	Tech startup accelerator program	Founder / CEO
7	39	M	Dutch	Business IT + MBA	Marketing and innovation agency	Immersive learning and development