D3.6: Qualitative research exploring public attitudes to human enhancement technologies

WP3 – Human Enhancement – ethical, legal and social analysis

Author	Kantar (Public Division)
	Qualteam@kantarpublic.com
Other contributors	Saskia Nagel, University of Twente
	Sean Jensen, University of Twente
	Sciences Po, University of Twente, Uppsala University, Helsinki Foundation for Human Rights, EUREC Office, University of Granada, Ionian University, Trilateral Research
Lead beneficiary	University of Twente

Due date	31 August 2019
Delivery date	31 August 2019
Type	Report
Dissemination level	PU = Public

Keywords	human enhancement technology, physical enhancement, cognitive enhancement, emotional enhancement, longevity enhancement, public opinion research; qualitative research

The SIENNA project – *Stakeholder-informed ethics for new technologies with high socio-economic and human rights impact* – has received funding under the European Union's H2020 research and innovation programme under grant agreement No 741716. Kantar Public was commissioned by the University of Twente on behalf of the SIENNA project to prepare the report.

Abstract

The SIENNA project – *Stakeholder-informed ethics for new technologies with high socio-economic and human rights impact* (website: http://www.sienna-project.eu/) – is a European Union (EU) funded project which is part of the Horizon 2020 research and innovation programme under grant agreement no. 786641. It deals with three emerging technology areas: human genomics, human enhancement, and artificial intelligence (AI) & robotics.

This report presents findings from qualitative research which involved a day-long workshop in five countries comprising three two-hour discussion sessions, with one session focused on human enhancement. The overarching aim of this qualitative research was to engage a range of citizens to consider issues raised by the three technology areas. The specific objectives for the human enhancement sessions were to briefly explore citizen views and concerns about the following types of enhancement: physical, cognitive, emotional and longevity enhancement.

Workshops were held in five countries: France, Germany, Poland, Greece, and Spain. Each workshop consisted of 50-53 participants (total n= 253) including a minimum of 10 participants from pre-specified vulnerable groups. This report outlines initial participant associations with the technologies and perceived benefits and concerns for their use and provides some very early insights into what mitigation measures citizens may want to see in place to address their concerns.

This qualitative research was conducted by a social research agency rather than academics. There are several important limitations to this research, which include referencing, methodological, sampling and analytical limitations. The results in this report should be read with reference to and in the context of these limitations. The results serve as indicative findings about public attitudes to this technology area and should be treated as a starting point for further academic research and analysis to build from. They should not be read in isolation and should be read with reference to the other reports that have been produced as part of the SIENNA project.

One of the main findings from the research was that participants did not understand that human enhancement technologies refer specifically to improving the capabilities of 'healthy' human beings beyond what is deemed 'normal'. Instead, they often combined references to health treatments and enhancement, seemingly not distinguishing between them. As such, across the four enhancement areas discussed, participants felt that the main benefits of new technologies revolved around healthcare and focused on clinical applications in their discussions. HET areas also raised various concerns, which can be grouped in two categories: individual concerns and societal concerns.

Document history

Version	Date	Description
V1	16 July 2016	First Draft
V1.1	25 July 2019	Comments
V2	02 August 2019	Second Draft
V3	29 August 2019	Final Version

Table of contents

Acknowledgement

The Kantar (Public Division) team would like to extend our thanks to the experts who gave their time to attend the workshops:

- Lisa Tambornino, Saskia Nagel, Philipp Hoevel (Germany)
- Bernard Reber, Roberto Gianni, Alexandra Soulier, Anaïs Rességuier (France)
- Zuzanna Warso, Emilia Niemiec, Konrad Siemaszko (Poland)
- Maria Bottis, Maria Papaioannou, Marilena Siahou, Martha Ioanna Stroumpou (Greece)
- Javier Valls Prieto, Ana Valverde, Oscar Huertas, and Patricia Saldaña (Spain)

This report was reviewed by Dr Jantina de Vries.

Executive summary

Overview of the research

The SIENNA project – *Stakeholder-informed ethics for new technologies with high socio-economic and human rights impact* – is a European Union (EU) funded project which is part of the Horizon 2020 research and innovation programme. It concerns three emerging technology areas: human genomics, human enhancement, and artificial intelligence (AI) & robotics. This report presents the findings from qualitative research exploring public attitudes to human enhancement.

The overarching aim of this qualitative research was to engage a range of citizens to begin to consider issues raised by the three technology areas. The primary research objectives were to:

- Obtain insights into awareness and understanding of the technologies and their applications
- Explore and improve understanding of citizens' views of the technology areas in general, and particular uses and applications
- Explore citizens' concerns about the three technologies (and specific applications) and how they would like these concerns to be addressed

The specific objectives for the human enhancement technologies (HET) sessions were to begin to explore citizen views and concerns about human enhancement technologies, including the following applications: physical enhancement, cognitive enhancement, emotional enhancement and longevity enhancement. The results serve as indicative findings about public attitudes to this technology area and should be treated as a starting point for further academic research and analysis to build from.

This qualitative research – which was conducted by a social research agency (rather than academics) to explore public attitudes to human enhancement – comprised of three two-hour discussion groups held as part of day long workshops in five countries. Qualitative research enables some discussion about complex, sensitive and/or contentious topics on which it is important to gain a public view. The workshops were a chance to introduce citizens to the technology areas and provide their initial responses to stimulus materials introducing the technology areas. Qualitative research does not aim or allow for statistical analyses; the data is neither representative nor generalizable and is not meant to be used to provide statistically significant results. The findings are one way to further understand why and how individuals perceive the technology areas, notably what concerns them about their development and use. The findings cannot be taken to be indicative of wider views within each country.

Full day qualitative workshops were held in five countries: France, Germany, Poland, Greece, and Spain. These countries were selected by the SIENNA consortium to represent different geographical regions, modes of socioeconomic development, and cultural, political & religious identity. Each workshop (lasting 8.5 hours) included three two-hour sessions, one covering each of the three technology areas. All workshops were held on a Saturday between 6th and 27th April 2019 and consisted of 50-53 participants (total n= 253 participants). Each workshop included a minimum of 10 participants from pre-specified vulnerable groups. Vulnerability, in this context, was defined as groups who might be at greater risk of disadvantage or of being adversely affected by the development and use of one or more of the three technology areas in their society. The vulnerability categories included the following: chronic health conditions; mental health conditions; genetic conditions; disabilities (including impairments to vision, hearing, mobility, breathing or dexterity and learning difficulties); those aged 70+; and immigrants (1st and 2nd generation). Some categories were more relevant to some technology areas than others.

Three to four members from the SIENNA consortium and their colleagues attended each of the workshops and were available to answer questions from participants during the discussions.

This research follows the more descriptive and interpretive traditions in qualitative research and is based on established qualitative analytical techniques used in social research agencies (rather than those typically used in academia). The analysis has focused on identifying key themes from within the accounts recorded by notetakers of the accounts provided by participants and should be understood within the limitations of the research and analysis context through which they were produced.

First, the report outlines the research design (chapters 1 and 2) and then presents the findings about participant response to the stimulus materials introducing the HET technologies. The discussion section presents key themes that emerged about public attitudes towards these human enhancement technologies.

Summary of limitations

There are several important limitations to this research which are outlined in Section 2.4, including referencing, methodological, sampling and analytical limitations. The results in this report should be read with reference to and in the context of these limitations. The results serve as indicative findings about public attitudes to this technology area and should be treated as a starting point for further academic research and analysis to build from. They should not be read in isolation and should be read with reference to the other reports that have been produced as part of the SIENNA project.

Most importantly, this project has been conducted by a social research agency and not academic researchers. This therefore limits the degree to which the research conforms with academic analysis and writing approaches and has not been referenced to the extent that would be expected in academic publications. It lacks introduction and discussion sections which contextualize the results with relevant academic literature to further understand the meaning of the results for the field.

This qualitative research involved a day-long workshop in each country comprising three two-hour discussion sessions, with one session focused on human enhancement. It was not possible within the time and budget constraints to conduct discussions to the point of saturation, as might be expected in some types of academic research. The limited length of the discussion sessions also means that this exercise cannot claim to have uncovered 'in depth' views of the public, but rather associations and initial responses to introductory materials about the three technology areas. Further to this, it is important to recognise that the results presented here can only be understood within the context of the stimulus materials that were presented to the participants. Furthermore, the project originally sought to understand public attitudes towards and concerns about the three technology areas and how citizens wanted to see their concerns mitigated. The discussions about mitigation were restricted to a limited amount of time and the presentation of these results should be viewed as limited and as an indication of participant views – they should not be used to inform decision-making about regulation of these technologies but rather a starting point for further research to build upon.

Small (qualitative) sample sizes mean the workshops were not representative of the local population and cannot be taken to be indicative of wider views within each country. Where references are made to views in countries in this report, this should be understood as references to the views expressed in the workshop in that country. Qualitative research does not aim or allow for statistical analyses; the data is neither representative nor generalizable and are not meant to be used to provide statistically significant results. Considering the data as such would be an invalid and misleading representation of qualitative data.

This report makes references to results that were obtained from pre and post event questionnaires completed by the participants. We note that these should be read with caution. The questionnaires were conducted as a workshop activity and should not be interpreted or treated as a robust survey methodology as this is not what they were intended to be. This project was not conceived or designed to investigate whether and how views about these technologies change, which would not be possible through this methodological approach, and the questionnaire results should be approached accordingly.

Finally, this report should also be read within the context of the limitations in which the analysis was conducted – namely time and budget restrictions. The analysis has been conducted to the standard that was possible within these constraints but may not meet with academic expectations for qualitative research analysis. Again, we reiterate that it should therefore be treated as a starting point for further analysis.

Summary of findings

A key finding was that participants did not understand that human enhancement technologies refer specifically to improving the capabilities of 'healthy' human beings beyond what is deemed 'normal'. Instead, they often combined references to health treatments and enhancement, seemingly not distinguishing between them. They chose to focus on and prioritise clinical applications in their discussions. It is important to read the findings in this report within this context.

Overall, top of mind awareness and understanding of the HET areas discussed was low. Participants were more aware of physical enhancement, possibly because they were more familiar with some of its applications such as performance enhancing drugs, cosmetic surgery and prosthetics – many participants had either used, heard of, or read about these in the media. Participants struggled to understand how other applications would work in practice. This feeling persisted in most cases despite reading through the stimulus material and examples.

Across the four enhancement areas discussed, participants felt that the main benefits of new technologies revolved around healthcare. The technologies were deemed more positive when they helped repair or improve people who suffer from severe illness or disability, whether physical or psychological – and would therefore be considered treatment rather than enhancement. Across the four enhancement areas, physical enhancement was deemed to be most beneficial due to the ability to "repair" people through use of prosthetics, implants or surgery. For the other technology areas, health benefits were acknowledged, but were outweighed by the number of concerns that people had. Overall, it was felt that enhancement technology should only be used if there is a medical need for it – and therefore when they were used as treatment, rather than for their original purpose of improving the capabilities of 'healthy' human beings. Generally, participants did not seem to consider enhancement to be acceptable. As such, the benefits of HET were only perceived outside of the definition of the term – when used for treatment other than improving the capabilities of otherwise 'healthy' human beings.

HET areas raised various concerns. While some differed between technology areas, the main concerns were common across physical, cognitive, emotional and longevity. These can be grouped in two categories: individual and societal concerns.

Individual concerns:

Individual concerns can be grouped into two categories: physical and psychological.

- Physical risks: across all four HET areas participants were concerned about the impact that applications, and especially invasive applications, could have on individuals. They were particularly

concerned about unanticipated side effects and long-term effects, pointing out that in most instances the applications have either been recently developed or are currently being developed, and that as such it is impossible to know their full impact and all possible risks associated with them.

- Psychological risk: participants commonly feared that people would become dependent on these technologies, and that this will create addiction. There was concern that using technology to enhance oneself would lead people on a never-ending search for perfection. There was an associated concern that people would come to rely on technology for their well-being and sense of self-worth. This could in turn have a negative impact on their health.

Societal concerns:

A range of concerns were raised about the impact that HET areas could have on society:

- Unequal access: there was concern about access to HET. Participants were worried that only the wealthy would be able to afford the technologies, and this would give already powerful individuals increased means of control over peers. Participants were also concerned about the impact that HET could have on fairness within society. They were worried about some people being given unfair advantage over others, and that this would increase competition between people – in turn increasing dependency and usage of the technologies. Linked to that, participants were concerned that individuals who refuse to use technology or cannot afford to use it will be discriminated against.
- Creation of a 'superhuman' race: there was concern about society becoming more artificial and homogeneous, with everyone looking, performing and behaving in the same way. As such, participants were concerned about creating a world where the 'self' is lost, where individuality is controlled by technology which makes you act or feel a certain way based on norms subjectively created by whoever will have the power to decide how people should feel, how they should perform, what they should look like, and how long they should live for.

Overall, due to the risks associated with HET, participants felt that use must be voluntary and that people should be fully informed about possible risks – both short and long-term. For all invasive applications (those that enter the body), it was discussed that these should be authorised by medical professionals and done where there is medical need. For non-invasive applications, such as night vision goggles or exoskeleton, medical supervision was not deemed necessary. Due to the potential risks, participants also felt that use on children should be strictly limited to severe medical cases, and that use should be authorised by parents as well as medical professionals.

For all HET areas, regulation was thought to be necessary. Although participants were not sure what this should look like beyond the creation of an independent committee made up of various experts and parties to ensure that all views are considered in the development of this regulation. Overall, participants felt that regulation should be strictest for invasive applications, such as drugs and devices that enter the body, to limit the risk of abuse and subsequent detrimental health impacts.

List of tables

List of acronyms/abbreviations

Abbreviation	Explanation
Cognitive enhancement	Cognitive human enhancement technology
Emotional enhancement	Emotional human enhancement technology
EU	European Union
HET	Human enhancement technology
Longevity enhancement	Longevity human enhancement technology
Physical enhancement	Physical human enhancement technology

Table 1: List of acronyms/abbreviations

Glossary of terms

Term	Explanation
Human enhancement technology	A modification aimed at improving human performance and brought about by science-based and/or technology-based interventions in or on the human body.
Physical enhancement technology	Interventions that improve or give people new bodily abilities or characteristics.
Cognitive enhancement technology	Interventions to improve people's ability to get and process knowledge.
Emotional enhancement technology	Interventions that improve and / or provide greater control over emotions and behaviour.
Longevity enhancement technology	Interventions that increase the length of a person's life or delay deterioration of the body and mind
Invasive applications	Procedures, products or applications that require intervening upon one's body in some way for use, such as via surgery (thus literally harming one's skin) or pills/injections (thus that enter and directly interact with the processes that occur within one's body).
Exoskeleton	A full-body mechanical device that allows an individual to potentially carry greater weights, run faster, reduce fatigue and have more strength. May or may not utilize artificial intelligence depending on the device.
Vulnerable group / individuals	In the context of the workshops, vulnerable groups or individuals comprised those who might be at greater risk of disadvantage or of being adversely affected by the development and use of one or more of the three technology areas in their society. The vulnerability categories included the following: chronic health conditions; mental health conditions; genetic conditions; disabilities (including impairments to vision, hearing, mobility, breathing or dexterity and

	learning difficulties); those aged 70+; and immigrants (1st and 2nd generation).

Table 2: Glossary of terms

1. Introduction

1.1 Introduction to SIENNA

The SIENNA project – *Stakeholder-informed ethics for new technologies with high socio-economic and human rights impact* – is a European Union (EU) funded project which is part of the Horizon 2020 research and innovation programme (grant agreement No 741716). It concerns three emerging technology areas: human genomics, human enhancement, and artificial intelligence (AI) & robotics.

These technology areas may offer benefits for both individuals and society - but also raise ethical challenges. SIENNA will address the ethical, legal and social issues (ELSI) covering these rapidly emerging technological fields and in particular the areas that may become more relevant to the publics' lives. It is therefore important and timely to develop ethical frameworks that will try to address both current and future ELSI.

The University of Twente (UT) leads a consortium of 11 international partners for this work. The project includes the following for each technology area: (1) review of the state of art; (2) analysis of legal and human rights issues; (3) a survey of normative documents; (4) ethical assessment; five surveys of citizens in 11 countries; (6) workshops in five countries; and (7) the proposal of an ethical framework. This work will then be used to contribute to suggestions for enhancement of current ethical and legal frameworks in each technology area as well as propose codes of conducts for stakeholders and offer additional guidance for research ethics committees.

A key feature of the SIENNA project is that stakeholders, including the general public, will be engaged throughout the project. Kantar (Public Division) was commissioned to conduct public opinion surveys and qualitative research to assess public awareness, understanding and perceptions of the three technology areas. This report presents the findings from the workshop discussions about human enhancement technology (HET).

Further information about SIENNA project can be found on the SIENNA project website: http://www.sienna-project.eu/.

1.2 Aims of the citizens workshops

The overarching aim of the qualitative research was to engage a range of citizens to begin to consider issues raised by the three technology areas. The primary research objectives were to:

- Explore citizens' views of the technology areas in general, particular uses and applications
- Explore citizens' concerns about the three technologies (and specific applications) and how they would like these concerns to be addressed

More specific secondary research objectives were used to structure the sessions and to try to achieve a level of consistency across the technology areas, whilst still allowing for divergence and flexibility as required by the area leads and their priorities. They were to explore:

- Awareness of the technology area and sources of awareness
- Feelings about the use of the technology
- Associations with and levels of understandings of the technology area
- Benefits, hopes and aspirations for the technology
- Risks and concerns about the technology – and what was driving these concerns
- Whether there should be a limit to use of the technology

- How citizens would like to see their concerns mitigated and who is seen to be responsible for the mitigation of public concerns
- Overall level of acceptability of / comfort with the development and use of the technology.

The specific objectives for the human enhancement technology sessions were to briefly explore citizen views and concerns about the following applications: physical enhancement, cognitive enhancement, emotional enhancement and longevity enhancement.

The results serve as indicative findings about public attitudes to this technology area and should be treated as a starting point for further academic research and analysis to build from. They should not be read in isolation and should be read with reference to the other reports that have been produced as part of the SIENNA project.

2. Methodology

2.1 Research design

2.1.1 Qualitative research: full day workshops comprising three two-hour discussion sessions (one of which focused on human enhancement technologies)

Qualitative research was conducted by a social research agency (rather than academics) to explore public attitudes to human enhancement technologies (HET). The research comprised three two-hour discussion groups which were held as part of day long workshops in five countries. Qualitative research of this nature at Kantar is primarily informed by the approach to research described in Ritchie and Lewis (2003)[1]. Full day workshops were held in five countries: France, Germany, Poland, Greece, and Spain (listed in the order the workshops were held). Each day (8.5 hours) included an introductory plenary session and three two-hour sessions, one covering each of the three technology areas (these were rotated as shown in Table 3 below). All workshops were held on a Saturday between 6th and 27th April 2019 and consisted of 50-53 participants (total n= 253 participants).

Qualitative research of this nature enables some discussion about complex, sensitive and/or contentious topics on which it is important to gain a public view. The workshops were a chance to introduce citizens to the technology areas and provide their initial responses to stimulus materials introducing the technology areas. The workshops gave members of the public the opportunity to begin to consider issues and express opinions on topics of interest. The limited length of the discussion sessions means that this exercise cannot claim to have uncovered 'in depth' views of the public, but rather associations and initial responses to introductory materials about the three technology areas. In-depth exploration of the topic was also limited by the consortium's preference to ask participants to explore multiple examples of each type of technology, rather than a more focused selection for deeper discussion.

The qualitative research performed herein used purposive sampling. Quotas were set with the aim of including a broad range of demographics and the likely diversity of views in each of the five countries. However, we note that we cannot be sure this is the case or that the variables chosen constitute all of those that may be relevant to informing views about these technologies. Small (qualitative) sample sizes mean the workshops were not representative of the local population and cannot be taken to be indicative of wider views within each country. Where references are made to views in countries in this report, this should be understood as references to the views expressed in the workshop in that country. Qualitative research does not aim or allow for statistical analyses; the data is neither representative nor generalizable and are not meant to be used to provide statistically significant results. Considering the data as such would be an invalid and misleading representation of qualitative data. The findings should be taken as one way to further understand why and how individuals perceive the technology areas and their uses, notably what concerns them about their development and use in their societies. Whilst the workshops enabled more detailed

[1] Ritchie, Jane., and Jane Lewis, *Qualitive Research Practice: A Guide for Social Science Students and Researchers*, Sage, London, 2003

discussions than a survey, the depth of insight is limited due to the short time available to discuss three complex topics (120 minute per topic, with all three topics done in one day) with a wide range of examples and applications included in each session. It should also be kept in mind, that while moderators who led the discussions were prepared for this task through a telephone briefing by the central research team, they were researchers from a social research agency and not experts in the technology areas, nor in the ethical, legal or social issues of the technology areas. Furthermore, group dynamic issues should be considered, such as some people feeling less able to express unpopular opinions in a group situation. Further detail about the limitations of this methodological approach are detailed in Section 2.4.

2.1.2 Description of the workshops

Here we offer a general description of all workshops and the way in which they were conducted. This is then followed in 2.1.3 by the specific details of the process for HET.

The five day-long workshops were held in Paris, Hamburg, Warsaw, Athens, and Madrid and were conducted in French, German, Polish, Greek and Spanish, respectively. The workshops in Paris and Hamburg were held on Saturday 6 April 2019, followed by Warsaw and Athens on Saturday 13 April, and Madrid on Saturday 27 April. The topic guide for the workshops, outlining the structure of the day and the topics for discussion posed, can be found in Appendix 1. Three to four SIENNA members with knowledge of, or expertise, in philosophy, (bio)ethics, law, or one of the three technology areas attended each of the workshops to observe or participate in the discussion (their role is outlined in detail below). Their names, affiliations, status, and which workshop they attended is provided in Appendix 2.

The design, topic guide, and stimulus materials for the workshops were developed by Kantar, with assistance from experts in the technology areas from the consortium. The overall design and structure of the day was reviewed and agreed by the consortium in Autumn 2018. In Spring 2019, the consortium experts informed Kantar what topics they wanted each discussion session to focus on and provided examples and applications for each technology area to be used as tangible examples for the participants. Kantar then developed the detailed topic guide (Appendix 1), which was reviewed at least twice by the consortium experts for each topic area. Kantar also developed the stimulus materials which were reviewed at least twice and signed off by the consortium, to ensure that the materials were accurate, up to date and balanced. There was not sufficient time available to cognitively tests the stimulus materials for the public to ensure their accessibility, which is a limitation of the design. The topic guide and stimulus materials were translated into the languages in which the workshops were held by the Kantar Brussels' translation unit. The translations were reviewed and signed off by members of the consortium. We note that the HET stimulus materials did not include an introductory definition explicitly differentiating the technologies from clinical and therapeutic uses and that this is a limitation of the research.

Each workshop followed the same format: an initial plenary session involving all 50-53 participants and then break out groups comprised of 10-11 participants. Before the workshop began, participants were asked to complete a short pre-task activity to explore hopes and concerns about technology more generally and a short two question questionnaire to ascertain familiarity with the technologies and feelings about them. After the workshop, a short two question follow up activity was conducted to see how they then felt about the technology area (Appendix 3). The questionnaire responses are provided in Appendix 3. We note that the findings from the questionnaires in this report should be read with caution. The questionnaires were conducted as a workshop activity and should not be interpreted or treated as a robust survey methodology as this is not what they were intended to be. Participants were asked to answer two questions before and after the workshop, to give an indicative suggestion as to whether and how views might have shifted about the technologies during the workshop. This project was not conceived or designed to investigate whether

and how views about these technologies change, which would not be possible through this methodological approach, and the questionnaire results should be approached accordingly.

The 20-minute introductory plenary session involved a presentation from the lead moderator from Kantar and informed participants about the SIENNA project, purpose of the research, aims of the workshops, and the structure of the day. Participants were then organised into moderated break out groups to encourage more in-depth discussions and to try to enable all participants to participate and contribute their views. Participants were randomly allocated to break out groups to try to achieve a mix of demographics in each group as this encourages exchange between participants with different perspectives or experiences. This was done through the distribution of coloured stickers at registration.

The workshop then consisted of three two-hour sessions, one for each of the technology areas. Division of workshops into three sessions facilitated somewhat more focused discussions on each topic as well as ensured even distribution of time across the technology. Each break out group was led by a Kantar moderator experienced in conducting qualitative research for a social research agency (we note they were not academic researchers nor did they have expertise in the topic area). The role of these moderators was to set the parameters for the discussion, to strive for an open and respectful exchange of views that everyone felt able to contribute to as far as possible, and that the flow of the discussion remained relevant and covered the agreed topics as much as possible. An agreed topic guide was used to – as far as possible - facilitate consistent coverage of topics and framing of questions across the five countries (Appendix 1). The order of the technology areas was rotated across the countries, to counter any ordering effects and ensure each technology area had the opportunity to be the first discussed.

Rotation of technology areas across the workshops

	Paris 6 April 2019	**Hamburg 6 April 2019**	**Athens 13 April 2019**	**Warsaw 13 April 2019**	**Madrid 27 April 2019**
ORDER OF SESSIONS					
SESSION 1 (2 hours)	Enhancement	AI & robots	AI & robots	Genomics	Enhancement
SESSION 2 (2 hours)	Genomics	Enhancement	Enhancement	AI & robots	Genomics
SESSION 3 (2 hours)	AI & robots	Genomics	Genomics	Enhancement	AI & robots

Table 3: Rotation of technology areas across the workshops

Although the exact structure of the 2-hour sessions for each technology area varied according to the priorities identified by each work package leader, all sessions covered awareness and associations and understandings of the technology area, as well as some discussion about how to mediate and mitigate any citizen concerns raised where time allowed. It is important to note that mitigation was not covered for all topics by all break out groups due to time constraints. Basic information was introduced to inform the discussion, followed by some limited further materials on the tangible applications and benefits, risks and ethical issues associated with the specific subjects outlined by work package leaders for each technology area (see Appendices 1 and 4). The materials were in the format of paper handouts. They were read through by the participants with the assistance of their moderator if required. The handouts were translated into the language in which the workshop was being conducted. There was not sufficient time in the project timeline to cognitively test these

materials before they were used, which is a limitation of the approach. However, in addition to this guide, discussions were always led by the priorities, interests and concerns of the participants.

The day closed with a short reflective plenary session, bringing all the participants together to reflect on how their views had developed over the course of the day. This also provided the SIENNA members present the opportunity to pose any final questions they had to the participants and allowed the participants to ask questions.

A small number of changes were made to the guide based on experiences at the first two workshops in Paris and Hamburg to help the smooth flow of the further events. This included increasing the amount of introductory time in the break out groups to maximise the opportunity to establish rapport before the first session began and a reduction in length of the final plenary session, which was felt to be less productive at the end of lengthy day for participants. No changes were made to the stimulus materials due to lack of time to have these translated.

2.1.3 Description of the human enhancement session

The human enhancement technology (HET) session explored views about and concerns with the development of four areas, although only physical and cognitive enhancement were discussed in all five countries whereas the other topics were rotated across the countries as outlined below:

1. **Physical enhancement technology**, that is to say interventions that improve or give people new physical abilities or characteristics.
2. **Cognitive enhancement technology**, that is to say interventions to improve people's ability to get and process knowledge.
3. **Emotional enhancement technology**, that is to say interventions that improve and / or provide greater control over emotions and behaviour.
4. **Longevity enhancement technology**, that is to say interventions that increase the length of a person's life or delay deterioration of the body and mind.

The full topic guide and stimulus materials can be found in Appendices 4 and 5. The tables below provide an outline summary of the structure of the session to show what topics were discussed.

Table 4: Structure and general content of the HET session

1. **Physical enhancement technology** – France, Germany, Greece, Poland, Spain

	Timing	Name of stimulus used
Awareness Awareness and associations Sources of awareness	5 mins	
Views on physical enhancement technology Feelings about the development and use of the technology • Athletic enhancement • Cosmetic enhancement • For therapeutic use Most and least acceptable examples Concerns and benefits Availability	15 min	PHYS STIM
Physical enhancement	5 min	PHYS STIM

Types of physical enhancement most and least comfortable with Circumstances most and least comfortable with physical enhancements being used Availability and restrictions		
Prosthetics and wearables Types of prosthetics and wearables most and least comfortable with Circumstances most and least comfortable with prosthetics and wearables being used Availability and restrictions	5 mins	PHYS STIM

2. **Cognitive enhancement technology** – France, Germany, Greece, Poland, Spain

	Timing	Name of stimulus used
Awareness Awareness and associations Sources of awareness	5 mins	
Views on cognitive enhancement technology Feelings about the development and use of the technology Most and least acceptable examples Concerns and benefits	15 min	COG STIM
Acceptability of use depending on location Acceptability of use in schools Acceptability of use in the workplace	5 min	COG STIM
Implication on society Feelings about the impact of cognitive enhancement technology on fairness and societal interrelations	5 mins	COG STIM

3. **Emotional enhancement technology** – France, Germany, Greece

	Timing	Name of stimulus used
Awareness Awareness and associations Sources of awareness	5 mins	
Views on emotional enhancement technology Feelings about the development and use of the technology Most and least acceptable examples Concerns and benefits Acceptability of use	15 min	EMOT STIM
Psycho-pharmaceuticals Acceptability of use Concerns	5 min	EMOT STIM
Acceptability of use depending on location Acceptability of use in schools Acceptability of use in the workplace	5 mins	EMOT STIM

4. **Longevity enhancement technology** – Poland, Spain

	Timing	Name of stimulus used
Awareness Awareness and associations Sources of awareness	5 mins	
Views on emotional enhancement technology Feelings about the development and use of the technology Most and least acceptable examples Concerns and benefits Acceptability of use	15 min	LONG STIM
Implication on society Perceived application in society Impact on fairness, equality and solidarity in society Impact on increasing the size of the elderly population	10 min	LONG STIM

Table 4: Structure and general content of the HET session

2.1.4 Role of SIENNA consortium members in the workshops

Three to four members from the SIENNA consortium and their colleagues attended each of the workshops. Not all were experts in the ethics of the technology areas, but each had a degree of knowledge and/or expertise in at least one of the following areas: law, political science, philosophy, bioethics or the technology area. All ranged in experience from doctoral students to professors.

All SIENNA consortium members were provided with a written and telephone briefing before the workshops to ensure they were informed of best practice at the workshops. They were given the opportunity to contribute to a one-hour telephone de-brief sessions afterwards with the Kantar research teams which gave the chance for them to talk about their main take-aways from the workshop. The full list of expert attendees and their affiliations can be found in Appendix 2.

The purpose of their attendance was to enable participants to ask questions and for them to provide accurate, up to date, and balanced information as far as possible. Whilst they sat with the break out groups, there was a limit to how much participants could engage with them due to time restrictions during the workshops due to the amount of material to be covered. However, participants were able to interact with the experts during the breaks, ask questions at the break out tables, and ask any outstanding questions in the final plenary session.

2.1.5 Ethics and data protection

Kantar Public Division adheres to the following standards and industry requirements: Market Research Society (MRS) and ESOMAR (the global voice of the data, research and insights community) professional codes of conduct, ISO 20252 international market research quality standard, ISO 9001 international standard for quality management systems and the Data Protection Act 2018. Ethics approval was not required by Kantar for this research in any of the five countries where the workshops were conducted, but the MRS and

code of conduct was followed which provides ethical guidelines for the industry[2]. Furthermore, the coordinating university, University of Twente, obtained ethics approval from the SIENNA project.

Participants took part voluntarily and provided informed consent for participation; this was ascertained through a recruitment screener which informed participants about the SIENNA project, the project commissioner for the research, aims and purpose of the research, how data would be used, and what participation would involve. Further information was provided via a Participant Information Sheet. The participants were informed that members of the consortium would be present at the workshops. They could withdraw from participation at any point during the workshop. As vulnerable groups were involved in the workshops, extra measures were taken to support their participation in the research: most of the discussions took place in break out groups with staff from Kantar moderating the groups; vulnerable groups were dispersed among the break out groups to avoid stigmatization; and accessible venues were chosen to accommodate vulnerabilities and sufficient time for extra breaks was allowed as required. Permission was also obtained from the participants – during recruitment and at the workshop itself – for the SIENNA consortium to audio record the discussions for use for their own analysis. A GDPR compliant consent from was used to gain permission from the participants. The consortium is the data controller for these recordings.

2.2 Sampling and recruitment

The workshops were held in Germany, France, Poland, Greece and Spain. The consortium selected these countries based on different geographical regions within Europe, modes of socioeconomic development, and cultural, political & religious culture. The choices were influenced by the requirement that these countries should also have partner representation in the project (some EU partners in the project were themselves chosen in part to reflect geographic, economic and cultural diversity in the project).–While the consortium would have preferred a greater variation in religious traditions (as is, three of the five countries are predominantly Catholic and one is Greek Orthodox) this was not achieved and is a limitation of the research.

The workshops were held in the capitals and large cities of Paris, Hamburg, Warsaw, Athens, and Madrid to best ensure successful recruitment, easy travel for participants, and the availability of suitably sized and equipped venues to hold these events. It was not feasible within the scope of the project to include participants from different regions of the countries, as we would not expect research participants to travel for more than an hour to attend a day-long event and there was not sufficient budget for travel and accommodation. Whilst a minimum number of three participants from more rural areas were included in each workshop, the urban locations and bias towards city-based experiences should be noted as a limitation of this methodology.

A total of 253 participants took part in the research, with 50-53 attending in each location. Each workshop was made up of 40 general public participants and a minimum of 10 participants from pre-specified vulnerable groups, to include the views of these audiences in this research. A full break down of the achieved sample can be found in Appendix 4.

[2] Market Research Society, “Code of Conduct 2019”.
https://www.mrs.org.uk/pdf/Draft%20MRS%20Code%20of%20Conduct%202019%20-converted.pdf

2.2.1 General composition of the workshops

Quotas were set with the aim of including a broad range of demographics and the likely diversity of views in each of the five countries. However, we note that we cannot be sure this is the case or that the variables chosen constitute all of those that may be relevant to informing views about these technologies. Minimum quotas were set to ensure the inclusion of a range of participant characteristics. However, it is important to note that small sample sizes mean the workshops were not representative of the local population, and cannot be taken to be indicative of wider views within each country. Qualitative research does not aim or allow for statistical analyses; the data is neither representative nor generalizable and are not meant to be used to provide statistically significant results. Considering the data as such would be an invalid and misleading representation of qualitative data. The findings should be taken as one way to further understand why and how individuals perceive the technology areas and their uses, notably what concerns them about their development and use in their societies.

Quotas were set for gender, age (no participant was younger than 18, with a minimum quota for those 70+), education level, work status (including students and retirees), occupation type, ethnicity, whether religious or not, character of their area of residence (urban or more rural), parents and non-parents, and comfort with technology. Occupation was established by asking what is/was the participant's last main paid occupation and selection was based on minimum quotas assigned for different categories (see appendix 4). Ethnicity was established by asking participants how they would describe their ethnicity. However, due to legal restrictions in France, participants were not asked for their ethnicity but were instead asked 'whether they feel they belong to a minority group due to the country they or their parents were born in'. Minimum quotas were set for areas of residence to include views from more rural locations in the research and higher rural quotas were set for Madrid and Warsaw as it was deemed easier for participants to travel in from more rural locations in these cities (although we note the urban bias of the workshops as discussed above). Venues were chosen to, as far as possible, accommodate those travelling from outside of the city. Comfort with technology was established by asking proxy questions about how comfortable participants were using the internet to buy goods and services; change energy supplier, and complete banking transactions. A refusal code was available for every question.

A quota was not included for socio-economic group due to the lack of availability of an agreed definition that could be applied consistently across the countries.

2.2.2 Vulnerable groups

A minimum of ten participants from vulnerable groups attended each workshop to attempt to allow diversity of views in the research. No vulnerable person included had severe disabilities or conditions that prevented them from joining the other participants, so they were included across the break out groups, rather than separated from the general population, also to avoid stigmatisation.

Vulnerability groups, in this context, were defined as groups who might feel they are at greater risk of disadvantage or of being adversely affected by the development and use of one or more of the three technology areas in their society. The vulnerability categories included the following: chronic health conditions; mental health conditions; genetic conditions; disabilities (including impairments to vision, hearing, mobility, breathing or dexterity and learning difficulties); aged 70+ (potentially including those living in nursing/care homes); and immigrants (1st and 2nd generation).

Lists of some of the most common conditions in Europe were provided for categories 1-4, but recruitment was not limited to these as 'Other - specify' codes were available to record other possible conditions. Due to the low prevalence of rare genetic conditions, participants were asked if they or a close relative had 'a

condition which has a genetic component (e.g. that can or will be passed from parents to children)' – and this included cancer and diabetes – or 'had ever been concerned that either you or a close family member has an illness which has a genetic component (even if this turned out to **not** be the case)'. Immigrants also needed to meet vulnerability criteria which were defined as one or more of the following: refugee or asylum seeker; not fluent in the main language of the country (but skilled and confident enough to participate); not confident reading or writing in the main language of the country; age 60+, low educational attainment, unemployed, semi or unskilled jobs; or a minority ethnic group.

We note that in Warsaw, the number of participants classified as vulnerable was substantially higher (40). While the general recruitment was conducted in the same way as in the other four countries, there were more participants who had chronic health conditions, relatives with cancer, and vision impairments among older participants.

The sample excluded some vulnerable groups for whom participation would have been too great a burden. The sample did not include individuals who had mental impairments that rendered them unable to give valid informed consent (e.g. dementia, Alzheimer's). The agreed screener document monitored for people's level of comfort in participating (by describing the event to them and what they will be asked to do and giving a choice as to whether they felt able to participate or not) and any extra needs those who did feel able to participate had, to ensure participants were fully informed of what the workshops entailed. Where it was not possible to include some vulnerable groups, and to boost these perspectives in the research, options were given to include close relatives of vulnerable groups to represent their experiences. 'Close relative' was defined as a partner, a parent / grandparent, a child or step child, a sibling, or a family member who had lived with a vulnerable person. Some participants were recruited on this basis and this is detailed in Appendix 4.

2.2.3 Recruitment

54 participants were invited to each workshop, including an over-recruitment of four in anticipation of an 8% drop out rate. A screening questionnaire was used during recruitment to ensure a consistent approach was taken across the countries, which was reviewed and signed off by the consortium.

At recruitment, to support the informed consent process, all participants were provided with information about the SIENNA project, the purpose of the research, the aims of the workshops, what participation in the workshop would involve, and how their data would be used. Furthermore, a detailed description of the workshop was provided to aim to inform participants what would be asked of them. Participants were also provided with a Participant Information Sheet (PIS), giving more detailed information about what the workshop would involve and contact details if they wanted further information.

Recruitment for the workshops was conducted by experienced, local qualitative recruiters in each of the countries. It was carried out in accordance to the screening document agreed with the consortium and to be compliant with GDPR and Market Research Society standards. A variety of recruitment approaches were taken across the five countries and were dependent on the networks and databases that were available there, meaning it would not be possible for further research to replicate this process which is a limitation of the approach. In France, participants were recruited via a national database of c.250,000 people which is refreshed monthly. Participants opted in by responding to a questionnaire and were then telephoned if they were eligible. In Germany, the recruiter recruited from a panel of over 10,000 people, first using email and then re-contacting via phone. In Greece, Kantar Greece's panel involving over 20,000 participants across the country was used (aged 10-70). In Poland, recruitment was done face to face in the city centre, with five recruiters stopping citizens in the street for 25 days between them. In Spain, a recruitment agency was used which recruited via telephone from a database of over 30,000 people. Participants were offered a financial

incentive to thank them for their time and participation and to cover travel and childcare costs, the amount being in line with local guidelines and norms (150 EUR in Germany; 200 EUR in France; 120 EUR in Spain; 100 EUR in Greece; and 300 PLN in Poland).

2.3 Analytical approach: thematic qualitative analysis

2.3.1 Raw data collection

The raw data was collected through the one-day workshops described in section 2.2. Three types of raw data were collected at the workshops; (1) audio recordings of the sessions; (2) notes taken by the note-takers; and (3) pre- and post-event questionnaires completed by the participants.

The workshops were conducted in hotels; in some cases, in one room and in others the groups were spread into smaller rooms, as the space allowed. The plenary sessions were led by a Kantar moderator experienced in conducting qualitative research for a social research agency (we note they were not academic researchers). The break out groups were each led by a Kantar moderator (with experience of conducting research in a social research agency context), who audio recorded the discussions. A member of staff from Kantar also took notes throughout the sessions. In Germany and Greece, the notetakers recorded into a structured template which mirrored the order of the discussion points in the topic guide. In France, Poland, and Spain, the note takers took notes in blank documents as this was their preference for recording the most accurate notes possible.

2.3.2 Analytical approach

This report should also be read within the context of the limitations in which the analysis was conducted – namely time and budget restrictions. The analysis has been conducted to the standard that was possible within these constraints but may not meet with academic expectations for qualitative research analysis. Again, we reiterate that it should therefore be treated as a starting point for further academic analysis.

This research follows the more descriptive and interpretive traditions in qualitative research (Spencer et al; 2003). It presents what participants mean and understand about the technology areas, analysing the 'situated accounts' provided within the workshops (Kvale; 1996). The analysis for this report has focused on identifying themes from within the accounts recorded by the notetakers of the accounts provided by the participants in the workshops (Ritchie and Lewis; 2003). The project did not seek to force a consensus; while it focuses on aggregate level results, it has sought to explore the diversity of views present across the sample as far as was possible within the limitations of the analytical approach which were defined by the budget available. We remind the reader that the results of qualitative analysis are to some extent subjective (to those conducting the analysis) and should be understood within the limitations of the research context through which they were collected which were taken into account as far as possible within the analysis; e.g. group dynamics, uneven coverage, the influence of other views, and within the limits of the information that was provided to participants and the questions that were asked to them (Ritchie and Lewis; 2003) - as well as the fact that the analysis was conducted from notes and not verbatim transcripts meaning that nuances will have been lost in the analysis process.

2.3.3 Analysis process

This section outlines the analysis process undertaken to provide transparency about how the data was managed and interpreted so that comprehensive coverage of the dataset was achieved within the limited time and budget available for this project. Analysis consisted of two stages, firstly management of the data

and then interpretation of it to produce a descriptive account afterwards. The analytical process consisted of the following:

- In the workshops, three types of raw data were collected: (1) audio recordings of the sessions; (2) notes taken by the notetakers; and (3) pre- and post-questionnaires completed by the participants.
- We note that the audio recordings were not transcribed, a decision made by the consortium due to budget limitations – and this should be noted as a limitation of the analytical process because it means that nuances have been lost in the process and means the analysis reported here was an analysis of accounts recorded by notetakers of accounts provided by participants. Recordings were reviewed by the lead moderators to collect illustrative quotations for the country level reports (by listening to relevant sections highlighted in the note taker notes, rather than audio recordings being reviewed in their entirety). Notes were recorded as accurately as possible into a blank document in all countries except Germany and Greece, where note takers used a structured template which reflected the order of the discussion topics in the topic guide. The notes were not translated, again due to budget constraints. The variety of approaches taken to recording the notes also limits the extent to which comparison between the countries has been possible.
- The audio recordings, notes, and questionnaires responses – all in the language in which the workshop was conducted – were reviewed by the lead moderators (experienced in qualitative research conducted in a social research agency environment rather than an academic environment) to produce five country level reports. They did this by reading the notes, and entering common themes identified into a structured country level report template provided by the project team.
- The country level reports were provided to Kantar Public UK approximately two weeks after the final workshop in Spain in a highly structured template, which closely mirrored the discussion points in the topic guide and asked the country lead moderators to draw out thematic findings for each discussion point (e.g. associations, awareness, response, reported benefits and risks/concerns associated with each technology area, how concerns should be mitigated and who is responsible for this). The template also instructed the lead moderators to include quotations to illustrate the findings, because the purpose of the quotations is to illustrate the key themes identified. The use of this structured country report template meant that the analysis was not a bottom-up, grounded approach.
- The analysis process also included a three-hour telephone de-brief sessions one week before and one week after the reports were submitted, led by the Kantar UK project lead or project director. These focused on and were used to draw out the key themes for each discussion point for each technology area (meaning those which were discussed mostly commonly across the groups). One-hour telephone de-brief sessions were held with the lead moderators in each country after each workshop with the Kantar UK team. The lead moderators reported key findings for each discussion topic for each technology area. The Kantar UK team noted these to keep track of key themes emerging during the fieldwork period. One-hour de-brief phone calls were held with some of the SIENNA members who attended the Paris, Hamburg, Warsaw, and Madrid workshops who also contributed their thoughts to this process.
- After the five country level reports were submitted to the team in Kantar UK, a final two-hour telephone based de-brief session was held with all the lead moderators to discuss the key themes to try to ensure they were consistent with their experiences in the workshops – before the final reports were drafted. A one-hour telephone de-brief was then held with the experts from the SIENNA consortium to check the headline findings were consistent with the observations and experiences of those who attended the workshops and to enable other consortium members to request what areas they wanted the further analysis to focus on.

- Kantar UK staff then spent more time reading the country level reports to produce report outline structures for each of the three reports. They identified key themes for each discussion topic for each technology area across the five countries – key themes being those that emerged most strongly across the break out groups. The report outline structures were provided to and agreed with the SIENNA leads to ensure the report structures considered the interests of the technology leads.
- The final phase of the analysis was then conducted by Kantar UK staff and involved reviewing the five country level reports to identify more detailed themes and sub themes for each discussion topic for each technology area. This was done by reading and annotating the country level reports where themes were reoccurring. Quotations were selected which supported and illustrated key findings in the reports at this stage. It is important to note the distance this final report has moved away from the original accounts provided by the participants, as the analysis has involved multiple layers of interpretation, beginning with the notetaker, the country lead who wrote the country level report, and then the final report authors.

Verbatim quotes are used throughout this report to illuminate and bring to life key findings and are attributed as follows: *"Quote."* (Location).

2.4 Limitations

In this section we consolidate the limitations of this research exercise, which include referencing, methodological, sampling and analytical limitations. The results in this report should be read with reference to and in the context of these limitations. The results serve as indicative findings about public attitudes to this technology area and should be treated as a starting point for further academic research and analysis to build from. They should not be read in isolation and should be read with reference to the other reports that have been produced as part of the SIENNA project.

2.4.1 Referencing limitations

Most importantly, this project has been conducted by a social research agency and not academic researchers. This therefore limits the degree to which the research conforms with academic analysis and writing approaches and has not been referenced to the extent that would be expected in academic publications. This report does not follow common academic standards for publishing qualitative research exercise results. It lacks introduction and discussion sections which contextualize the results with relevant academic literature to further understand the meaning of the results for the field. This decision was made by Kantar and the consortium to meet the time and budget constraints within which the project was conducted. Clearly, each discussion group could and should be more deeply analysed to fully understand their meaning and how this pushes our understanding of public views toward HET further. Ideally such further analysis will be conducted by academic partners through academic publications.

2.4.2 Methodological limitations

This qualitative research involved a day-long workshop in each country comprising three two-hour discussion sessions, with one session focused on HET. Qualitative research of this nature at Kantar is primarily informed by the approach to research described in Ritchie and Lewis (2003)[3].

Originally the research was conceived of as a piece of deliberative research. However, time and budget constraints meant that this approach could not be employed as it was not possible to fund a study which would allow the reconvening of participants or enough time for discussion which would allow the level of reflection required for deliberative research. The research follows the standards and conventions used in social research agencies. It was not possible within the time and budget constraints to conduct discussions to the point of saturation, as might be expected in some types of academic research.

The limited length of the discussion sessions also means that this exercise cannot claim to have uncovered 'in depth' views of the public, but rather associations and initial responses to introductory materials about the three technology areas. In-depth exploration of the topic was also limited by the consortium's preference to ask participants to explore multiple examples of each type of technology, rather than a more focused selection for deeper discussion.

Further to this, it is important to understand that the results presented here can only be understood within the context of the stimulus materials that were presented to the participants. All three technology areas are complex, and participants commonly had little to no previous awareness and understanding of the technologies. Therefore, discussion was limited to their response to the high-level introductory materials they were exposed to. It is particularly important to note the limited definitions that were provided to participants and the large number of examples that participants had to comprehend within a limited time frame. Furthermore, the project originally sought to understand public attitudes towards and concerns about the three technology areas and how citizens wanted to see their concerns mitigated. The discussions about mitigation were restricted to a limited amount of time and the presentation of these results should be viewed as limited and as an indication of participant views – they should not be used to inform decision-making about regulation of these technologies but rather a starting point for further research to build upon.

It should also be kept in mind that while moderators who led the discussions were prepared for this task through a telephone briefing by the Kantar project team, they were not experts in the technology areas, nor in the ethical, legal or social issues of the technology areas.

2.4.3 Sampling limitations

As well as the design of the exercise, it is important to understand the limitations of the sampling approach taken in this qualitative exercise. Quotas were set with the aim of including a broad range of demographics and the likely diversity of views in each of the five countries. However, we note that we cannot be sure this

[3] Ritchie, Jane., and Jane Lewis, *Qualitive Research Practice: A Guide for Social Science Students and Researchers*, Sage, London, 2003

is the case or that the variables chosen constitute all of those that may be relevant to informing views about these technologies.

Small (qualitative) sample sizes mean the workshops were not representative of the local population and cannot be taken to be indicative of wider views within each country. Where references are made to views in countries in this report, this should be understood as references to the views expressed in the workshop in that country.

Qualitative research does not aim or allow for statistical analyses; the data is neither representative nor generalizable and are not meant to be used to provide statistically significant results. Considering the data as such would be an invalid and misleading representation of qualitative data. The findings should be taken as one way to further understand why and how individuals perceive the technology areas and their uses, notably what concerns them about their development and use in their societies. We also note that it is not possible to carry out sub group analysis through this style of qualitative research, as there are not sufficient numbers to represent sub groups, moderators are not able to accurately allocate participants in their group to sub groups, and because this is not possible within the dynamics of a group research setting where some voices may be more dominant than others.

Recruitment for the workshops was conducted by local qualitative recruiters in each of the countries. It was carried out in accordance to a screening document agreed with the consortium and to be compliant with GDPR and Market Research Society standards. A range of recruitment approaches were taken across the five countries and were dependent on the networks and databases that were available there. It would not be possible for further research to replicate this process.

This report makes references to results that were obtained from pre- and post-questionnaires completed by the participants. We note that these should be read with caution. The questionnaires were conducted as a workshop activity and should not be interpreted or treated as a robust survey methodology as this is not what they were intended to be. Participants were asked to answer two questions before and after the workshop, to give an indicative suggestion as to whether and how views might have shifted about the technologies during the workshop. This project was not conceived or designed to investigate whether and how views about these technologies change, which would not be possible through this methodological approach, and the questionnaire results should be approached accordingly.

2.4.4 Analytical limitations

Finally, this report should also be read within the context of the limitations in which the analysis was conducted – namely time and budget restrictions. The analysis has been conducted to the standard that was possible within these constraints but does not meet with academic expectations for qualitative research analysis. Again, we reiterate that it should therefore be treated as a starting point for further analysis. We remind the reader that the results of qualitative analysis are to some extent subjective (to those conducting the analysis) and should be understood within the limitations of the research context through which they were collected; e.g. group dynamics, uneven coverage, the influence of other views, and within the limits of the information that was provided to participants and the questions that were asked to them (Ritchie and Lewis:2003).

The approach follows in the descriptive and interpretive traditions for qualitative research (Spencer et al: 2003). However, it does not conform with academic standards for grounded or thematic analysis. For example, there was not sufficient budget available for the transcription of the audio files which would be required for a purist implementation of these approaches. The analysis in this report has been conducted based on the notes taken by note takers for each of the discussion groups which were collated into country

level reports (according to a structured template) and then comparison was made between these country level reports and themes drawn out accordingly – rather than robust and systematic thematic analysis being conducted as may be expected in academia.

There are three final limitations to be noted. The results are presented as an aggregate of the dataset comprising of the material across the five countries. Whilst we acknowledge that the five countries have different political, economic, social and cultural contexts (and indeed were chosen by the consortium for this reason), it is not possible to draw any conclusions about the impact of these differences on the results within the limits of the design. It is also not possible to compare the results of the three technology areas as the analysis process does not allow for systematic comparison between the technology areas. Finally, where technologies are referred to as being most and least acceptable in these reports, this refers to them appearing to be acceptable through the discussions in the workshops and should not be taken to imply statistical significance as is established through quantitative research.

3. Physical human enhancement technology

3.1 Introduction

In the workshops, physical HET was defined as interventions that improve or give people new physical abilities or characteristics. The focus for usage was placed on four areas:

- Performance, defined as helping complete tiring activities more quickly
- Endurance, defined as allowing to do physical activities for longer
- Additive, defined as adding new physical abilities a person did not have before
- Cosmetic, defined as modifying a person's appearance (face or body)

Concrete examples were then provided to drive the conversation: athletic, prosthetics, military and cosmetic.

Participants in France, Germany, Greece, Poland and Spain all discussed physical HET. All discussions were structured as follows: participants were asked what they thought physical human enhancement meant, and what they associated it with. They were then probed about what they thought they would be used for. Following this, participants were given stimulus material which provided some definitions of HET, as well as examples of use, benefits and limitations. This material informed the rest of the discussion, and therefore form the context and limitations within which to interpret the following findings.The full content of the stimulus on physical human enhancement can be found in the Appendix 5.

A key finding was that participants did not understand that human enhancement technologies refer specifically to improving the capabilities of 'healthy' human beings beyond what is deemed 'normal'. Instead, they often combined references to health treatments and enhancement, seemingly not distinguishing between them. They chose to focus on and prioritise clinical applications in their discussions. It is important to read the findings in this report within this context.

3.2 Awareness and understanding of physical human enhancement technology

At the start of the event, participants were given a pre-workshop questionnaire and asked how familiar they were with two types of physical enhancement technology: cosmetic surgery and prosthetics. Familiarity was higher with cosmetic surgery than prosthetics, but in both cases the number of participants who were unfamiliar outweighed the number who were familiar.

To start the workshop discussion, participants in each country were asked about their awareness and understanding of physical HET, and how they knew of these technologies. Overall, participants were most familiar with treatment options related to physical human enhancement, but less familiar with enhancements that improve capabilities beyond the normal. Top of mind associations with physical HETs mentioned by the participants can be grouped into three categories:

- **Health**: it was associated with repairing or reconstructing body parts following an accident or illness, and included various types of prosthetics, wearables and transplants. This association relates to both physical treatments, through repairing what was damaged, and enhancement using technology or drugs.
- **Cosmetic**: this was associated with health through the repair of damaged skin or body parts, but also included plastic surgery, implants, Botox, and tanning salons. As for health, this association relates to both physical treatments and enhancement.
- **Endurance and strength**: these were associated with enhancement technology, including anabolic steroids, doping, exoskeletons and the Paralympics.

In all countries, some of the understanding that participants had of physical human enhancement was erroneous, which indicates that while there was some understanding, there was a lack of clarity about the scope and definition of physical HET. Examples given by participants included living longer and using drugs

to improve concentration. Physical enhancement was also spontaneously associated with **'natural' remedies and solutions** in some countries (although SIENNA has not and will not pursue this avenue). Examples include exercise, such as yoga or Pilates (France, Greece), healthy eating (Poland), and vitamins and food supplements (Greece).

When asked about where their understanding and awareness of physical human enhancement came from, participants mentioned the media (including social media) and personal experiences – knowing people who have used physical enhancement technology or having used some themselves. We note that in most cases, these were mistakenly referred to as enhancement for medical purposes, rather than treatments; e.g. wheelchairs and prosthetics. In Poland, science fiction films were also mentioned, while in France and Greece, participants also referred to documentaries.

> *"I have seen in the news athletes using wearables." (Greece)*

Following discussions about awareness and top of mind associations with physical HETs, participants were provided with some information about the topic to help inform the conversation. In it, **physical enhancement was defined as interventions that improve or give people new physical abilities or characteristics**. Participants were also provided with some information about the types of HETs that exist, some specific usage, as well as some benefits and risks around it. The next section reports on their response to these materials.

3.3 Benefits of physical human enhancement technology

Physical HET was perceived as most beneficial when it was deemed to be 'needed', and the need was conceived as medical treatment. As such, it was perceived positively outside of the actual definition of human enhancement, which is to improve capabilities beyond what is normal to human beings. As such, physical enhancement was seen as most beneficial within a medicalised context, because of its possibility to help repair and reconstruct individuals, and therefore bring some therapeutic comfort to them. It was seen as most beneficial with regards to prosthetics and skin reconstruction following severe burns.

The functional benefits mentioned around health were both physical and psychological. The physical side related to improving peoples' physical quality of life by improving their mobility, for instance allowing someone who had lost a leg to walk again. It was also mentioned in relation to cosmetic surgery for health purposes, for instance liposuction for somebody who is heavily overweight or to remove moles from your body as these can be cancerous. The psychological side related to allowing them to (re)integrate into society by looking more like everyone else. It also related to helping (re)build peoples' self-confidence and sense of self-worth by enhancing their appearance. As such, this understanding fell outside the definition of enhancement technology as improving human beings beyond what is deemed 'natural'. The psychological side of physical HET's benefits was associated with health, and also to actual enhancement, through the improvement of physical appearance.

> *"It is important in the case of injuries or illnesses. It's a form of treatment and improves people's lives." (Poland)*

> *"After an accident it really helps you to think that you can fully recover." (Greece)*

Even within the field of healthcare, physical enhancement was only considered beneficial if it did not cause any harm to the individual or impacted anyone else. Outside of healthcare, physical human enhancement was perceived positively when it was a non-invasive device that helped improve comfort, efficiency and safety of the user. For instance, in Poland, the exoskeleton was mentioned as helpful to help carry heavy loads in certain professions, or to help catch criminals. It therefore was perceived as helping with comfort (by making it easier to carry things), efficiency (by allowing people to conduct their tasks quicker) and safety (by limiting the risks of injury).

In Greece, physical HET was also perceived positively in the case of gender reassignment, as this was deemed a personal decision and a basic human right. It was also perceived positively in sports as far as non-invasive technologies were used. By non-invasive, participants meant devices that didn't enter the body, such as the use of smartwatches for athletes to track their performance, which were positively considered. Food supplements, exercise devices and legal medicines were also perceived positively to improve strength and endurance.

3.4 Concerns about physical enhancement technology

A range of concerns were raised about physical enhancement technology being used beyond what participants saw as 'necessary medical use'. As such, participants were concerned about physical enhancement technology when used in its truest sense, that is to enhance the capabilities of human beings beyond what is deemed 'normal'. Indeed, **participants were most negative when technology was used to provide additional abilities or improve physical appearance in a non-medical context**. This was especially the case for invasive technologies, where drugs or operations were conducted without being needed for health reasons. Most participants seemed to be of the view that if someone is in good health, there is no reason they should be using enhancement drugs or technologies.

"I'm against physical enhancement If the change creates something that is not natural." (France)

Concerns about physical enhancement technology can be grouped into three categories: personal, societal and misuse – explored in turn below.

3.4.1 Personal concerns

Personal concerns related to both physical and psychological issues. In terms of physical issues, people were concerned about possible side-effects and unforeseen complications in the long term. There was a general sense that putting chemicals or materials into your body was hazardous, and that some technologies could use cheap or unsafe materials that could be harmful. This was mentioned in relation to prosthetics and implants – with examples in Greece including lips being distorted. In all countries, cosmetic surgery was a concern, because operations could go wrong or not have the intended impact. In Greece, participants specifically mentioned the risks of physical enhancement drugs on athletes' health.

"We shouldn't interfere so much with nature. The body will suffer." (Germany)

In terms of psychological concerns, addiction and subsequent abuse were widely mentioned, as the benefits of physical enhancement were often seen to be temporary. The reliance on technology for one's sense of self-worth also raised concerns about increased low confidence and feelings of insecurities, isolation and depression, especially in France and Greece.

"It could be addictive […] New technologies are risky." (Poland)

In Spain, participants also wondered who would take the blame if something went wrong when a person used a physical enhancement technology or drug, and whose responsibility it would be to solve the issue.

3.4.2 Societal concerns

Participants were also concerned about the potential societal impact if these technologies became widely used, particularly in the sports and cosmetic industries. The overarching concern was that wider use could lead to greater inequality and increased discrimination. In all countries, participants raised concerns about uneven access to physical enhancement technology. Participants worried that only wealthy individuals would be able to access these technologies and drugs, widening the gap between rich and poor in terms of opportunities.

"I think the risk of inequality is very concerning." (Spain)

Participants were also concerned that increased use would lead to the creation of a more superficial and uniform society where everyone is concerned about their physical appearance and strength. Participants thought that widespread use of the technology would have a ripple effect, increasing pressure on others to use it in order to fit in. This was perceived as a threat because it would result in a society where everyone looks the same, and individuals lose their sense of self. It would also cause people to strive for physical perfection, which is unobtainable because perfection does not exist. As such, it would make individuals addicted to technology and would risk increasing discrimination and intolerance of those who are different. This was a discussed most widely in Greece.

"We live in the era of perfectionism […] the uniqueness of individuals will be lost." (Greece)

Societal concerns were most commonly mentioned in relation to cosmetic surgery. While a few health benefits were mentioned, cosmetic surgery was commonly seen as unnecessary, with breast implants and Botox being particularly condemned. The main concern about cosmetic surgery was the worry that it would create a more 'artificial society' and enforce narrower perceptions of beauty upon people, making them feel obliged to change their appearance to feel included. There was a fear of suppressing differences and creating a situation where everyone looks the same, leading to a more homogenous society.

"Plastic surgery would mean the death of natural beauty." (Greece)

This was felt slightly differently across the countries:

- In Spain, there was a sense that people were becoming 'victims' of the obsession that some people had with beauty and physical appearance.
- In Poland and Greece, what was put forward was the feeling of distortion – that people stopped looking like themselves by undergoing cosmetic surgery.
- In Greece, participants feared that cosmetic surgery would increase narcissistic behaviours. They were also concerned about the lack of education around it, both in terms of individuals being fully aware of possible side- or long-term effects before undergoing it, but also in terms of practitioners not having the right qualifications or using the right tools.

Questions were also raised about the motives behind the development of the technologies and drugs, and who will profit from it from a financial perspective. In Germany, participants specifically discussed the danger of advertising companies setting beauty standards and creating superficial images of beauty for profit purposes.

3.4.3 Misuse

In some countries, there was also concern about the implications of misuse of physical enhancement technology, including criminal misuse.

Participants were worried about physical enhancement technology being misused for criminal activities. An example provided in Germany and Poland referred to using cosmetic surgery to change one's appearance and avoid capture following a crime.

Looking specifically at the sports industry, participants were concerned about the misuse of physical HET for doping and cheating. Greece was particularly concerned about physical enhancement in sports. While participants in some countries, especially Poland, acknowledged that this already happens and that it will be difficult to control and regulate further, there was a sense that using physical enhancement would make sport meaningless, because all results would be artificially created. As such, it was perceived as being contrary to the purpose of sports itself. Participants in France, Greece and Poland also feared that such use would increase competition, and therefore result in a vicious circle of addiction in a never-ending search for being the best. Athletic use raised the most concerns, and as such was the most negatively perceived of the physical

enhancement technologies discussed. In France, some participants questioned the purpose of improving capabilities beyond what was normal.

"Physical enhancement in sports is against the meaning of sportsmanship." (Greece)

"Does everybody need to be able to run a marathon?" (France)

3.5 Comfort with the use of physical enhancement technology

A pre- and post-workshop questionnaire was used to indicate if and how views about each technology area shifted during the workshop. Ahead of the workshop, participants most commonly felt 'neutral' about cosmetic surgery, followed by hopeful and curious, while they mostly selected hopeful and excited for prosthetics. By the end, for prosthetics, more felt 'hopeful' and 'excited'. For cosmetic surgery, feelings shifted from mostly 'neutral' to mostly 'hopeful'.

Most commonly, participants thought that prosthetics would have a positive impact on society – as they were generally understood as a form of treatment rather than enhancement – and within that most thought it would have a positive impact. Views were more mixed about cosmetic surgery, although more participants thought it would have a positive than negative impact.

During the workshop, access to physical enhancement technology was discussed in relation to children and to employees in the workplace. Overall, use of physical enhancement technologies amongst employees and children was deemed acceptable when temporary, non-invasive, and voluntary. For children, it was thought that any use should be heavily restricted to the medical domain.

3.5.1 Use of physical enhancement technology in the workplace

Overall, participants had mixed views about the use of physical HETs in the workplace. These came up in the discussion without being mentioned in the stimulus material. Non-invasive as well as temporary physical enhancements were generally accepted, because these were perceived as having fewer risks to the individual's well-being. In France and Spain, exoskeletons were particularly well regarded as they could help with tiresome work and are both non-invasive and temporary. However, perceptions of night vision goggles were more mixed. Even though this technology is also non-invasive and temporary, some participants raised concerns about abuse – for instance using them to spy on others, or steal. They were deemed acceptable if they were not used to harm others.

"The army, fire service, police – it should be available to them. If it helps them, it will help us." (Poland)

Invasive drugs were less acceptable in the workplace, as they were seen to provide an unfair advantage and there were concerns about the physical risks associated with them for individuals. This includes the use of performance enhancement drugs in the athletics field, which were highly criticized in all countries, as discussed above.

3.5.2 Use of physical enhancement technology in schools and with children

There was a strong belief amongst participants that physical enhancement technology should not be used with children as they are still developing physically and psychologically. The only instances when it was deemed acceptable for physical enhancement to be used on children was in the case of severe medical conditions, where approval should be given not only by the parents but also by a medical professional and therapist. Even in the case of adolescents, it was thought that children should not be allowed to choose to use physical enhancement technology by themselves until they reached 18 years old. They should however be part of the conversation – and it should not be enforced upon them by any third party.

"Children's bodies are constantly changing. […] They have to become adults first and then they can decide by themselves." (Greece)

"Young people may make decisions that they regret their whole lives." (Germany)

The rationale behind this was that physical enhancements, and especially invasive ones, could harm children and their development. The use of physical enhancement on children was particularly condemned in the case of sports and cosmetic surgery as it was not deemed necessary for their health or wellbeing.

3.6 Views on regulation

This section reports on discussions held with the participants about what measures they wanted in place to address their concerns about physical enhancement technologies. We note that these findings are limited due to the short amount of time allocated to this discussion, which would be more substantial in truly deliberative work and the findings should therefore be read as highly tentative. We also note that these views are not presented as Kantar (Public Division) or SIENNA's recommendations, but as reporting of participant views.

Overall, participants in all countries felt that physical enhancement should only be allowed under medical supervision and should only take place when there is a medical need for it. This was deemed necessary to ensure that no life was put at risk. The only circumstances where it was deemed acceptable not to have medical supervision was when the technology was not invasive, temporary, and could not cause any harm to oneself or others. Examples of this included exoskeleton and night vision goggles. These were the applications mentioned in the stimulus material.

However, it was also felt by participants that the medical field itself should be monitored, to protect citizens against organisations or individuals acting for their own self-interest, rather than to benefit others – for instance, doctors recommending plastic surgery because they get commission. As such, participants recommended that a committee should make the final decision on whether physical enhancement is needed, on a case-by-case basis. Who this committee should comprise slightly varied between countries, but always included: doctors, therapists and experts.

This committee would be in charge of ensuring that physical enhancement is used for medical purposes only, or for instances that do not cause harm oneself or others. This relates to the overarching view that physical enhancement technology should not be used to enhance capabilities beyond what is deemed 'normal'. This includes ensuring that the technology would not give more advantage to some than others or provide means from some to dominate others – this was specifically mentioned with regards to sports. Participants also believed that regulations should be put in place to ensure that there are no abuse or misuse of the technology and to ensure that it does not create increased inequalities within society.

Different levels of regulation were deemed necessary, depending on the perceived risks associated with the type of enhancement.

- **Use in sports.** Participants felt that physical enhancement to improve one's capabilities beyond what is deemed normal should be prohibited. Participants also felt that the use of any drug to enhance strength or endurance in a sport environment equates to doping, and most countries already have legislation against this, as it is illegal.

- **Use with children.** Participants felt that this should be prohibited unless there was a strong medical case for it. If there was, the decision to proceed with the drug or technology should involve the child, the parents, at least one medical professional, and in most cases, a psychiatrist. Participants in most countries believed that the child could make the decision once he or she turned 18 – but in France there were discussions about the age being raised to 21, as it was felt that 18 was still too young to make potentially life changing decisions.

- **Use for cosmetic reasons.** On the whole, it was felt that some legislation was needed to avoid abuse or misuse, for instance in the case of criminals changing their face in order avoid capture, or to ensure that professionals have the right qualifications. Other than that, personal use should be advised by medical professionals.

- **Use of non-invasive devices**. Regulation on non-invasive devices should ensure that they remain in the hands of the right people.

In all countries, most participants thought that if there was a medical need for the technology or drug, then it should be free of charge. If there was no need, for instance in the case of Botox, then the costs should be incurred by the individual.

4. Cognitive human enhancement technology

4.1 Introduction

For the purpose of the discussions, **cognitive HET was defined as interventions to improve people's ability to get and process knowledge.**

The focus for usage was placed on three areas:

- **Intelligence**, to improve critical thinking, memory, or reasoning
- **Clarity**, to improve concentration
- **Creativity**, to improve inventiveness and artistic abilities

Concrete examples were then provided to drive the conversation: **healthcare, education, workplace and home or recreation**.

Participants in France, Germany, Greece, Poland and Spain all discussed cognitive enhancement technology. All discussions were structured as follows: participants were asked what they thought cognitive human enhancement meant, and what they associated it with. They were then probed about what they thought it would be used for. Following this, participants were given stimulus material which provided some definitions of cognitive HET, as well as examples of use, benefits and limitations. These then informed the rest of the discussion, and therefore form the context under which to interpret the following findings.

The full content of the stimulus on cognitive human enhancement can be found in the Appendix 5.

A key finding was that participants did not understand that human enhancement technologies refer specifically to improving the capabilities of 'healthy' human beings beyond what is deemed 'normal'. Instead, they often combined references to health treatments and enhancement, seemingly not distinguishing between them. They chose to focus on and prioritise clinical applications in their discussions. It is important to read the findings in this report within this context.

4.2 Awareness and understanding of cognitive human enhancement technology

Ahead of the workshops, participants were asked how familiar they were with technologies to make people more intelligent. Participants were more likely to say they were unfamiliar than familiar with the technology.

To start the workshop discussion, participants in each country were asked about their awareness and understanding of cognitive HET, and where this derived from. Overall, **participants were not very familiar with cognitive enhancement technologies,** although they generally understood what 'cognitive' referred to. Top of mind associations with cognition primarily related to the brain, and within that to memory, intelligence and concentration. It was also linked to behavioural disorders or illnesses impacting the brain or mental capabilities, including Attention Deficit Hyperactivity Disorder (ADHD), Autism, Dyslexia, Alzheimer's and Parkinson's. Cognitive enhancement was also mentioned in relation to drugs taken to increase memory and concentration, especially while studying – all of which are accurate associations. In Germany and Greece, participants also referred to some drugs being developed for healthcare, to treat patients who suffer from Alzheimer's, Autism, Dementia, Depression, Anxiety and other cognitive diseases. These are incorrect associations, as this relates to treatment rather than enhancement of capabilities for 'healthy people'. As such, cognitive enhancement technology was primarily associated with use of psychopharmaceutic products.

> *"To improve intelligence […] and capacity to concentrate." (France)*

In all countries, the concept of cognitive enhancement technology felt **abstract**, and people struggled to understand how it would work in practice. Some top of mind examples mentioned by participants included Ritalin, caffeine, alcohol, sugar and hallucinogenic drugs. The only examples mentioned that did not relate to

natural remedies or drugs included neuro-stimulation (Germany), electrodes (Greece) and computerized translators (Poland).

Participants' awareness and understanding of cognitive enhancement derived from a variety of sources, including the internet, media, films, TV series, books, scientific articles, and personal experience. Personal experience primarily related to taking drugs for concentration or memory or knowing someone with a degenerative disease.

Following discussions about top of mind understanding and awareness of cognitive HETs, participants were provided with some information about the topic to help inform the conversation. In it, cognitive enhancement was defined as interventions to improve people's ability to get and process knowledge. Participants were also provided with some information about the types of cognitive HETs that exist, some specific usage, as well as some benefits and risks around it. The specific usage provided in the stimulus revolved around:

- **Healthcare**, including a brain-computer interface that allows communication between the brain and a computer (i.e. to control prosthetic arms/legs with the brain)
- **Education**, including psycho-pharmaceutical drugs that can improve brain abilities, such as memory, focus and the ability to do difficult mental activities (i.e. to make it easier to concentrate)
- **Workplace**, including virtual-reality and augmented-reality devices that show a different reality (i.e. to visualise what a building will be like before construction)
- **Home or recreation**, neuro-stimulation that modifies brain activity (i.e. to improve language and mathematical learning, or enhancing memory)

4.3 Benefits of cognitive human enhancement technology

Participants mentioned few benefits about cognitive enhancement technology. Similar to physical enhancement, cognitive enhancement was seen to be beneficial when it was used in a medical context. It was positively perceived when it was used to alleviate people's suffering or improve their cognitive abilities, and as such the quality of life of those who use it. Therefore, it was perceived as beneficial for reasons that differed from its actual purpose, which is to enhance people's cognitive abilities beyond that of 'normal' human beings.

> *"You shouldn't interfere with nature unless it's necessary for your health." (Germany)*

With regards to medical use, participants mentioned cognitive enhancement as beneficial with regards to **treating patients** with ADHD, Dementia, Depression and Autism to help alleviate the symptoms of their condition and live as much of a 'normal' life as possible. Cognitive enhancement technology was also considered beneficial because it offers individuals with cognitive impairments the possibility to have more **equal opportunities**. However, in most cases cognitive enhancement was seen positively in healthcare if it were **temporary**. It was often perceived as a means to help people improve their conditions, but in conjunction with other treatments (i.e. therapy for Depression). As such, it was also deemed necessary to be undertaken under medical supervision.

> *"People with certain problems can become more functional, can socialise and live normally again." (Greece)*

> *"For someone who doesn't hear well, it would help them understand." (Spain)*

Participants also mentioned benefits with regards to efficiency and skills in certain professions. Specifically, following mention in the stimulus material, they discussed virtual reality and augmented reality devices used in the workplace. These were generally seen as beneficial as they can help make products and services better, and therefore benefit both workers and consumers. Overall, participants felt that if the device was non-invasive, it did not pose as many ethical dilemmas as drugs or invasive technologies because the chances of harm to individuals or society were less. As a result, participants tended to be more positive about them.

"[I am in favour of] a type of goggles which will show us the house before it is built [which also] makes it easier for the architect." (Poland)

Some participants in Germany and Poland also showed interest at the prospect of learning quicker or being able to focus better. In Poland, some participants also expressed interest for brain-to-brain communication, and the possibility to break the language barrier between people.

"I'd love to improve my ability to focus." (Poland)

4.4 Concerns about cognitive human enhancement technology

While they saw some benefits to cognitive enhancement technologies, on the whole participants in all countries raised many concerns about them. Overall, participants were frightened by the prospect of cognitive enhancement technology, but the fear tended to derive from a lack of understanding of what the expression meant. Indeed, participants wondered whether it referred to drugs, neuro-stimulation or other technologies. Participants also wondered about the effects that cognitive technology would have on people, and how it would work in practice. Heightened understanding about the technologies is likely to alleviate some of the concerns discussed below.

As with physical enhancement technologies, concerns can be divided into three core categories: personal, societal and misuse.

4.4.1 Personal concerns

As with physical human enhancement, personal concerns revolved around both **physical and psychological impacts**. Physical concerns were linked to drugs and technologies having many unknown side effects and long-term impacts. It was also linked to the possibility of individuals thinking they know best and self-medicating, risking overdose or damage to internal organs or brain cells.

"The technology is new and not yet tried and tested, hence there has been too little time to experience and be able to have an objective and safe judgement [on its impact]." (France)

Psychological concerns were primarily linked to addiction and dependency. One difference with physical enhancement was the fear of dehumanisation that could result from regular use of drugs. Participants were concerned that this could change one's essence of self and their personality – and as such be 'controlled' by drugs.

"I'm totally against it, because it implies modifying our essence." (France)

In France, this voluntary change of one's self was equated to cheating, because people would be modifying who they naturally are for something that would be created by drugs or technology. There was a concern that it would make them 'artificial'. There was a sense that everyone has strengths and weaknesses, and this is what characterises humankind. Participants felt that removing weaknesses would create a society where everyone is under increased pressure to perform to high standards.

In Spain, there was a belief that cognitive technology would make people less decisive, by impacting their abilities to think for themselves. It was thought that drugs and technology would end up controlling people's thoughts and actions.

4.4.2 Societal concerns

Participants had many concerns about the impact that cognitive enhancement technology could have on society.

The main societal concern was **increased inequality**. Participants feared that only the wealthy would be able to access cognitive enhancement technology, and that it would therefore create a two-tier society, as it would give already powerful individuals the means to increase their control on others. The concern about the domination of one group over another was particularly strong in Greece and Spain – it was also mentioned that it could be a means for a state to ensure its domination over citizens.

> *"It concerns me that only those who have more resources can access it." (Spain)*

Linked to inequality of access, participants also feared that cognitive technology would not give everyone the same chances. Indeed, if some people can enhance their capabilities while others cannot, then one group will be at an **unfair advantage** – whether at school or in the workplace. If not, everyone can access the technology, another risk is increased discrimination amongst those who are different, whether because of illness or because they are simply not enhanced. This was specifically raised in Poland and Greece.

> *"If you don't take it, you won't be the same as everyone else." (Spain)*

> *"We tend to create Aryan race societies, where all people are the same and no differences will be accepted." (Greece)*

Concern was also raised about the **creation of a 'lazy' society**, where people forget the meaning of effort, and do not have to work hard to achieve their goals. Participants stressed that learning requires effort, and that if you could take pills or use technology to learn faster, then you weren't using your brain as much, and not putting that much effort towards achieving your goals. Everything would become easy and people would **not get any sense of reward** to completing tasks. It was also stressed that if cognitive enhancement became widespread, society risks becoming more homogenised, and people will be replaceable.

> *"Will we not become lazy and unable to solve problems without external help?" (France)*

Everyone having access to the technology would also mean that there would be **increased competition** between people, because everyone will be similarly enhanced. Therefore, individuals would be in a never-ending quest to be better than others, which is perceived as unhealthy. It also puts pressure on people to use this technology, even if they don't want to.

> *"Those who can use this technology would be smarter and considered better than others, so they would be offered more opportunities." (Poland)*

4.4.3 Added value

There was an overarching **concern about the purpose and added value** of using cognitive enhancement technology. Participants did not grasp the need to improve human beings 'beyond what was normal' and were concerned about the motives behind the decision to do so. In France, the discussion revolved around what the reasons were for cognitively enhancing individuals, and what the purpose was.

> *"What's the point of these neurostimulations pushing brain activity? What happens when everyone can access it?" (Germany)*

> *"If it's used to enhance the capacities of a normal human person, I do not feel comfortable with it." (France)*

There was a general belief that **cognitive enhancement has always existed**, and that this was what **schools and reading** were about. Therefore, participants stressed the need to continue using natural means to learn and educate people, rather than start using drugs and technologies that could be detrimental to their health and wellbeing.

> *"Cognitive enhancement has always existed, it's exactly what school does, developing people's intelligence." (France)*

In Spain and Poland, participants also mentioned the risk about technology being hacked, and people being able to control other people's brains, or control their thoughts and actions.

In Greece, there was also a debate about who should dictate what the ultimate cognitive abilities should be. Who decides what smart looks like? Whether someone should be cognitively enhanced?

4.5 Comfort with the use of cognitive enhancement technology

Ahead of the workshops, participants most commonly felt 'curious' about technologies to make people more intelligent, followed by 'hopeful' and 'excited'. By the end, most participants still felt 'curious', followed by 'hopeful'. The number of those who felt 'excited' decreased, while the number of those who felt 'scared' increased.

Most commonly, participants thought technologies to make people more intelligent would have a positive impact on society.

During the workshops, access to cognitive enhancement technology was discussed in relation to children and to employees in the workplace. Overall, use of cognitive enhancement technologies amongst employees and children was not deemed acceptable except in very specific situations.

4.5.1 Comfort with the use of cognitive enhancement technology in the workplace

There were **mixed views** about the use of cognitive enhancement technology in the workplace. Overall, participants were against the use of drugs or invasive technology, but were generally favourable of non-invasive devices, as long as their use was voluntary.

Participants were **against the use of drugs and invasive technology** in the workplace, as they felt it gave some employees an unfair advantage over others. There was a sense that it would undermine merit if all tasks could be achieved without effort. There was also a fear that allowing people to improve performance through cognitive enhancement in a work environment will result in **exploitation** from employers. It was argued that it could empower employers to force their employees to take drugs to enhance their performance or force new recruits to take them before they are hired. Use of drugs and technology was particularly condemned if it was enforced on employees, as this was perceived as exploitation and deemed outside of ethical use.

> *"If these pills were in our working environment we would be exploited by employers. This would be an excuse for making us work harder." (Greece)*

Non-invasive applications in the workplace were deemed **acceptable in certain professions**, especially those that have a responsibility for human life (i.e. pilots and surgeons) if they improve skills and efficiency. Participants were more in favour of these applications because they were **unlikely to impact on a person's health or wellbeing**, being non-invasive. For instance, virtual reality and augmented reality were positively seen if they helped architects create homes.

4.5.2 Comfort with the use of cognitive enhancement technology in schools and with children

Overall, participants were **not comfortable** with the use of cognitive enhancement in schools and on children. As with physical enhancement, participants argued that children's brains are still developing and that until it reached its full potential, drugs or technology could cause real damage. It was also felt that the main reasons why children or students would take cognitive drugs would be to enhance their performance and results (i.e. learn faster) and that this ought to be a skill that is developed naturally. The intake of drugs to enhance concentration and memory was generally perceived negatively, and in some cases associated with drug abuse. There was a belief that students ought to learn by themselves, and learn to deal with failure, as it is character building and part of human experiences. There was also a sense that it would create inequalities

between students if some took cognitive enhancement drugs and others didn't and that if all students used drugs, competition and addiction would increase. This was particularly felt in Spain.

> *"Children should follow the normal process of learning, otherwise they will not learn at all." (Greece)*

> *"It should not be used by students to obtain better results. They should just study more." (France)*

In all countries some participants argued that cognitive enhancement **could be used** on children when there **was a strong health need**, but only under close medical supervision and with both child and parent consent. In Spain, it was argued that parents needed to be made fully aware of the potential risks of the drug or technology on their children before they consented to its use – and even then, concern levels were high about possible long-term effects.

> *"I am for it. My son is autistic and the fact that he does not speak blocks his cognitive development." (Spain)*

4.6 Views on regulations

This section reports on discussions held with the participants about what measures they wanted to see in place to address their concerns about cognitive enhancement technologies. We note that these findings are limited due to the short amount of time allocated to this discussion, which would be more substantial in truly deliberative work and the findings should therefore be read as highly tentative. We also note that these views are not presented as Kantar (Public Division) or SIENNA's recommendations, but as reporting of participant views.

Overall, participants felt that cognitive enhancement technology should be heavily regulated to ensure that it is not misused or abused by individuals or organisations. As such, they believed that regulation should be created and overseen by an independent committee to ensure that no single institution can take control of it. In Greece, participants also thought strict regulation was needed to avoid accessibility on the black market. Participants felt that regulation should be most strict about use in schools and universities, and least strict about devices that are not invasive.

In most countries, people said it should not be available freely and should only be prescribed under medical supervision. The only exception was Spain, where some participants compared cognitive drugs to alcohol, and therefore felt it ought to be freely available for all to purchase.

> *"What, free circulation with anyone being able to take it without prescription? There will be no moderation, this might be harmful." (Greece)*

> *"It should be allowed for people who need it but that implies we need to agree on a limit." (France)*

In all countries, participants said that cognitive enhancement technology and drugs should be prohibited for children, until they are adults and can make their own choices. If needed, then it should be prescribed and supervised by a doctor, and in some cases a psychologist to minimise unplanned impacts.

5. Emotional human enhancement technology

5.1 Introduction

For the purpose of the discussions, **emotional HET was defined as interventions that improve and/or provide greater control over emotions and behaviour.**

The focus for usage was placed on four areas:

- **Mood enhancement,** defined as gaining more control over your mood
- **Emotional enhancer,** defined as altering people's feelings
- **Empathy enhancer,** defined as helping people understand the feelings of other
- **Moral enhancer,** defined as making it easier for people to know what the 'right' thing to do is

Concrete examples were then provided to drive the conversation, relation to four emotions and/or behaviour: **fear, happiness, empathy, moral decision-making**.

Only participants in France, Germany and Greece discussed emotional enhancement technology. All discussions were structured as follows: participants were asked what they thought emotional human enhancement meant, and what they associated with it. They were then probed about what they thought it would be used for. Following this, participants were given some stimulus material which provided some definitions of emotional HET, as well as some examples of use, benefits and limitations. These then informed the rest of the discussion, and therefore form the context under which to interpret the following findings.

The full content of the stimulus on emotional human enhancement can be found in the Appendix 5.

A key finding was that participants did not understand that human enhancement technologies refer specifically to improving the capabilities of 'healthy' human beings beyond what is deemed 'normal'. Instead, they often combined references to health treatments and enhancement, seemingly not distinguishing between them. They chose to focus on and prioritise clinical applications in their discussions. It is important to read the findings in this report within this context.

5.2 Awareness and understanding of emotion human enhancement technology

Ahead of the workshops, participants were asked how familiar they were with technologies that help people control their emotions and with technologies that improve people's moral values. In both cases, few participants said they were familiar with these technologies: **they most commonly said they were 'unfamiliar'.**

To start the workshop discussion, participants in each country were asked about their awareness and understanding of emotional HET, and where this derived from. Top of mind, participants tended to **associate emotional enhancement to psychotherapy,** and the taking of drugs to reduce emotional distress. As such, and as was the case for other enhancement technologies discussed, primary association was with health treatment, which differs from the definition of enhancement technology as improving capabilities of 'healthy' individuals beyond what is deemed 'normal'. In some countries, especially France, it was also associated with meditation, mindfulness and sophrology (a type of mindfulness) – but this falls outside of SIENNA's definition of enhancement.

> *"Pills to lower feelings of anxiety, to make you calm and relaxed." (France)*

However, participants struggled to conceptualise what emotional enhancement could be. Some mentioned drugs to regulate emotions (i.e. antidepressants) and understood usage in the medical field. Beyond drugs, participants did not understand how technology could enhance one's emotions. The concept felt very abstract to them.

> *"It's all very theoretical […] These are interventions in very deep areas of humanity and I can't imagine what it would look like technologically." (Germany)*

Participants' awareness of emotional enhancement primarily derived from personal experience, word of mouth and from the media.

Following discussions about top of mind understanding and awareness of emotional HETs, participants were provided with some information about the topic to help move the conversation along. In it, emotional enhancement was defined as **interventions that improve and/or provide greater control over emotions and behaviour**. Participants were also provided with some information about the types of emotional HETs that exist, some specific usage, as well as some benefits and risks around it.

5.3 Benefits of emotion human enhancement technology

Overall, **participants saw very few benefits to emotional enhancement technology**. As with physical and cognitive enhancement, the primary benefit mentioned by participants was usage in healthcare, to alleviate people's suffering, improve their quality of life and allow people to feel they can function better in society. As such, participants only found emotional enhancement beneficial as treatment, they did not see the actual enhancement of one's capabilities beyond 'normal' standards as having any benefits.

Even in a medical context, emotional enhancement was **only perceived positively in specific cases**, when emotional disorder severely impacted on the life of the person. For adults, examples given included Post-Traumatic Stress Disorder, including in cases of rape. It also included severe Depression. Many participants agreed that, as a **short-term solution**, emotional enhancement drugs could help people become emotionally stable again or help them deal with trauma. For children, the only context in which emotional enhancement was deemed as acceptable by some participants was for Autism. If provided, it was deemed that enhancement ought to be under supervision from a psychologist and medical professional.

> *"A good friend of mine suffers from depression. She is much better with the pills." (Greece)*

> *"If due to depression you only see negative things and there are pills to brighten you up, that's a good thing." (France)*

5.4 Concerns about emotional human enhancement technology

Emotional enhancement raised **many concerns** amongst participants, more so than physical or cognitive enhancement. As with physical and cognitive enhancement technology, concerns about emotional enhancement can be divided into two core categories: personal and societal.

5.4.1 Personal concerns

Similar to physical and cognitive enhancement, personal concerns related to **both physical and psychological issues**. With regards to physical, this was tied to the risks to one's health. As the technology is still being developed, the side-effects and long-term effects are unknown.

At a personal level, the main concerns about emotional enhancement were psychological. There was concern about the damage that the technology could cause to one's identity and sense of self. In that respect, this was similar to cognitive enhancement, and the fear of loss of personality. Participants thought that emotions are what makes people unique; it is tied to their personality and their identity. It was argued that individuals need to learn to control and manage their emotions, and this can only be done via experience. You learn from making mistakes, you enjoy positive feelings because you've felt negative emotions. As such, participants stressed that all emotions are good and that you appreciate positive emotions because you experience negative ones. Participants therefore argued that removing negative emotions would lessen the impact of positive emotions. It would also make people less 'human'.

"If we were happy all the time, we could not appreciate happiness." (Greece)

"The variation of different feelings is important otherwise you become a zombie." (Germany)

There was also concern about the short-term impact of emotional technology. Participants were worried about what would happen to someone who stopped taking the drug or technology, both in terms of their own wellbeing but also in terms of their relationship with others. They wondered whether participants would revert to their old self, and what the impact of that would be. Participants felt that making people feel a particular emotion was 'fake', and that it meant that people were lying to themselves and others about who they truly were and what they truly felt. They also felt that allowing people to feel specific emotions through drugs and technology would create a dependency, because their emotional stability would revolve around constant consumption.

"If you take medication you will feel happy at first and then depressed again later." (Germany)

"If you use medicine is creates dependency and it isn't you who takes the decision but the medicine." (France)

5.4.2 Societal concerns

In France, Germany and Greece there was also concern about the societal impact of emotional enhancement technology.

Participants were concerned about the technology creating a homogenised society where everyone feels the same way, and where individuality, which they considered as intrinsic to humans, is lost. There was also a fear that by becoming dependent on drugs people lose the ability to act for themselves, and that their emotional response becomes inadequate to the situation at hand. For instance, in relation to fear reducing technology, some participants stressed that decreasing fear could result in reckless behaviour and unnecessary death.

"Our anxiety makes us human, it's a bad thing to suppress it." (France)

"We lose the fear of being punished, the fear of killing and abusing." (Germany)

Participants also feared that use of emotional enhancement would result in decreased tolerance for people expressing negative emotions. They stressed that what makes a society is the diversity of the people within it, as otherwise everyone would be the same. There was a concern about creating a society of robots where everyone is made to feel the same.

"Hyperactive people are part of our diversity, which needs to be preserved." (France)

"We are not the same and therefore shouldn't have the same emotional response after taking a pill. This is not normal." (Greece)

There was also a fear of misuse, and that some people or organisations would use emotional enhancement to control others. This was mentioned by some participants in Greece with relation to powerful people or companies 'feeding' others with drugs to control their emotions and ultimately serve their interests. In France, participants discussed a 'higher force' controlling emotions – be it drugs or technology, with or without intervention from human beings. Overall, participants felt that it was a person's own responsibility to learn how to control their emotions – and in the case of children, this could be achieved through parental guidance. There was a sense that taking emotional enhancement when not medically needed could become an 'easy way out' from learning how to control one's emotions.

"We are responsible for who and what we are. We learn and when we practice we make mistakes, but they allow us to improve ourselves." (France)

"Emotions cannot be controlled by others." (France)

5.5 Comfort with the use of emotional enhancement technology

Ahead of the workshops, participants most commonly said they felt 'curious' about technologies that help people control their emotions and about technologies that improve people's moral values. For technologies that help people control their emotions, 'curiosity' was followed by being 'anxious' and 'scared'. For technologies that improve people's moral values, 'curiosity' was followed by being 'hopeful' and 'scared'. These technology areas were the only ones amongst the HET areas surveyed where being 'scared' and/or 'anxious' was amongst the top three feelings most felt before the workshops.

By the end, participants were split between those who felt 'hopeful', 'curious', 'anxious' and 'scared' about both technology areas. A similar proportion also felt 'angry' about technology to help people control their emotions.

At the end of the workshop, participants were also asked what impact they thought technologies that help people control their emotions and moral values have on society. These were the only HET areas for which participants were nearly split between those who thought the impact would be positive and those who thought it would be negative.

During the workshops, access to emotional enhancement technology was discussed in relation to children and to employees in the workplace through reference to four emotional enhancement areas.

- **Reducing fear**: this was described as making people less scared in a specific situation or helping them recover from traumatic experiences. The example provided referred to helping soldiers feel less scared before battle.
- **Increasing empathy**: this was described allowing for a better understanding of the experiences of others. The example provided referred to making a bully at school understand what it is like to be bullied.
- **Increasing happiness**: this was described as helping healthy people feel happier. The example provided referred to making children happy to do their homework.
- **Helping decide what is right or wrong**: this was described as helping people decide if actions are right or wrong, or what should be done in a situation. The examples provided referred to increasing understanding of what a crime is amongst prisoners.

Overall, participants in France, Greece and Germany were not comfortable with the use of these four applications, and most felt very abstract. Reducing fear was the only application some participants felt comfortable with. For other applications, participants felt that they were very abstract and did not understand how they would work in practice, or why individuals would want to use them. This was particularly the case for helping decide what is moral and what is not, as is posed a lot of questions around who initially decides what moral is. It was also thought that these technologies worked superficially, by dealing with the emotional issue but not the underlying cause.

> *"Who decides what's good or bad?" (France)*
>
> *"A medicine cannot decide for us what's good or bad. That's something that comes from ethics, religion or politics." (France)*

5.5.1 Comfort with the use of emotional enhancement technology in the workplace

Overall, emotional enhancement technology was perceived negatively in the workplace. Participants were concerned about the risk of exploitation by employers. If used, it was deemed that specific laws needed to be in place to protect employees from abuse.

"Imagine if you could fire a person because he would not want to take a pill? Or that if you swallow the pill you would be given 6,000 euros? Many would do it even if it goes against their beliefs." (France)

Fear reduction was used as a stimulus – and participants had mixed views about it. It was mentioned in relation to the military, and while some participants acknowledged the benefits in terms of helping soldiers feel more confident before battle, others found this dehumanising. Some participants stressed that fear could be a protective mechanism, helping people assess danger. Reducing fear could make people reckless, and therefore commit risks on their lives that they wouldn't otherwise do.

Some participants mentioned that it would be acceptable for emotional enhancement to be used in the workplace in very specific circumstances, for instance if it helped people to do a job that they would not otherwise be able to do.

"Why can't it help a person who wants to become a pilot but is afraid of flying?" (France)

5.5.2 Comfort with the use of emotional enhancement technology in schools and on children

Overall, there was widespread discomfort with using emotional enhancement technology on children, and particularly on schools using it on children without prior medical and parental consent. Participants felt emotional enhancement technology should only ever be used on children if there was a severe need for it, and only with medical consent. For most participants, medical consent should include therapeutic assessment. Overall, participants felt that providing medication to children without clear medical need could be detrimental to the child.

"With kids it's terrible, they need to develop first." (France)

"If a psychologist evaluates that a child should take these pills, then it's ok. But they should not be provided by schools." (Greece)

5.6 Views on regulations

This section reports on discussions held with the participants about what measures they wanted to see in place to address their concerns about emotional enhancement technologies. We note that these findings are limited due to the short amount of time allocated to this discussion, which would be more substantial in truly deliberative work and the findings should therefore be read as highly tentative. We also note that these views are not presented as Kantar (Public Division) or SIENNA's recommendations, but as reporting of participant views.

Overall, participants felt that the use of emotional enhancement should **always be supervised by medical professionals** – whether psychologist or doctor. It should not be available to buy freely on the market.

There was widespread belief that many emotional issues could be tackled without using drugs or technology, through non-invasive means, such as therapy. As such, if used, emotional technology was perceived as a **temporary** means to help the person recover quicker, while still being overseen by a medical professional.

"Being followed by a psychiatrist is better than taking a pill." (France)

"Therapy offers much more for the patient than just calming him down with medication." (Germany)

As such, participants believed that the creation of regulations around emotional enhancement technology should be driven by **medical professionals as well as independent organisations**.

There also ought to be **education** about the risks and benefits of each emotional enhancement technology so that people can make informed decisions about their use. In Greece, it was discussed that the government,

and other institutions such as schools, should be proactive in providing seminars and case studies on emotional enhancement technologies – including their risks and benefits.

Ultimately, whatever the legislation, **usage should always be voluntary and following informed consent.** Participants were adamant that under no circumstance should emotional enhancement be enforced upon people by the government, employers, or schools.

In Greece, participants also felt that there ought to be **strict governmental control over access** to ensure there is no black market or abuse.

6. Longevity human enhancement technology

6.1 Introduction

For the purpose of the discussions, longevity HET was defined as **interventions that increase the length of a person's life or delay deterioration of the body and mind.**

The focus for usage was placed on four areas:

- **Stopping or slowing the ageing process:** examples provided included vaccines, memory enhancement and gene editing.
- **Improving a person's ability to survive or recover from harm or damage:** examples provided included synthetic skin, advanced tissue engineering and exoskeletons.
- **Preventing or lessening the negative effects of disease or disability:** examples provided included anti-ageing drugs and allowing a person to communicate without a body through computer systems or robots.

Only participants in **Poland and Spain** discussed longevity enhancement technology. All discussions were structured as follows: participants were asked what they thought longevity human enhancement meant, and what they associated with it. They were then probed about what they thought it would be used for. Following this, participants were given some stimulus material which provided some definitions of longevity HET, as well as some examples of use, benefits and limitations. These then informed the rest of the discussion, and therefore form the context under which to interpret the following findings.

The full content of the stimulus on longevity human enhancement can be found in the Appendix 5.

A key finding was that participants did not understand that human enhancement technologies refer specifically to improving the capabilities of 'healthy' human beings beyond what is deemed 'normal'. Instead, they often combined references to health treatments and enhancement, seemingly not distinguishing between them. They chose to focus on and prioritise clinical applications in their discussions. It is important to read the findings in this report within this context.

6.2 Awareness and understanding of longevity human enhancement technology

Ahead of the workshops, participants were asked how familiar they were with technologies that enable people to live longer, and most commonly said they were unfamiliar with the technology.

To start the workshop discussion, participants in both countries were asked about their awareness and understanding on longevity HET, and where this derived from. There was **low awareness** of longevity enhancement technology in Spain and Poland but participants **correctly associated it with lengthening life**. Top of mind associations ranged from natural remedies (exercise, healthy eating) to enhancement technologies (gene editing, transplants, plastic surgeries, cryonics). In Spain, the concept was also linked to the right to euthanasia and palliative care.

> *"Each of us wants to live as long as possible and to enjoy life." (Poland)*

Despite this, and like cognitive and emotional enhancement technology, the concept of longevity technology was **perceived as very abstract** in both countries, and participants struggled to understand how it would work in practice and what the purpose was.

> *"It's a totally abstract territory for me." (Poland)*

Awareness of longevity enhancement primarily came from movies, the media and the internet. Science documentaries were also mentioned in Spain. **Most technology areas introduced were surprising to participants.**

Following discussions about top of mind understanding and awareness of longevity HETs, participants were provided with some information about the topic to help move the conversation along. In it, longevity enhancement was defined as **interventions that increase the length of a person's life or delay deterioration of the body and mind**. Participants were also provided with some information about the types of longevity HETs that exist, some specific usage, as well as some benefits and risks around it.

6.3 Response to longevity human enhancement technology

Ahead of the workshops, participants most commonly felt 'excited' and 'hopeful' about technologies to enabled people to live longer, followed by 'curious'. By the end, most participants felt 'curious', while fewer felt 'excited'.

6.3.1 Benefits of longevity human enhancement technology

Overall, participants were only able to identify a small number of benefits of longevity HET. Like the other HET areas discussed in this report, the main benefits mentioned in both countries related to healthcare. Longevity enhancement was deemed beneficial when it was used for medical purposes, to help individuals live a longer and better life when they had a medical condition.

Overall, Spain was slightly more positive than Poland. Spanish participants mentioned the possibility of lengthening and improving people's quality of life as a benefit. They mentioned organ transplants, anti-ageing drugs and vaccines as beneficial, although it was stressed that they ought to be taken under medical supervision. Exoskeleton technology was also deemed beneficial under the premise that it would improve the patient's life. Polish participants were more sceptical overall but also mentioned the corrective or preventative medical purpose of longevity enhancement as beneficial. Advanced tissues technology and exoskeleton were perceived as useful to help rehabilitate and reconstruct lost organs. In Poland, vaccines were already considered as part of everyone's life, and were deemed completely normal to use, and beneficial if they were not imposed on people against their will.

Other benefits mentioned differed between the two countries. In Spain, some participants thought that longevity enhancement would have a positive impact on state spending, by reducing costs for healthcare. However, this was a controversial area, and more people thought that the impact on state spending would be negative, rather than positive (outlined in the next section).

> *"It reduces healthcare costs, hospital won't be so full." (Spain)*

In Poland, some participants also valued the possibility of retaining memories, as individuals tend to forget a large part of what happens in their lives. However, this was a controversial area, and participants were split between those who found this appealing, and those who did not.

> *"I don't remember 90% of my childhood, and it would be great to watch it in the form of a film." (Poland)*

6.3.2 Concerns of longevity human enhancement technology

While few benefits were mentioned, participants raised a range of concerns about longevity enhancement technology. Concerns can be split into three spheres: individual, national and global.

Individual concerns

There was concern about the correlation between living longer and having a good quality of life. Participants did not want a longer life if they were not able to enjoy it and be both physically and mentally fit. Participants feared living longer if they were not healthy, if they suffered from illness or from any physical or mental

degradation that prevented them from being independent and doing what they loved. In Poland, participants were also concerned that living longer would mean working for longer, which did not seem appealing to them.

> *"My father-in-law died at 102. Until 100, he took care of himself. The other two years, he was bedridden and unbale to do anything." (Spain)*

> *"My mum passed away at the age of 91 and her last years were horrible." (Poland)*

Participants stressed that dying is part of the circle of life, and that as such it goes against nature to make people life longer. The benefits of living longer to see offspring was mentioned, but participants felt that people could not live forever and wondered about the purpose of making people live longer, and up to what point it made sense.

> *"Why live so long?" (Poland)*

> *"This goes against nature." (Spain)*

In Spain, participants felt that longevity enhancement would create a dependency on technology, for the sole profit of pharmaceutical companies.

National concerns

During the discussion, participants in Poland and Spain were asked about the implications they felt longevity enhancement technology would have on society and specifically on the size of the elderly population. This was a concern to participants, who mentioned the strain that a growing elderly population would put on the state, in terms of costs for pensions and healthcare. Participants felt that enabling people to live longer was unsustainable for the state, and that there were not enough resources for this to happen – both financially and in terms of people to take care of the elderly. Participants were also concerned about the cost for the working population of supporting the elderly, in terms of increasing taxes to pay for their pensions, or time taken to care for relatives.

> *"If the non-working population is double the size of the working population then it generates problems with resources, economics etc." (Spain)*

As for the other technology areas discussed during the workshop, participants in Poland and Spain were also concerned about creating a two-tier society, where only the wealthy would be able to afford the technology, and therefore would be the only ones benefitting from it.

This was also perceived as a threat because it could result in increased discrimination against the elderly, and people with disabilities generally. Polish participants also mentioned the risk of inter-generational conflicts due to the increasing age gap, and the existing difficulty for people from different generations to interact.

> *"It poses a possible increase in negative perceptions towards people with disabilities." (Spain)*

> *"The elderly don't easily get along with the youth." (Poland)*

Overall, there was confusion about the purpose and value of longevity enhancement technology and it was not seen to be necessary or particularly desirable.

Global concerns

Overall, participants were concerned about the impact that people living longer would have on global resources. It was stressed that the planet already 'suffers' from overpopulation and depletion of resources, and that longevity enhancement would only aggravate this. Some participants stressed that the birth rate was low in Europe, and this was therefore not a risk.

"It affects the planet's sustainability." (Spain)

6.4 Views on mitigation

This section reports on discussions held with the participants about what measures they wanted to see in place to address their concerns about longevity enhancement technologies. We note that these findings are limited due to the short amount of time allocated to this discussion, which would be more substantial in truly deliberative work and the findings should therefore be read as highly tentative. We also note that these views are not presented as Kantar (Public Division) or SIENNA's recommendations, but as reporting of participant views.

Overall, participants felt that, outside of vaccines or other health-related technology, longevity enhancement technology was not an area that would greatly benefit society. As such, there were questions about why society would need to focus on its development, outside of profiting pharmaceutical companies. This could be linked to a general lack of understanding of how longevity enhancement would work, what they would look like, and the benefits they would offer.

Participants agreed that longevity enhancement technology should always be used voluntarily, and that participants should be fully informed beforehand of possible risks associated with use.

In Poland, participants thought that general supervision was needed to ensure that people did not live forever and risk injuring themselves in the process. They also thought there should be supervision on the development of the technologies, to mitigate potential risks. However, in both Poland and Spain, participants were unsure about who should be mitigating their concerns, or who should be responsible for setting regulations around longevity enhancement technologies.

7. Results and discussion

7.1 Summary of findings

The results in this report should be read with reference to and in the context of the limitations set out in Section 2.4. The results serve as indicative findings about public attitudes to HET and should be treated as a starting point for further academic research and analysis to build from. They should not be read in isolation and should be read with reference to the other reports that have been produced as part of the SIENNA project. This project has been conducted by a social research agency and not academic researchers. The report lacks contextualization of the results with relevant academic literature to further understand the meaning of the results for the field. Clearly, each discussion group could and should be more deeply analysed to fully understand their meaning and how this pushes our understanding of public views toward AI and robots further. Ideally such further analysis will be conducted by academic partners through academic publications.

Overall, HET was seen as a complex and controversial technology area. A key finding was that participants did not understand that that human enhancement technologies refer specifically to improving the capabilities of 'healthy' human beings beyond what is deemed 'normal'. Instead, they often combined references to health treatments and enhancement, seemingly not making the difference between them. **It is key that this underlies the findings in this report.**

Views about comfort with and acceptability of the applications varied substantially across the four different HET strands, with physical HET being the most acceptable and longevity HET being the least acceptable, because participants struggled to understand why people would want to live for significantly longer, especially if it could not be guaranteed that they would be in full health – both physically and psychologically. Participant views about each of the HE technology areas were, and participants tended to be concerned about similar applications across the countries.

Overall, top of mind awareness and understanding of the HET areas discussed was low. Participants were more aware of physical enhancement, because some of the applications, such as performance enhancing drugs, cosmetic surgery and prosthetics were more familiar to them – many participants either used some, heard of, or read about some in the media. Other areas felt more abstract, and participants struggled to understand how applications would work in practice. This feeling persisted in most cases despite reading through the stimulus material and examples.

Across the four enhancement areas discussed, participants felt that the main benefits revolved around healthcare. The technologies were deemed more positive when they helped repair or improve people who suffer from severe illness or disability, whether physical or psychological. Even within the field of healthcare, benefits were deemed most important for physical enhancement, due to the already established ability to repair people through use of prosthetics, implants or surgery. For other areas, health benefits were acknowledged, but were outweighed by the number of concerns that people had. Overall, it was felt that enhancement should only take place if there is a medical need for it. It was not seen as acceptable to enhance oneself beyond what is 'normal'. As such, the benefits of HET were only perceived outside of the definition of the term, that it to say outside of improving the capabilities of otherwise healthy human beings.

HET areas raised various concerns. While some differed between technology areas, the main ones were common across physical, cognitive, emotional and longevity. These can be grouped between individual concerns and societal concerns.

Individual concerns:

Individual concerns can be grouped into two categories: physical and psychological.

- **Physical risks**: across all four HET areas participants were concerned about the impact that applications, and especially invasive applications, could have on individuals. They were particularly concerned about unanticipated side effects and long-term effects, pointing out that in most instances the applications have either been recently developed or are currently being developed, and that as such it is impossible to know their full impact and all of the possible risks associated with them.
- **Psychological risk**: participants commonly feared that people will become dependent on these technologies, and that this will create addiction. There was concern that using technology to enhance oneself will lead people on a never-ending search for perfection, which means that they will rely on technology for their well-being and sense of self-worth. This could in turn have a negative impact on their health, through the increased use of technology.

Societal concerns:

A range of concerns were raised about the impact that HET areas could have on society:

- **Unequal access**: there was concern about access to HET. Participants were worried that only the wealthy would be able to afford the technologies, and this would give already powerful individuals increased means of control over peers.
- **Inequality**: linked to unequal access, participants were concerned about the impact that HET could have on fairness within society. They were worried about some people being given unfair advantage over others, and that this would, in turn, increase competition between people – and in turn increase dependency and usage of technology. Linked to that, participants were concerned that individuals who refuse to use technology or cannot afford to use it will be discriminated against.
- **Creation of a 'superhuman' race**: there was concern about society becoming more artificial and homogeneous, with everyone looking, performing and behaving the same way. As such, participants were concerned about creating a world where the 'self' is lost, were individuality is controlled by technology which makes you act or feel a certain way based on norms subjectively created by whoever will have the power to decide how people should feel, how they should perform, what they should look like, and how long they should live for.

Overall, due to the risks associated with HET, participants felt that use must to be voluntary and that people should be fully informed about possible risks – both short and long-term. For all invasive applications, that is to say for applications that enter the body, it was discussed that these should be authorised by medical professionals and done where there is medical need. For non-invasive applications, such as night visions goggles or exoskeleton, medical supervision was not deemed necessary. Due to the potential risks, participants also felt that use on children should be strictly limited to severe medical cases, and that use should be authorised by parents as well as medical professionals.

For all HET areas, regulation was thought to be necessary, although participants were not sure what this ought to look like beyond the creation of an independent committee made up of various experts and parties to ensure that all views are considered in the development of this regulation. Overall, participants felt that regulation should be strictest for invasive applications, such as drugs and devices that enter the body, to limit

the risk of abuse and subsequent detrimental health impacts. They felt that non-invasive devices did not need as stringent regulation, because their possible impact on people's health was less.

7.2 Key themes

Five themes emerged from the analysis regarding public attitudes to HET:

1. Understanding
2. Consent
3. Purpose
4. Invasiveness
5. Impact

These areas impacted on how acceptable each HET was to participants and can help us understand why some of the technologies were more acceptable than others. Acceptability of the technology areas is associated with the perceived need for more or less strict regulation, as well as who each HET should be available to. The findings below are ranked by importance, but it should be noted that they are interrelated, and that most of them impact on each other.

1. **Understanding**

Most HETs felt abstract to participants. Except for some of the applications of physical enhancement, such as performance drugs, cosmetic surgery and prosthetics, most applications for cognitive, emotional and longevity enhancement raised a lot of questions from participants, and as such a lot of concerns. It was often stressed that people would need to be educated about the technologies so that they could make informed decisions about whether to use them or not. Understanding was thought to be less important for non-invasive technologies – technologies that do not enter the body – these include night vision goggles and exoskeleton. For these, it was felt that the risks were not as high as for applications that entered the body – such as drugs or medical procedures. It should be stressed that increasing understanding might not increase acceptability, but lack of understanding was associated with low acceptability. For now, the workshops highlighted that people misunderstood HET as a treatment to repair or reconstruct people rather than as a means to gain capabilities beyond that of 'normal' human beings.

2. **Consent**

Across all HET areas there was agreement that use of any HET should be voluntary and follow informed consent. Three types of consent emerged from the conversations:

- **Individual consent**: this refers to participants choosing to use HET. Participants were against technology being used against a person's will. There was a concern of abuse otherwise, and a fear that in some circumstances people in power would be able to force their subordinates to use HET – for instance a manager forcing their team to take cognitive enhancers to improve their productivity under threat of being fired, or a head of state forcing citizens to take emotional enhancers to control their behaviours under threat of incarceration.
- **Parental consent**: this refers to parents consenting to their children's decision to use HET. With regards to application on children, participants felt that this should never be enforced. The child, if old enough to understand what is happening, should give consent. But even if the child consents, parents should not be the only authority deciding whether a HET can or should be used on their child, this decision should be made in consortium with at least one medical professional. It was often discussed that both a doctor and a psychiatrist should give their consent for use on children.

- **Medical consent**: this refers to medical professionals authorising the use of HET. This was discussed in reference to children as well as adults. For children, as mentioned above, this was to ensure that it was indeed needed, but also that it would be unlikely to have negative repercussions. For adults, this was to ensure that there was no abuse, and that the use of HET is indeed needed. It was also to monitor impact – for instance to ensure that all goes well following a surgery.

3. **Purpose**

The purpose of the technology was key to determining its acceptability. This refers to the reason why the technology was developed, and the impact it is meant to have on people. As such, this relates to understanding, and it is key for people to know what the purpose of each application is. As discussed throughout the report, there are two types of technologies, those that are felt to be needed, usually for medical purposes, and those that are not felt to be needed, usually because they are not seen to have a medical purpose[4]. There are some exceptions, such as non-invasive devices used to enhance efficiency or skills in certain professions, such as night goggles and exoskeleton.

On the whole, technologies designed and used as treatment and/or for therapeutic use were more acceptable and perceived as more valuable – whether this was a physical or psychological need. There was greater acceptance of technologies which fixed or restored previous abilities, such as prosthetics – rather than those which address desire for enhanced abilities beyond what is seen as 'normal' and 'human'. There was also a desire for some technologies to be used short-term to help the pace of recovery. This was particularly the case for some emotional enhancement invasive technologies such as anti-depressants, which were seen as able to alleviate suffering while the person was also undergoing non-invasive treatment, like therapy.

4. **Invasiveness**

As discussed above, there were two types of applications: those that were invasive and those that were not. Participants did not refer to them as such, and did not consciously make the correlation between the level of invasiveness and their level of comfort with the technology. Rather, this was implicit in the examples they talked about, and their perceptions of these technologies.

There was overall a higher level of concern about invasive technology. This was linked to the perception that the risks to one's health were higher, because side effects and long-term effects were unknown. In contrast, participants felt that risks associated with non-invasive devices could be more easily mitigated. This also impacted perceptions of use. Overall, participants were reluctant for invasive technologies to be used unless there was a medical need for it. They felt that participants were unlikely to be fully aware of, or understand, the risks associated with use, and that doctors should therefore establish whether use was needed or not.

[4] This distinction is similar to that found on p16 of D3.1 State of the Art Review of Human Enhancement, namely the distinction found by a previous study on HET between "Restorative, preventative non-enhancing," "Therapeutic enhancement," and "Non-therapeutic enhancement."

Participants were less strict about the use of non-invasive devices, although there was a tendency to limit it to use in certain professions, where there was a need for it – such as the police using night goggles to catch criminals, or architects using augmented reality glasses to imagine a building. This finally impacted on perceived strictness of regulations around the technologies, with strict regulation being desired for invasive devices, and greater leniency for non-invasive technologies.

5. **Impact**

   Acceptability of HET was also driven by the extent to which the technology was associated with negative individual and social impacts. Some of the main concerns included:

   - **Physical impact on individuals**: Side-effects and long-term effects (thought to be currently unknown, thus tying back to the importance of education around the technology).
   - **Psychological impact on individuals**: There was a concern about addiction and dependency if technology use becomes more common and people become increasingly concerned about being 'perfect' – for instance wanting to be the highest performer, most beautiful or happiest.
   - **Impact on equality in society:** Participants feared unequal access to HET, with only the wealthy and/or powerful being able to afford or get hold of the technologies.
   - **Impact on tolerance in society:** Fear for diversity and inclusion, and discrimination against anyone who is different – for instance people with physical disability if everyone is physically enhanced, or with mental health problems if everyone is emotionally enhanced. This in turn might put pressure on people to use technology to fit in with society, even if they might not have wished to do so.
   - **Impact on sense of 'self' and identity**: This refers to technology impacting on individuality by homogenising people so that everyone looks, feels, thinks and acts the same.

Participants raised the importance of education to mitigate perceived negative impacts. They believed that some of these concerns, and especially those around side-effects and long-term effects, could be addressed by informing people, while other risks could be tackled through legislation – such as preventing overuse or offering equal access.

8. Appendices

Appendix 1 – Topic guide

Logistics

Location	Date	Timings	Location
Hamburg	Saturday 6th April	09:00-17:30	ms Teststudio, Ute Fehling, Mönckebergstraße 18, 20095 Hamburg
Paris	Saturday 6th April	09:00-17:30	LE PAVILLON DE CHESNAIE, Route de la Pyramide, 75012 Paris
Warsaw	Saturday 13th April	09:00-17:30	Centrum Konferencyjne Golden Floor Tower, ul. Chłodna 51; 00-867 Warszawa
Athens	Saturday 13th April	10:00-18:30	DIVANI CARAVEL HOTEL, 2 Vassileos Alexandrou ave. 16121 Athens
Madrid	Saturday 27th April	09:00-17:30	Hotel Puerta de América, Avenida de América, 41, 28002 Madrid

Topic guide

Background

Aim

- The aim of the panels is to engage citizens in deep consideration of the issues raised by three technologies (Human genetics and genomics; Human enhancement; and Artificial intelligence and robotics)

Primary objectives

- To explore and understand citizens' views of the technology areas and particular uses and applications
- To explore citizens' concerns about the three technologies (and specific applications) and how they would like these concerns to be addressed

Methodology

- Full-day Saturday citizens panels in five countries - held in the (main) national language
- Citizen panels provide a forum for discussion and deliberation of complex, sensitive and/or contentious topics on which it is important to gain a public view. They give members of the public the time, space and information they need to consider issues and express confident opinions.
- Deliberation begins by providing background information and obtaining participants' initial views. Over the course of the panel, experts provide information, informing participants' discussions. Discussions will build incrementally – first introducing basic principles, then looking at potential applications and issues of ethical and legal regulation. Discussions will start from the point of view of participants, allowing them to frame content, raise questions and identify concerns or areas of uncertainty. Stimulus materials will be used to encourage discussion and provoke debate.
- The day includes both plenary sessions and breakout group discussions where participants are split into five groups of 10 participants. The breakout groups will each comprise participants from a range of demographic groups and discuss each of the topics and respond to provided stimulus materials.
- Each panel will be moderator by x5 local KP moderators, with an additional x5 KP notetakers, with one moderator and one notetaker in each breakout group.

- 2-5 experts will attend each workshop

Materials

X1 Leader pack:

Client Research Observation and Monitoring Confidentiality Agreement	X1 (A4, black and white, single side)
Expert name badges	As required
Participant SIENNA audio recording consent forms	X54 (A4, black and white, single side)
Stickers	X54 (x5 different colours)
Incentives and signature sheets	X54
Participant questionnaires booklets	X54 (A4, colour, doubled sided, stapled)
Laptop and connector cable with the introductory presentation pre-loaded	X1
Flip chart pens	X3
Audio security confirmation form	X1 (A4, black and white, single side)

X5 Moderator packs <u>each</u> with:

Encrypted GDPR-compliant audio recorder	X1
Laptop with note taker template pre-loaded (for notetaker to use)	X1
Flip chart pens	X3
Pens	X11
Fictional segments	X11 (A4, colour, single sided)
Stimulus materials	X11 copies (A4, colour, doubled sided) EACH **SUB TOPIC** SHOULD BE SEPARATELY STAPLED (e.g. 'DRONES' should be **separate stapled** pack)

Topic guide

ALL TIMINGS MUST BE MOVED FORWARD BY ONE HOUR FOR ATHENS WORKSHOP TO START AT 10:00

1. 07:30 – 08:15: Set up by local Kantar team (45 mins)

2. 08:15 – 08:30: Kantar lead to brief expert(s) (15 mins)

PLENARY	**Timing**	**Stim**

2.1 Kantar local lead to brief experts
 	
• Introduce the venue (e.g. toilets, fire exit)
• Sign Observation agreement (Kantar lead to talk through requirements)
• Collect name badges
• Briefing points
  ○ Ask them to give a short introduction in the introductory plenary (4.1)
  ○ X1 experts to observe each break out group
  ○ Experts to circulate around the break out groups throughout the day
  ○ Experts only to answer questions during break out sessions when invited by the moderator
  ○ Experts should provide unbiased accurate, and up to date information and provide succinct answers and avoid the use of jargon and complex / academic language
	15 mins	**Name badges**
		
		Client observation agreement

3. 08:30 – 09:00: Participants arrive (30 mins)

REGISTRATION AREA – with coffee and biscuits (to be left out)	**Timing**	**Stim**
3.1 Registration • Register and receive incentive • Give a random sticker to allocate to a break out group (use 5 colours to ensure each group has a mix of demographics) • Sign consent form • Hand out questionnaire booklet	**30 mins**	**Signature sheet** **Incentives** **SIENNA audio recording consent forms**

○ Ask participants to complete Section 1 (pre-task) and Section 2 (pre-questionnaire) before the workshop starts		**Stickers** **Questionnaire booklet**

4. 09:00 – 09:20: Introductory plenary (20 mins)

PLENARY	**Timing**	**Stim**
4.1 Introduction • Welcome from Kantar lead moderator • Kantar local lead to give introductory presentation (USING SLIDES PROVIDED) • Experts to introduce themselves (name, role, university, area of expertise) • Introduce 'burning issues board' (where unresolved issues are written up to draw on-going conversations to a close) • Participants join their break out group (indicated by their sticker) • **KP moderator to check all participants have completed their pre-workshop questionnaire before they join their break out group**	**20 mins**	**Introductory presentation slides**

5. 09:20 – 09:40 Introductions (20 mins)

- **Experts split across the break out groups – they will observe and help answer any questions only when indicated by moderators**

BREAK OUT GROUPS	**Timing**	**Stim**
5.1 Moderator introduction • Moderator introduction – name, role • Reassure participants there are no right or wrong answers, this is not a test, and that we are interested in their views • Check whether they have any questions about the introductory presentation • Reiterate ground rules ○ Take turns, do not speak over each other, respect each other's views • Check permission for Kantar audio recording and begin audio recording	**10 mins**	

• Confirm participants give permission for the SIENNA experts to record the discussions and for them to analyse the data for academic publications. **5.2 Participant introductions** • Participants to briefly introduce themselves ○ First name, who they live with, any jobs or hobbies		

TOPIC ORDER TO ROTATE AS FOLLOWS:

	Paris	Hamburg	Athens	Warsaw	Madrid
TOPIC 1	Enhancement	AI & robots	AI & robots	Genomics	Enhancement
TOPIC 2	Genomics	Enhancement	Enhancement	AI & robots	Genomics
TOPIC 3	AI & robots	Genomics	Genomics	Enhancement	AI & robots

ROLE OF EXPERTS DURING THE BREAK OUT GROUPS:

- **One expert per group - where there are <5 experts – experts rotate between (not during) sessions**
- **Observe and help answer any questions only when indicated by moderators**

6. 09:40 – 11:40 Topic 1 (120 mins) – BREAK OUT GROUP

7. 11:40 - 12:00: BREAK (20 mins)

REGISTRATION AREA – with coffee and snacks (to be left out)	**Timing**	**Stim**
• Experts circulate and allow participants to ask them questions	**15 mins**	

8. 12:00 – 14:00 Topic 2 (120 mins) – BREAK OUT GROUP

9. 14:00 - 14:50: LUNCH (50 mins)

REGISTRATION / PLENARY AREA (venue dependent) – food and drinks to be left out	**Timing**	**Stim**
• Experts circulate and allow participants to ask them questions	**45 mins**	

10. 14:50 – 16:50 Topic 3 (120 mins) – BREAK OUT GROUP

11. 16:50 - 17:05: BREAK (15 mins)

REGISTRATION AREA – with coffee and snacks (to be left out)	Timing	Stim
• Experts circulate and allow participants to ask them questions	15 mins	

12. 17:05 – 17:20 Reflective session (15 mins)

- **Experts to observe and help answer any questions only when indicated by lead moderator**

PLENARY	Timing	Stim

KP TO RECORD THE PLENARY SESSION AND KEEP NOTES FOR THE ANALYSIS
 	
Set up x1 flipchart for each technology area and Kantar lead moderator to flip chart:
 	
• Any final questions **to experts**
  ○ Kantar moderator to ask experts if they have any response to the issues on the burning issues board
 	
• Briefly reflect on **key hopes and concerns** for each of the 3 technology areas [**REVERSE** the order you have discussed the topics today]
  ○ Briefly reflect on whether any of the four fictional segments may have different / additional concerns
 	
• Reflection on how they would like to see their concerns for each area mitigated
  ○ **Whose responsibility** it is to mitigate citizen concerns
  ○ **Whether and what role there is for the EU regarding regulation in these areas**
	20 mins	

• Overall – what are participants' **main concerns** about the development of technology in our society more generally	5 mins	
• Opportunity for experts to ask any final questions **to participants**	5 mins	

13. 17:20 – 17:30 Close (10 mins)

PLENARY	Timing	Stim

13.1 Close • Thank participants • Final questions • Confirm everyone has incentives	**2 mins**	
13.2 Questionnaires • Ask participants to complete the SECTION 3 (post questionnaire) of their questionnaire booklet (ASK PARTICIPANTS TO RETURN THESE TO THEIR BREAK OUT MODERATOR FOR ANALYSIS)	**8 mins**	Questionnaire booklet

14. 17:30 – 18:00 De-brief and clean up (30 mins)

	Timing	**Stim**

• Kantar lead moderator to lead de-brief with experts
  ○ What were the most interesting findings for each technology area
  ○ What, if anything, surprised them
  ○ What, if anything, will they do differently as a result of attending the workshop
  ○ Whether any changes need to be made to the guide or materials for future sessions
	15 mins	

• Kantar team clean up • Ensure that questionnaire booklets are returned **to the break out group moderator / notetaker** to be analyzed with their notes/recordings	**15 mins**	

IF AUDIO RECORDERS ARE NOT PASSWORD PROTECTED AND ENCRYPTED – TRANSFER AUDIO FILES TO ENCRYPTED LAPTOP AND KP LEAD TO SIGN THE AUDIO SECURITY FORM AND SCAN AND EMAIL THE FORM TO KP UK

Human enhancement (120 mins) – BREAK OUT GROUPS

SECTION 1: PHYSICAL ENHANCEMENT
CONDUCT WITH ALL COUNTRIES

30 MINS	Timing	Stim
1.1 AWARENESS AND ASSOCIATIONS • What are your associations with 'physical enhancement'– and why? • How aware were you of physical enhancement technologies before attending this workshop? ○ Sources of awareness	**5 mins**	

1.2 INFORMATION
 	
MODERATOR TO HAND OUT X1 COPY OF PHYS STIM 1,2,3 TO EACH PARTICIPANT AND TALK THROUGH
 	
• How do you now feel about the development and use of physical enhancement technologies in our society?
  ○ Athletic enhancement
  ○ Cosmetic enhancement
  ○ For therapeutic use
• Which examples are most and least acceptable – and why?
• What do you think are the main benefits?
• What are your main concerns?
	15 mins	**PHYS STIM 1,2,3**

1.3 PHYSICAL Moderator to explain that technologies can be used to physically enhance humans. • Which types of physical enhancement are you MOST and LEAST comfortable with – and why? • Which circumstances are you MOST and LEAST comfortable with physical enhancements being used and why? • Should physical enhancement be freely available in the market? Should anyone be restricted from using physical enhancement? ○ Children / young adults	**5 mins**	

1.4 PROSTHETICS AND WEARABLES Moderator to explain that prosthetics and wearables can be used to enhance physical capability. • Which types of are you MOST and LEAST comfortable with – and why? • Which circumstances are you MOST and LEAST comfortable with these being used and why? • Should they be freely available in the market? Should anyone be restricted from using them? ○ Children / young adults	**5 mins**	

SECTION 2: COGNITIVE ENHANCEMENT
CONDUCT WITH ALL COUNTRIES

30 MINS	**Timing**	**Stim**
2.1 AWARENESS AND ASSOCIATIONS • What are your associations with the term 'cognitive enhancement'– and why? • How aware were you of cognitive enhancement technologies before this workshop? ○ Sources of awareness	**5 mins**	
2.2 INFORMATION MODERATOR TO HAND OUT X1 COPY OF COG STIM 1,2,3 TO EACH PARTICIPANT AND TALK THROUGH • How do you now feel about the development and use of cognitive enhancement technologies in our society? • Which examples are most and least acceptable – and why? • What do you think are the main benefits? • What are your main concerns? • Would any of your views change if cognitive enhancement was only ever used as a treatment rather than by healthy individuals to improve their performance?	**15 mins**	**COG STIM 1,2,3**

○ Should cognitive enhancement be available to those without cognitive impairments ○ Should it be available freely in the market?		
2.3 LOCATION Moderator to explain (with reference to the stimulus materials) that cognitive enhancement could be used in schools and workplaces. • How acceptable would use in schools be to you? Why? ○ Are any use cases more acceptable? • How acceptable would use in the workplace be to you? Why? ○ Any variation by sector or profession? ○ Are any use circumstances more acceptable?	**5 mins**	
2.4 FAIRNESS/SOLIDARITY Moderator to explain that the use of cognitive enhancement could have implications on society more widely. • How concerned are you about cognitive enhancement affecting: ○ How fair society is ○ How people relate to each other in your society – for example how divided your society feels	**5 mins**	

SECTION 3A: LONGEVITY ENHANCEMENT CONDUCT IN POLAND AND SPAIN ONLY

30 MINS	**Timing**	**Stim**
3A.1 AWARENESS AND ASSOCIATIONS • What are your associations with 'technologies that increase life length'– and why? • How aware were you, if at all, of the idea of technologies that increase length of life before this workshop? ○ Sources of awareness	**5 mins**	

3A.2 INFORMATION AND ACCEPTABILITY MODERATOR TO HAND OUT X1 COPY OF LONG STIM 1,2,3 TO EACH PARTICIPANT AND TALK THROUGH • How do you now feel about the development and use of these technologies in our society? • Which examples are most and least acceptable – and why? • What do you think are the main benefits? • What are your main concerns? • How acceptable are the use of these technologies in our society?	**15 mins**	**LONG STIM 1,2,3**
3A.3 FAIRNESS/SOLIDARITY Moderator to explain that the use of longevity technologies could have implications on society more widely. • What types of implications for society could there be? ○ Do any of these concern you? • How concerned are you about them affecting fairness and equality in society? Why? • How concerned are you about them affecting solidarity in society? Why? • How concerned are you about these technologies increasing the size of the elderly population? Why?	**10 mins**	

SECTION 3B: EMOTIONAL AND AFFECTIVE ENHANCEMENT
CONDUCT IN GERMANY, FRANCE, GREECE ONLY

30 MINS	**Timing**	**Stim**
3B.1 AWARENESS AND ASSOCIATIONS • What are your associations with 'technologies that enhance emotional capabilities' – and why? • How aware were you of technologies that can enhance people's emotional capabilities before this workshop? ○ Sources of awareness	**5 mins**	

3B.2 INFORMATION AND ACCEPTABILITY MODERATOR TO HAND OUT X1 COPY OF EMOT STIM 1,2,3 TO EACH PARTICIPANT AND TALK THROUGH • How do you now feel about the development and use of these technologies in our society? • Which examples are most and least acceptable – and why? • What do you think are the main benefits? • What are your main concerns? • How acceptable are the use of these technologies in our society?	**15 mins**	**EMOT STIM 1,2,3**
3B.3 PSYCHO-PHARMACEUTICALS Moderator to explain that psycho-pharmaceuticals can be used to enhance emotional capabilities in children. • How acceptable do you find this – and why? • Do you have any concerns about this? • Are there any circumstances in which you feel comfortable with this?	**5 mins**	

3B.4 LOCATION
 	
Moderator to explain that psycho-pharmaceuticals could be used in schools and workplaces.
• How acceptable would use in schools be to you? Why?
  ○ Any variation by age groups?
  ○ Are any use cases more acceptable?
 	
• How acceptable would use in the workplace be to you? Why?
  ○ Any variation by sector / profession?
  ○ Are any use cases more acceptable?
	5 mins	

SECTION 4: FICTIONAL SEGMENTS
CONDUCT WITH ALL COUNTRIES

10 MINS	**Timing**	**Stim**

• Introduce/reintroduce participants to the fictional segments
 	
• Explore whether and how participants think any might feel differently about:
  ○ Any specific technologies – why?
  ○ Any of the benefits and concerns discussed – why?
  ▪ Any additional concerns they may have
	10 mins	**Fictional segments**

SECTION 5: MITIGATION
CONDUCT WITH ALL COUNTRIES

20 MINS	**Timing**	**Stim**

5.1 MITIGATION
 	
• Thinking about all the concerns you have about the human enhancement discussed: (MODERATOR TO REMIND PARTICIPANTS OF THE KEY CONCERNS DISCUSSED):
  ○ What would you like to see done to address your concerns
  ○ Do you think regulation is required – and what kinds?
  ○ Who do you think is responsible for addressing citizens' concerns?
 	
• What extra action might be required to address the concerns of the fictional segments?
	20 mins	

Appendix 2 – Experts attendance at the citizen workshops

Germany – Hamburg	France – Paris	Poland – Warsaw	Greece – Athens	Spain – Madrid
Lisa Tambornino, European Network of Research Ethics Committees (EUREC)	**Bernard Reber**, Sciences Po	**Zuzanna Warso**, Helsinki Foundation for Human Rights	**Maria Bottis**, Ionian University	**Javier Valls Prieto**, University of Granada
Saskia Nagel, University of Twente	**Roberto Gianni**, Sciences Po	**Emilia Niemiec**, Uppsala Universitet	**Maria Papaioannou**, Ionian University	**Ana Valverde**, University of Granada
Philipp Hoevel, European Network of Research Ethics Committees (EUREC)	**Alexandra Soulier**, Uppsala Universitet	**Konrad Siemaszko**, Helsinki Foundation for Human Rights (Observer)	**Marilena Siahou**, Ionian University	**Oscar Huertas**, Freelancer Communiation Granada Emprende
	Anaïs Rességuier, Trilateral Research (Observer)		**Martha Ioanna Stroumpou**, National Printing House in Athens	**Patricia Saldaña**, University of Granada

Appendix 3 – Pre and Post Questionnaire Results

The SIENNA Project Citizens' workshop: Pre-workshop questionnaire results

Q1 **How familiar are you with the technology? PLEASE TICK**								
	Very familiar	Quite familiar	Not very familiar	Not familiar at all	Excluded	No response	Total participants	**Valid participants**
Prosthetics								
France	9	17	21	1	0	5	**53**	**48**
Germany	2	6	22	20	0	0	**50**	**50**
Poland	2	11	21	13	0	3	**50**	**47**
Greece	8	5	20	17	0	0	**50**	**50**
Spain	7	13	18	12	0	0	**50**	**50**
TOTAL	**28**	**52**	**102**	**63**	**0**	**8**	**253**	**245**
Cosmetic surgery								
France	9	23	14	3	0	4	**53**	**49**
Germany	1	15	16	17	0	1	**50**	**49**
Poland	1	13	24	11	0	1	**50**	**49**
Greece	9	8	17	16	0	0	**50**	**50**
Spain	5	14	19	12	0	0	**50**	**50**
TOTAL	**25**	**73**	**90**	**59**	**0**	**6**	**253**	**247**
Technologies that make people more intelligent								
France	1	10	16	22	0	4	**53**	**49**
Germany	0	9	20	20	0	1	**50**	**49**
Poland	3	5	25	16	0	1	**50**	**49**
Greece	7	12	17	14	0	0	**50**	**50**
Spain	4	8	22	16	0	0	**50**	**50**
TOTAL	**15**	**44**	**100**	**88**	**0**	**6**	**253**	**247**
Technology that enables you to live for longer								
France	1	9	24	15	0	4	**53**	**49**
Germany	0	9	20	19	0	2	**50**	**48**
Poland	2	8	22	16	0	2	**50**	**48**
Greece	5	12	17	16	0	0	**50**	**50**
Spain	4	7	25	14	0	0	**50**	**50**
TOTAL	**12**	**45**	**108**	**80**	**0**	**8**	**253**	**245**
Technologies that help you control your emotions								
France	0	5	17	27	0	4	**53**	**49**
Germany	0	1	17	30	1	1	**50**	**48**
Poland	1	3	24	20	0	2	**50**	**48**
Greece	2	9	15	24	0	0	**50**	**50**
Spain	2	7	21	20	0	0	**50**	**50**
TOTAL	**5**	**25**	**94**	**121**	**1**	**7**	**253**	**245**
Technologies that improve peoples' moral value								
France	0	4	11	34	0	4	**53**	**49**

Germany	0	3	16	31	0	0	**50**	**50**
Poland	1	7	18	23	0	1	**50**	**49**
Greece	2	5	18	25	0	0	**50**	**50**
Spain	3	6	19	22	0	0	**50**	**50**
TOTAL	**6**	**25**	**82**	**135**	**0**	**5**	**253**	**248**

Q2 Which of these words describe how you feel about each of the technologies? PLEASE TICK										
	Excited	Hopeful	Curious	Neutral	Anxious	Scared	Angry	No response	Total participants	**Valid participants**
Prosthetics										
France	22	16	4	3	3	0	0	5	53	**48**
Germany	7	8	11	20	3	2	0	1	50	**49**
Poland	4	16	13	15	0	1	0	1	50	**49**
Greece	20	20	3	4	1	2	0	0	50	**50**
Spain	18	25	3	4	0	0	0	0	50	**50**
TOTAL	**71**	**85**	**34**	**46**	**7**	**5**	**0**	**7**	**253**	**246**
Cosmetic surgery										
France	10	6	9	13	9	2	1	3	53	**50**
Germany	3	8	13	16	7	2	0	1	50	**49**
Poland	7	11	12	14	0	2	2	2	50	**48**
Greece	8	14	7	20	0	0	2	0	50	**50**
Spain	10	14	7	16	0	0	3	0	50	**50**
TOTAL	**38**	**53**	**48**	**79**	**16**	**6**	**8**	**6**	**253**	**247**
Technologies that make people more intelligent										
France	7	5	11	6	9	6	5	4	53	**49**
Germany	1	8	18	8	9	7	0	0	50	**50**
Poland	4	13	17	6	4	3	1	2	50	**48**
Greece	9	12	17	1	10	4	1	0	50	**50**
Spain	15	9	15	1	3	6	1	0	50	**50**
TOTAL	**36**	**47**	**78**	**22**	**35**	**26**	**8**	**6**	**253**	**247**
Technology that enables you to live for longer										
France	13	5	11	6	6	4	4	4	53	**49**
Germany	5	11	11	6	9	7	1	0	50	**50**
Poland	8	17	12	4	2	2	2	3	50	**47**
Greece	16	17	8	3	4	3	1	0	50	**50**
Spain	20	12	11	1	0	5	1	0	50	**50**
TOTAL	**62**	**62**	**53**	**20**	**21**	**21**	**9**	**7**	**253**	**246**
Technologies that help you control your emotions										
France	6	1	13	4	9	6	10	4	53	**49**
Germany	1	6	9	7	17	8	1	1	50	**49**
Poland	5	8	18	5	6	3	2	3	50	**47**
Greece	2	7	12	9	7	13	4	0	50	**50**
Spain	10	6	20	5	1	5	3	0	50	**50**
TOTAL	**24**	**28**	**72**	**30**	**40**	**35**	**20**	**8**	**253**	**245**
Technologies that improve peoples' moral value										
France	5	3	14	5	10	2	10	4	53	**49**

Germany	1	6	10	10	16	8	1	0	50	**50**
Poland	1	12	17	7	6	2	2	3	50	**47**
Greece	7	10	18	6	5	2	6	0	50	**50**
Spain	9	14	12	4	3	6	2	0	50	**50**
TOTAL	**23**	**45**	**71**	**32**	**40**	**20**	**21**	**7**	**253**	**246**

The SIENNA Project Citizens' workshop: Post-workshop questionnaire

Q1 What kind of impact do you think each of these technologies will have on society? PLEASE TICK									
	Very positive	Quite positive	Neutral	Quite Negative	Very negative	Excluded	No response	Total participants	**Valid participants**
Prosthetics									
France	32	11	3	2	0	0	5	53	**48**
Germany	17	18	7	2	1	3	2	50	**45**
Poland	23	15	11	0	0	3	2	50	**45**
Greece	35	12	1	1	1	0	0	50	**50**
Spain	35	9	2	2	2	0	0	50	**50**
TOTAL	**142**	**65**	**24**	**7**	**4**	**6**	**9**	**253**	**238**
Cosmetic surgery									
France	5	21	12	5	5	0	5	53	**48**
Germany	10	20	11	5	1	0	3	50	**47**
Poland	7	20	17	3	1	0	2	50	**48**
Greece	13	19	13	3	2	0	0	50	**50**
Spain	17	17	11	3	2	0	0	50	**50**
TOTAL	**52**	**97**	**64**	**19**	**11**	**0**	**10**	**253**	**243**
Technologies that make people more intelligent									
France	3	12	11	15	7	0	5	**53**	**48**
Germany	2	10	11	20	5	0	2	**50**	**48**
Poland	3	26	14	5	1	0	1	**50**	**49**
Greece	8	13	11	9	9	0	0	**50**	**50**
Spain	8	26	8	6	2	0	0	**50**	**50**
TOTAL	**24**	**87**	**55**	**55**	**24**	**0**	**8**	**253**	**245**
Technology that enables you to live for longer									
France	10	13	12	12	1	0	5	53	**48**
Germany	6	10	12	15	4	1	2	50	**47**
Poland	6	23	13	6	1	0	1	50	**49**
Greece	16	14	8	8	4	0	0	50	**50**
Spain	15	21	9	2	3	0	0	50	**50**
TOTAL	**53**	**81**	**54**	**43**	**13**	**1**	**8**	**253**	**244**
Technologies that help you control your emotions									
France	4	7	9	14	14	0	5	53	**48**
Germany	1	6	13	13	14	1	2	50	**47**
Poland	6	21	15	5	2	0	1	50	**49**
Greece	3	7	10	10	20	0	0	50	**50**
Spain	2	21	14	8	5	0	0	50	**50**
TOTAL	**16**	**62**	**61**	**50**	**55**	**1**	**8**	**253**	**244**

Technologies that improve peoples' moral value									
France	2	6	12	14	13	0	6	53	**47**
Germany	1	8	11	20	8	1	1	50	**48**
Poland	8	18	15	6	2	0	1	50	**49**
Greece	6	10	13	9	12	0	0	50	**50**
Spain	9	22	13	4	1	0	1	50	**49**
TOTAL	**26**	**64**	**64**	**53**	**36**	**1**	**9**	**253**	**243**

Q2 Which of these words now describe how you feel about each of the technologies? PLEASE TICK										
	Excited	Hopeful	Curious	Neutral	Anxious	Scared	Angry	No response	Total participants	**Valid participants**
Prosthetics										
France	25	15	3	4	0	1	0	5	53	**48**
Germany	13	19	9	6	2	1	0	1	50	**49**
Poland	10	21	12	6	0	0	0	1	50	**49**
Greece	22	24	3	0	3	0	0	0	50	**50**
Spain	25	18	4	0	0	0	1	2	50	**48**
TOTAL	**95**	**97**	**31**	**16**	**5**	**2**	**1**	**9**	**253**	**244**
Cosmetic surgery										
France	7	11	8	11	3	4	1	8	53	**45**
Germany	7	14	9	16	4	1	0	1	50	**49**
Poland	6	13	15	10	3	1	0	2	50	**48**
Greece	6	21	5	15	1	1	2	0	50	**50**
Spain	9	15	8	10	0	2	4	2	50	**48**
TOTAL	**35**	**74**	**45**	**62**	**11**	**9**	**7**	**13**	**253**	**240**
Technologies that make people more intelligent										
France	4	4	14	9	7	6	4	5	53	**48**
Germany	2	5	11	9	14	7	0	2	50	**48**
Poland	4	12	17	7	5	1	1	3	50	**47**
Greece	5	7	12	8	9	11	5	0	50	**50**
Spain	6	19	13	2	2	5	1	2	50	**48**
TOTAL	**21**	**47**	**67**	**35**	**37**	**30**	**11**	**12**	**253**	**241**
Technology that enables you to live for longer										
France	7	5	13	5	11	3	2	7	53	**46**
Germany	5	8	7	12	10	7	0	1	50	**49**
Poland	4	13	19	5	5	2	1	1	50	**49**
Greece	11	18	7	3	5	7	3	0	50	**50**
Spain	9	15	14	3	0	6	1	2	50	**48**
TOTAL	**36**	**59**	**60**	**28**	**31**	**25**	**7**	**11**	**253**	**242**
Technologies that help you control your emotions										
France	2	3	9	7	10	7	10	5	53	**48**
Germany	1	2	6	9	15	8	6	3	50	**47**

Poland	5	17	9	8	4	4	2	1	50	**49**
Greece	3	4	8	5	7	14	15	0	50	**50**
Spain	4	15	10	4	3	8	4	2	50	**48**
TOTAL	**15**	**41**	**42**	**33**	**39**	**41**	**37**	**11**	**253**	**242**
Technologies that improve peoples' moral value										
France	2	4	5	10	10	5	11	6	53	**47**
Germany	1	3	7	12	14	9	5	1	50	**49**
Poland	4	12	15	10	3	2	3	1	50	**49**
Greece	6	5	10	8	9	12	6	0	50	**50**
Spain	6	15	12	4	3	6	2	2	50	**48**
TOTAL	**19**	**39**	**49**	**44**	**39**	**34**	**27**	**10**	**253**	**243**

Appendix 4 – Achieved Sample

	OVERALL TARGET	PER COUNTRY TARGET	PARIS	HAMBURG	WARSAW	ATHENS	MADRID	TOTAL
TOTAL								
5 workshops of 50 participants (OVER RECRUIT TO 54)	250	50	53	50	50	50	50	253
GENERAL POPULATION QUOTAS								
GENDER								
Female	Min 100	20	29	21	25	24	25	124
Male	Min 100	20	24	29	25	26	25	129
Other / prefer not to say								
TOTAL	Min 200	40	53	50	50	50	50	253
AGE								
18-24	Min 25	5	9	10	12	10	11	52
25-34	Min 25	5	15	11	8	8	12	54
35-49	Min 25	5	14	9	11	12	11	57
50-59	Min 25	5	7	9	10	10	9	45
60-69	Min 15	3	7	7	6	8	5	33
70+	Min 10	2	1	4	3	2	2	12
TOTAL	Min 125	25	53	50	50	50	50	253
EDUCATION LEVEL								

University degree or above (or equivalent)	Min 50	10	29	21	17	19	21	107
High school/senior school (or equivalent)	Min 50	10	17	18	21	23	19	98
Below high school/senior school Inc. vocational qualifications (or equivalent)	Min 50	10	7	11	10	8	9	45
No educational qualifications			0	0	2	0	1	3
TOTAL	Min 150	30	53	50	50	50	50	253
WORK STATUS								
Student	40	8	8	8	10	10	8	44
Working	75	15	30	23	24	25	27	129
Not working	40	8	8	10	8	7	9	42
Retired	40	8	7	9	8	8	6	38
TOTAL	195	39	53	50	50	50	50	253
OCCUPATION								
Professional, managerial or administrative job managing people	25	5	18	13	8	6	6	51
Professional, managerial or administrative job not managing people	25	5	13	8	11	20	14	66
Skilled manual job	25	5	7	8	9	7	5	36
Semi-skilled or unskilled manual job	25	5	7	13	10	8	16	54
Other			8	8	12	9	9	46
TOTAL	100	20	53	50	50	50	50	253

ETHNICITY								
White			[redacted]	44	44	49	41	178
Non-white (Inc. Roma)	20	Min 5 Germany, Min 7 Spain, Min 3 Poland, Min 5 Greece	[redacted]	6	6	1	9	22
TOTAL	20	Min 3	[redacted]	50	50	50	50	200
MINORITY GROUP (FRANCE ONLY)								
Feel they belong to a minority group due to the country they or their parents were born in	7	Min 7 France	7	[redacted]	[redacted]	[redacted]	[redacted]	7
TOTAL	7	Min 7	7	[redacted]	[redacted]	[redacted]	[redacted]	7
RELIGION								
Catholicism	100	20	22	1	32	0	29	84
Orthodox Christianity			1	0	5	42	0	48
Protestantism			1	0	0	0	0	1
Islam			2	3	3	1	3	12
Judaism			1	0	0	0	0	1
Sikhism			0	0	0	0	0	0
Hinduism			0	0	0	0	0	0
Buddhism			2	1	0	0	0	3
Other			2	17	1	0	0	20
No/Agnostic/atheist	25	5	22	28	9	7	18	84

TOTAL	125	25	53	50	50	50	50	253
AREA OF RESIDENCE								
Urban (city)	Min 25	Min 5	16	32	33	30	29	140
Suburban (suburbs of city)	Min 25	Min 5	27	13	7	19	14	80
Rural/Semi rural (town or village)	Min 19	Min 3 France, Min 3 Germany, Min 3 Greece, Min 5 Spain, Min 5 Poland	10	5	10	1	7	33
TOTAL	Min 69	Min 3	53	50	50	50	50	253
LIFE STAGE								
Not parent	25	5	34	29	22	27	27	139
Parent	50	10	19	21	28	23	23	114
Total	75	15	53	50	50	50	50	253
INTERNET SCALE								
More negative (1-3)	60	12	10	12	12	12	12	58
Medium	60	12	10	16	12	17	13	68
Positive	60	12	33	22	26	21	25	127
TOTAL	180	36	53	50	50	50	50	253
VULNERABLE GROUPS QUOTAS								

10 Participants from Vulnerable Groups	50	10	19	15	40	10	10	94
CHRONIC PHYSICAL CONDITIONS								
Heart disease	5	1	0	1	2	0	0	3
Stroke			0	0	0	0	0	0
Chronic Obstructive Pulmonary Disease (COPD)			0	6	2	0	0	8
Emphysema and other respiratory conditions			0	0	0	0	0	0
Arthritis (including gout or fibromyalgia)			0	0	3	0	0	3
Asthma			0	0	1	0	0	1
Cancer			1	0	2	1	1	5
Osteoporosis			0	0	2	0	0	2
Kidney and or liver conditions			0	0	1	0	0	1
Epilepsy			0	0	0	0	0	0
High blood and or high cholesterol levels			0	0	8	1	0	9
Lupus			0	0	0	0	0	0
Glaucoma			0	0	2	0	0	2
Thyroid condition			1	0	2	0	0	3
Other			0	0	4	0	0	4
TOTAL	5	1	2	7	29	2	1	41
MENTAL HEALTH CONDITIONS								
Anxiety	5	1	1	0	2	0	0	3

Depression (including post-natal depression)			2	6	5	1	0	14
Panic attacks			1	0	0	0	0	1
An eating disorder			2	0	2	0	0	4
Obsessive Compulsive Disorder (OCD)			4	0	0	0	0	4
Asperger's Syndrome			0	0	0	0	0	0
Post-Traumatic Stress Disorder (PTSD)			0	0	0	0	0	0
Phobia(s)			1	0	0	0	0	1
Bipolar or other personality disorder			0	1	0	0	0	1
Schizophrenia and psychosis			0	0	2	0	1	3
Self-harm			0	0	0	0	0	0
Suicidal thoughts or attempted suicide			0	0	0	0	0	0
Other			0	0	2	0	0	2
TOTAL	5	1	11	7	13	1	1	33
PLEASE NOTE HERE WHO HAS EACH CONDITION (participant, partner, parent, child, step child, sibling, family member living at home at the time of the condition) (e.g. anxiety = participant, depression = participant's sibling)	**Paris:** 1 x participant = depression (themselves), OCD (themselves); 1 x participant = depression (relative), panic attacks (relative) OCD (themselves);1 x participant = anxiety (themselves), eating disorder (themselves), phobia (themselves) ; 1 x participant = OCD (themselves), eating disorder (themselves); 1 x participant = OCD (themselves) **Hamburg:** 1 x participant = bipolar disorder (themselves); 1 x participant = manic depression (themselves) and cardiac insufficiency (themselves); 1 x participant = depression (themselves), Multiple Sclerosis (themselves), Diabetes (themselves), Skin allergy (themselves); 1 x participant = depression (themselves) and Crohn's disease (themselves); 1 x participant = depression (themselves), arthrosis (themselves); 1 x participant = depression (themselves); 1x participant = depression (themselves) **Warsaw:** 1 x participant = depression (participant), depression (partner); 1 x participant = Eating disorder (child), 1 x participant = Autism (child); 1 x participant = Anxiety (participant), eating disorder (child), Schizophrenia (relative); 1 x participant = Autism (child); 1 x participant = Anxiety (parent), depression (parent); 1 x participant = depression						

	(participant); 1 x participant = depression (relative); 1 x participant = depression (child); 1 x participant = schizophrenia (sibling) **Athens:** 1 x participant = depression (themselves) **Madrid:** 1 x participant = schizophrenia (son), psychosis (son)							
GENETIC DISORDERS								
Cancer	5	1	0	2	11	0	1	14
Type 1 Diabetes			0	1	5	0	0	6
Cystic Fibrosis			0	0	0	0	0	0
Crohn's Disease			0	0	0	0	0	0
Haemophilia			0	0	0	0	0	0
Down's Syndrome			0	0	0	1	0	1
Thalassemia			0	0	0	0	0	0
Sickle Cell Anaemia			0	0	0	0	0	0
Huntingdon's Disease			0	0	0	0	0	0
Tay-Sachs			0	0	0	0	0	0
Angelman Syndrome			0	0	0	0	0	0
Type 1 Neurofibromatosis			0	0	0	0	0	0
Tuberous Sclerosis			0	0	0	0	0	0
Autosomal Dominant Polycystic Kidney Disease (ADPKD)			0	0	0	0	1	1
Duchenne Muscular Dystrophy			1	0	0	0	0	1
Fragile X Syndrome			0	0	0	0	0	0
Edward's Syndrome			0	0	0	0	0	0
Patau's Syndrome			0	0	0	0	0	0
Turner Syndrome			0	0	0	0	0	0
Klinefelter's Syndrome			0	0	0	0	0	0

Other			1	1	0	0	0	2
TOTAL	5	1	2	4	16	1	2	25
PLEASE NOTE HERE WHO HAS EACH CONDITION (participant, partner, parent, grandparent, child, step child, sibling, family member living at home at the time of the condition) (e.g. diabetes = participant, cancer = participant's parent)	**Paris:** 1 x participant = myopathy (child), myopathy (child's father); 1 x participant = Duchenne muscular dystrophy (niece) **Hamburg:** 1 x participant = Meniere's disease (themselves); 1 x participant = cancer (other person); 1 x participant = factor V Leiden thrombophilia (themselves); 1 x participant = diabetes (other person) **Warsaw:** 1 x participant = cancer (participant), type 1 diabetes (parent); 1 x participant = cancer (parent), cancer (siblings); type 1 diabetes (relative); 1 x participant = cancer (partner); 1 x participant = cancer (parent); 1 x participant = cancer (parent); 1x participant = cancer (parent); 1 x participant = cancer (partner), type 1 diabetes (partner); 1 x participant = cancer (participant) cancer (parent), cancer (siblings); 1 x participant = cancer (partner); 1 x participant = cancer (relative); 1 x participant = type 1 diabetes (parent); 1 x participant = type 1 diabetes (parent); 1 x participant = cancer (parent) **Athens:**1 x participant = Down's Syndrome (child) **Madrid:**1 x participant = cancer (themselves); 1 x participant = Crohn's disease (themselves), Autosomal dominant polycystic kidney disease (child)						
GENETIC CONCERN								
Cancer			0	2	6	1	0	9
Type 1 Diabetes			0	1	2	0	0	3
Cystic Fibrosis			0	0	0	0	0	0
Crohn's Disease			0	0	0	0	0	0
Haemophilia			0	0	0	0	0	0
Down's Syndrome			0	0	0	0	0	0
Thalassemia			0	0	0	0	0	0
Sickle Cell Anaemia			0	0	0	0	0	0
Huntingdon's Disease			0	0	0	0	0	0

Tay-Sachs			0	0	0	0	0	0
Angelman Syndrome			0	0	0	0	0	0
Type 1 Neurofibromatosis			0	0	0	0	0	0
Tuberous Sclerosis			0	0	0	0	0	0
Autosomal Dominant Polycystic Kidney Disease (ADPKD)			0	0	0	0	0	0
Duchenne Muscular Dystrophy			0	0	0	0	0	0
Fragile X Syndrome			0	0	0	0	0	0
Edward's Syndrome			0	0	0	0	0	0
Patau's Syndrome			0	0	0	0	0	0
Turner Syndrome			0	0	0	0	0	0
Klinefelter's Syndrome			0	0	0	0	0	0
Other			0	1	0	0	1	2
Total			0	4	8	1	1	14
PLEASE NOTE HERE WHO THE CONCERN WAS ABOUT (participant, partner, parent, grandparent, child, step child, sibling, family member living at home at the time of the condition) (e.g. diabetes = participant, cancer = participant's parent)	**Hamburg:** 1 x participant = cancer (other person); 1 x participant = cancer (other person); 1 x participant = diabetes (other person); 1 x participant = other (other person) **Warsaw:** 1 x participant = cancer (child); 1 x participant = cancer (participant); 1 x participant = cancer (participant); 1 x participant = cancer (partner), type 1 diabetes (parent); 1 x participant = cancer (participant); 1 x participant = cancer (participant); 1 x participant = type 1 diabetes (parent) **Athens:** 1 x participant = cancer (partner) **Madrid:** 1 participant = autism (son)							
DISABILTIES								

Vision (e.g. impaired vision, macular degeneration, blindness)	10	2	0	1	10	0	1	12
Hearing loss			1	0	3	0	0	4
Learning difficulties (including dyslexia and dyspraxia)			1	4	4	1	0	10
Impaired mobility			0	0	5	1	0	6
Breathing problems (reduced stamina, severe fatigue)			0	0	1	0	0	1
Dexterity			0	0	0	0	0	0
Other			0	0	1	0	1	2
TOTAL	10	2	2	5	24	2	2	35
PLEASE NOTE HERE WHO HAS EACH CONDITION (participant, partner, parent, grandparent, child, step child, sibling, family member living at home at the time of the condition) (e.g. impaired vision = participant's grandparent; hearing loss = participant's grandparent; impaired mobility = participant's sibling)	**Paris:** 1 x participant = hearing loss (themselves); 1 x participant = learning difficulties (themselves) **Hamburg:** 1 x participant = arthropathic (themselves); 1 x participant = walk with walking stick (themselves); 1 x participant = slipped disc (themselves); 1 x participant = arthropathic (themselves) 1 x participant = other (themselves) **Warsaw:** 1 x participant = vision (participant); 1 x participant = vision (participant), hearing loss (participant); 1 x participant = vision (participant); 1 x participant = cerebral palsy (child); 1 x participant = learning difficulties (child), breathing problems (partner); 1 x participant = vision (participant); 1 x participant = vision (participant); 1 x participant = learning difficulties (participant); 1 x participant = vision (participant); 1 x participant = vision (parent), learning (child), impaired mobility (child); 1 x participant = impaired mobility (participant); 1 x participant = impaired mobility (relative); 1 x participant = vision (participant); 1 x participant = impaired mobility (child); 1 x participant = learning difficulties (sibling); 1 x participant = vision (participant); 1 x participant = impaired mobility (participant); 1 x participant = hearing (parent); 1 x participant = vision (participant); 1 x participant = hearing loss (participant) **Athens:** 1 x participant = learning difficulties (participant), dyslexia (participant); 1 x participant = Impaired mobility (participant)							

	Madrid: 1 x participant = retinitis pigmentosa (child); 1 x participant = Disabilities caused in childbirth (child); 1 x participant = Polio (relative)							
IMMIGRATION								
At least one of my parent was born outside of this country	10	2	2	16	2	3	2	25
Born outside of this country	5	1	5	1	10	3	4	23
TOTAL	15	3	7	17	12	6	6	48
BASIS OF VULNERABILTY								
I am a refugee or asylum seeker	15	3	0	0	0	0	0	0
I am not fluent in the main language of this country			1	0	0	0	0	1
I do not feel fully confident reading or writing in the main language of this country			0	0	1	0	1	2

60+ years old			1	0	0	0	0	1
Low educational attainment			0	4	3	1	0	8
Unemployed			0	4	3	1	0	8
Semi-skilled or unskilled job			0	0	2	1	1	4
From a non-white ethnic group (Germany, Poland, Spain, Greece)				0	6	0	1	7
Feel they belong to a minority group due to the country they or their parents were born in (France only)			6					6
From a minority religious group in this country			2	2	3	0	0	7
TOTAL	15	3	10	10	18	3	3	44

Appendix 5 - Stimulus Materials

Fictional segments

John

- Age 72
- Lives alone in a French village since his wife died – and his children and young grandchildren visit occasionally
- Is beginning to develop dementia and has hip pain from his old job in a factory that make it harder for him to walk in the future
- Has regular check-ups with his doctor but this is a long bus ride away

Isabella

- Age 50
- Married with three teenage children
- A senior executive of a large social media company in Berlin
- Very busy with her work and family
- Has recently learned that she has high cholesterol

Elias

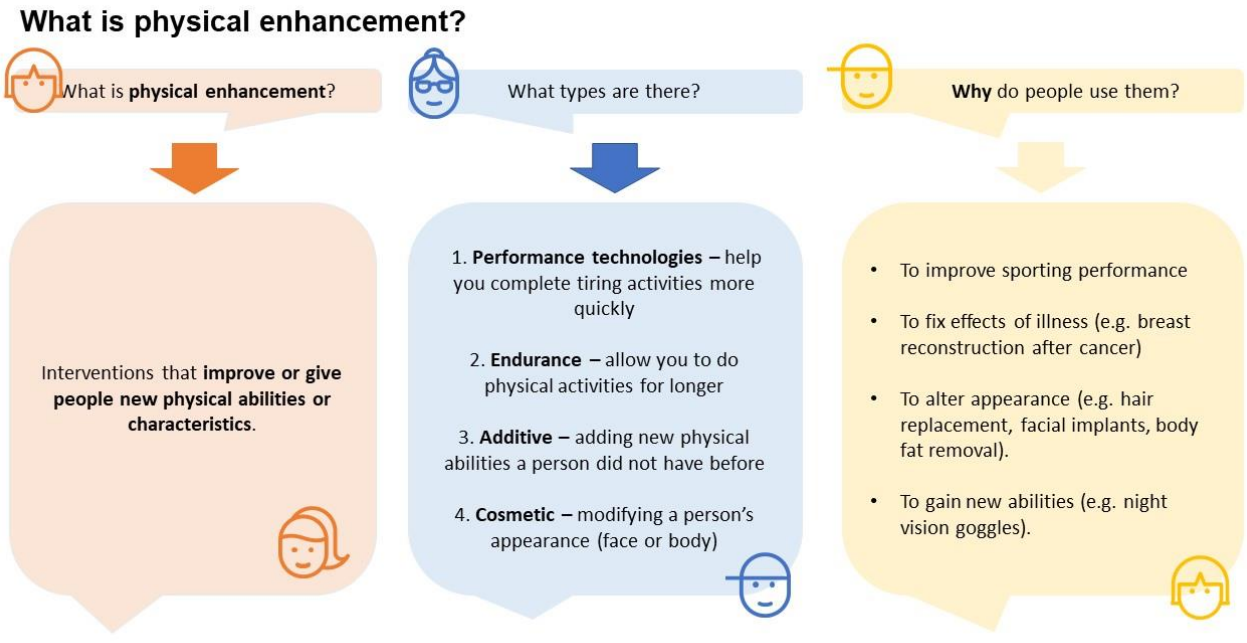
- Age 21
- Greek and studying abroad at a university in Warsaw
- Has thalassemia – a genetic blood disease which often makes him tired, feel weak and have trouble breathing
- Feels very anxious about falling behind with his studies
- Misses his family back in Greece

Fahima

- Age 34
- Arrived in Barcelona from Pakistan two years ago with her two young children
- Unskilled worker in numerous jobs including cleaning and delivering fast food on a bike
- Wants to start her own fashion business but waiting for a bank to assess her loan application.

FICTIONAL SEGMENTS

Physical enhancement



PHYS STIM 1

What types of physical enhancement are there?

Athletic

- **Increase muscle strength**
- **Build endurance** (e.g. run marathons quicker, swim faster, cycle for 12 hours)

Prosthetics

- **Change in appearance** to improve the way on feels about oneself (e.g. cosmetic surgery)
- **Replace a missing body part / restore its functions** (prosthetics and wearables)

Cosmetic

- **Reconstruct or repair the body after injury** (i.e. skin reconstruction following severe burns)
- **Reconstruct or repair the body after illness** (e.g. breast reconstruction following cancer)
- **Change your appearance** (e.g. liposuction or botox)

Military

- **Increase performance and endurance** (e.g. run quicker or walk for longer)
- **Provide additional skills or tools** (e.g. use night vision goggles)
- **Restore physical appearance following injury** (e.g. rebuild skin or organs, prosthetics)

PHYS STIM 2

Benefits?

- Improve physical capabilities beyond what is currently possible
- Enable recovery following physical injuries
- Allow those with illnesses to recover lost abilities
- Build confidence

Risks?

- Drug addiction
- Illegal usage
- Criminal usage (e.g. to change faces)
- Focus on 'perfection' could reduce acceptance of differences

Ethical questions?

- Should physical enhancement be available to healthy people?
- Should children be allowed to use physical enhancers?
- Should they be freely available in the market?
- Will physical enhancers make society less accepting of differences?
- Could people become dependent / addicted to them?

PHYS STIM 3

Cognitive enhancement

What is cognitive enhancement?

What is cognitive enhancement?

Interventions to **improve people's ability to get and process knowledge**.

What types are there?

- **Intelligence –** improved critical thinking, memory, or reasoning (e.g. when studying for an exam)
- **Clarity –** improved concentration (e.g. keeping focused longer at work)
- **Creativity –** improved inventiveness and artistic abilities (e.g. inspiration for musicians)

What are current and future uses?

Currently used to improve concentration.

Future development focuses on:

- **Improving brain capabilities** at any age
- Helping people **solve complex problems**
- Being more **innovative**
- Be **more strategic**
- Brain to brain **communication** regardless of native language

COG STIM 1

What are some examples of cognitive enhancers?

Healthcare

A **brain-computer interface** allows communication between the brain and a computer.
E.g.: to **control prosthetic arms/legs** with the brain.

Education

Psycho-pharmaceutical drugs can improve brain abilities, such as memory, focus and the ability to **do difficult mental activities**.
E.g. to make it **easier to concentrate**.

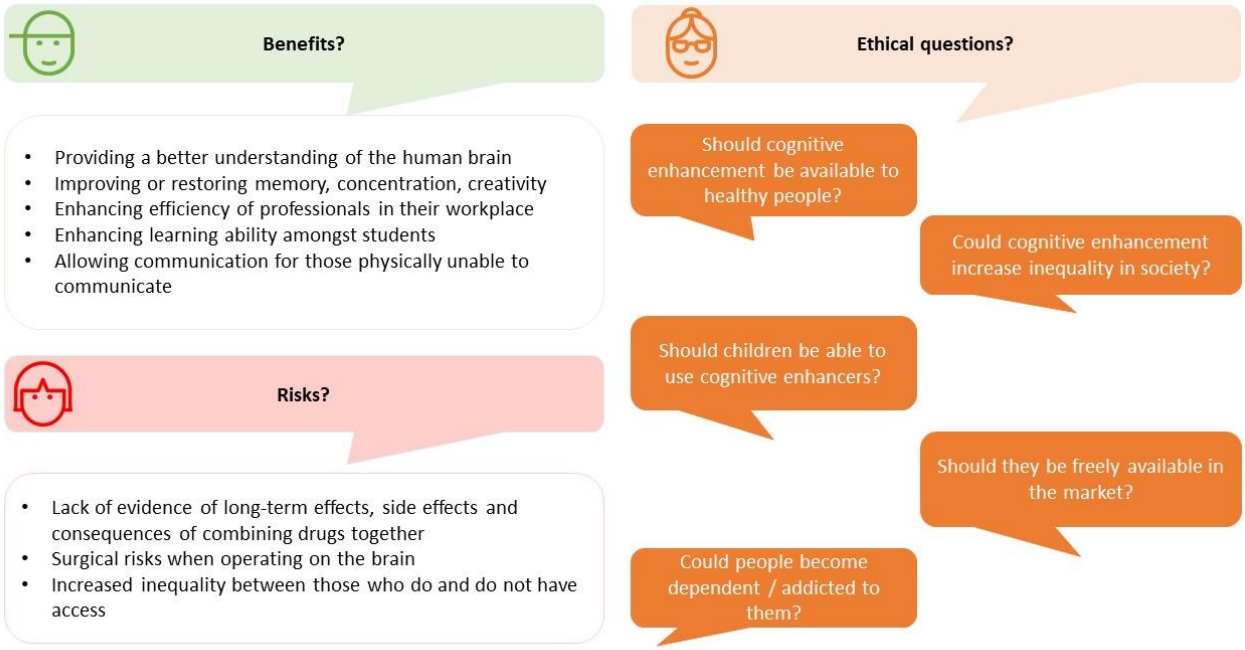
Workplace

Virtual-reality and **augmented-reality** devices **show a different reality**.
E.g.: to **visualise** what a building will be like before construction

Home or recreation

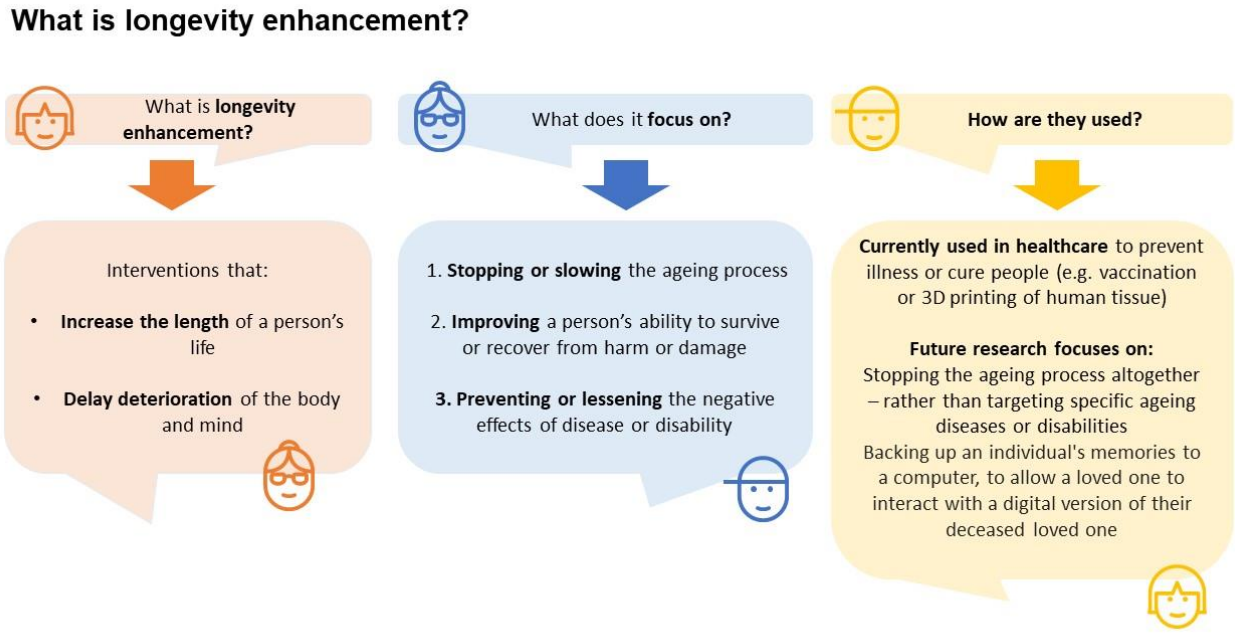
Neuro-stimulation modifies brain activity.
E.g.: improving **language** and **mathematical learning**, or enhancing **memory**.

COG STIM 2



COG STIM 3

Longevity enhancement



LONG STIM 1

What are some examples of longevity enhancers?

Preventing or reducing the effects of disease or disability

Vaccines – prevent diseases (from the common cold to the Zika virus).
Memory enhancement – make people able to remember more information (e.g. a brain device to boost memory).
Gene therapy and gene editing – modify DNA in people or unborn babies to prevent or cure diseases (e.g. HIV, malaria, cancers and genetic conditions).

Slowing or stopping aging

Anti-aging drugs – stop or delay the body and mind from aging and reduce risk of age-related illnesses (e.g. Alzheimer's).
'Uploading' a person's brain – allow the person to communicate without a body through computer systems or robots

Improving survival, recovery and harm avoidance

Synthetic skin – replace or improve skin (e.g. making 'chameleon-like' colour-changing skin to help camouflage).
Advanced tissue engineering – create or mend organs and bones (e.g. 3D printing organs for transplant patients).
Exoskeletons – wearable devices placed to increase, reinforce, or restore human movement and reduce the risk of injury (e.g. helping limping people walk better).

LONG STIM 2

Benefits

- Increase length of life and improve quality of life
- Delay body and mind deterioration
- Prevent genetic diseases
- Prevent or cure diseases

Risks?

- Overpopulation
- Increased strain on food and water resources
- Increased need for pensions, social care, housing and healthcare for more elderly people
- Potentially increased negative perceptions of old people and people with disabilities

Ethical questions?

Should everyone be allowed to live longer?

What could be the impact of increasing lifespan and the elderly population on society?

Could these technologies increase negative feelings about people with disabilities?

Should they be freely available in the market?

Should this technology be used on children?

LONG STIM 3

Emotional enhancement

Benefits?

- Reducing fear and improving well-being
- Helping people control their emotions better
- Improving social cohesion by increasing people's ability to understand one another
- Helping people do 'the right thing'

Risks?

- Reducing motivation to do things you feel less positive about
- Decreasing individuality if everyone experiences the same emotions
- Increasing bias in decision-making
- Increasing recklessness by reducing fear
- Lack of evidence about long term impacts

Ethical questions?

Who decides what is right and wrong?

Who should these technologies be available to, if anyone?

What would be the impact on society if people could choose what emotions to feel?

Should people be allowed to choose how they feel on demand?

Who decides which emotions are 'good' and 'bad'?

EMOT STIM 3

What are some examples of emotional enhancers?

Reducing fear

Making people **less scared** in a specific situation, or helping **recovery from traumatic experiences.**
E.g.: helping soldiers feel less scared before battle

Increasing empathy

Better understanding of the experiences of others
E.g.: making a bully at school understand what it is like to be bullied

Helping decide what is right or wrong

Helping people **decide if actions are right or wrong**, or what should be done in a situation
E.g.: increasing understanding of what a crime is amongst prisoners

Increasing happiness

Helping healthy people **feel happier**
E.g.: making children happy to do their homework

EMOT STIM 2

9. References

Kvale, Steinar., *Interviews: An Introduction to Qualitative Research Interviewing*, Sage, Thousand Oaks, CA: Sage, 1996

Ritchie, Jane, Liz Spencer, and William O'Connor, "Carrying out Qualitative Analysis", in Jane Ritchie and Jane Lewis (eds.), *Qualitive Research Practice: A Guide for Social Science Students and Researchers*, Sage, London, 2003, pp219-262.

Spencer, Liz, Jane Ritchie, and William O'Connor, "Analysis: Practices, Principles and Processes" Jane Ritchie and Jane Lewis (eds.), *Qualitive Research Practice: A Guide for Social Science Students and Researchers*, Sage, London, 2003, pp219-262.