Ethical Guidelines in Virtual Reality: Towards a Code of Conduct in Research

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The use of Virtual Reality (VR) opens new possibilities in research and training and helps create situations that cannot or must not be realized in real life. Before using it, it should be analyzed from an ethical point of view. This handout summarizes and explains several important principles regarding the ethical use of VR technologies, namely the equivalence principle, non-maleficence, privacy, informed consent, preservation of autonomy, transparency and dual use. Additionally, it provides an overview of potential harms together with guidelines concerning the implementation of VR experiments.

General Principles

Research in the field of psychology should be governed by the established ethical guidelines, also if new technologies such as VR are used. In the spirit of *Lex specialis,* new issues inherent to the use of VR will be addressed through more specific guidelines, but still the foundation comes from broader ethical codes of conduct such as the ones provided by the British Psychological Society (BPS) or the American Psychology Association (APA).

Concretely, the APA suggests five core principles for ethical research:

- Benefice and non-malevolence
- Fidelity and Responsibility
- Integrity
- Justice
- Respect for people's rights and dignity

Similar to that, the BPS formulates the following principles of ethical human research:

- Respect for autonomy, privacy and dignity of individuals and communities
- Scientific integrity
- Social responsibility
- Maximizing benefit and minimizing harm

The last principle includes the specification that "(w)here risks arise as an unavoidable and integral element of the research, robust risk assessment and management protocols should be developed and complied with. Normally, the risk of harm must be no greater than that encountered in ordinary life […]". This hints at the overall and simplest principle "Do no harm!" from which we can derive all other ethical principles. Applied to the case of VR we can formulate following maxim (Madary, 2016):

> "No experiment should be conducted using Virtual Reality with the foreseeable consequence that it will cause serious or lasting harm to a subject."

Specific Principles

Starting from this maxim and the general principles, we analyse the special features of VR in an attempt to derive more specific rules of conduct. The summary of current research about the ethical challenges of VR yields seven principles for the use of VR (Chirokoff, 2017; Madary, 2016; Pan, 2018):

1. Equivalence principle (Ramirez, 2018)

If it would be wrong to subject a person to an experience then it would be wrong to subject a person to a virtually real analogue of that experience. As a simulation's likelihood of inducing virtually real experiences in its subject increases, so too should the justification for the simulation's use.

It is important to remember that this concerns experiences with high context-realism, because unnatural environments have fewer parallels to the real world, that is, this principle does not touch situations in VR that might be questionable but would never occur in reality.

2. Non-maleficence

No experiment should be conducted using VR with the foreseeable consequence that it will cause involuntary suffering or serious or lasting harm to a subject.

The evaluation of the principle of non-maleficence needs extensive knowledge about the potential dangers of VR, and researchers must always keep themselves informed about new risks due to novel insights into VR. A first collection of possible harms is provided in the next part of this handout.

3. Privacy

Users ought to be made aware of new kinds of data collection such as reading out "motor intentions" or a "kinematic fingerprint" during avatar use. The researcher must ensure the informed consent of the subject on the topic of privacy as well as prevent any misuse of gathered data.

4. Informed consent

Informed consent for VR experiments ought to include an explicit statement to the effect that immersive VR can have lasting behavioural influence on subjects, and that some of these risks may be presently unknown. Experimental VR research should not be carried out on subjects who are incapable of delivering informed consent.

5. Preservation of autonomy

Certain virtual environments and especially embodiments in VR can induce changes of one's attitudes during or after the experiment. Changes of perception after re-entry into the real world also affect decisions of the participant. The researcher must be aware that these effects can infringe the autonomy of the participant.

6. Transparency

In experimental work and when new applications are still developed, researchers should be careful not to create false hopes in participants by repeatedly reminding them of the merely experimental nature of the research.

7. Dual use

Torture in VR is still torture. The fact that one's suffering occurs while one is immersed in a virtual environment does not mitigate the suffering itself. Researchers must be aware of potential misuses of the technology.

Potential Harms of VR

This section describes the potential harmful effects that can affect the participant of a VR experiment and some possible solutions to minimize the risks. The researcher must be aware that this list is not complete and has to be expanded in the future. (Behr, 2005; Kolasinski, 1995; Pan, 2018; Schultheis, 2003; Spiegel, 2018)

- VR-Sickness:
  General discomfort, headache, stomach awareness, nausea, vomiting, pallor, sweating, fatigue, drowsiness.
  → Possible solution: High framerates, room-scale VR, fixed frame of reference, high refresh rates, motion through teleportation

- Eye strain

- Impaired balance

- Disorientation

- Seizures

- Depersonalization/ Derealisation

- Information overload:
  Amount of available information exceeds user's ability to process it. Stress, impaired judgement.
  → Possible solution: Limit the complexity of environments and scenarios used in an experiment

- Intensification of experience:
  Stronger perception of experiments than in regular laboratory settings. Possible to exceed of the tolerable limits of psychological stress.
  → Possible solution: Avoid unsettling or exiting environments

- Re-entry problems:
  Mismatch between real emotions and moods after the experiment and the only virtual reasons during the experiments. Perception of own body (hand-eye coordination), distance or speed may be distorted which can lead to dangerous situations during e.g. driving. Furthermore, participants can confuse real life knowledge and knowledge gained inside VR.
  → Possible Solution: Provide the participant with the possibility to settle down after the experiment

- Physical damage of surroundings
  → Possible Solution: Using spacious and secure surroundings, room-scale VR
- Reactions to stressful virtual situations as if they were real (Virtual Pit)
  → Possible solution: Informing the participant that one can close the eyes or say a safe-word to stop the experiment

- Gathering and storing sensitive / personal data about the participant (without informed consent)

- False Hope:
  Participants may believe that the technology is more capable than it really is and be disappointed if the expected effects do not occur
  → Possible solution: Briefing the participants about the known effects

- Change of behaviour during the experiment (Proteus Effect)

- Change of behaviour after the experiment and psychological manipulation
  → Possible solution: Debriefing after the experiment

We must notice that the risks of involuntarily changing the behaviour of the participant during or after the experiment can also be beneficial in context of learning or training. Still, the scientist has to ensure informed consent and must evaluate the possible benefits against the potential risks.

Practical Guidelines for Implementation of VR Experiments

Every new setting requires a re-evaluation of the before mentioned ethical principles to check for possible violations. Nevertheless, there exist some general guidelines to mitigate the possible risks of VR. This last part of the handout lists the current best practices for conducting an experiment in VR (Autodesk, 2017; Behr, 2005).

Experimental procedures

- Informing participants about the possible adverse effects of the experiment
- Presence of an experimenter during the procedure who can stop the experiment and assist participants
- Supporting participants to re-enter the real world after the experience (e.g., by providing tasks to distract them after the experiment)
- Debriefing of the participants and offering opportunities to share their experience after the experiment
- Monitoring the setup in terms of noise levels and unobstructed mobility
- Stopping the experiment in case of any harmful effects

<u>Contents of the VR-experience</u>

- Avoiding invoking negative emotions as fear, anger or disgust; creating milder versions of these stimuli if needed
- Objects inside the VR environment should be slow or at higher altitudes
- Avoidance of extreme or unusual movements within the VR environment
- Adaptation of exposure time and movements with high velocity changes dependent on subject's familiarity with the environment

<u>Selection of participants</u>

- Screening for susceptibility to motion sickness; making sure that the subject has not taken any substances that increase motion sickness
- Screening for phobias that may be related to the contents of the environment, e.g. claustrophobia, acrophobia
- Participants should have a sufficient level of understanding about the functionality of a VR system

<u>Exclusion from VR experiments</u>

- Tiredness, sleep deprivation, alcohol/drug use, emotional stress/anxiety, headaches, earaches, dizziness, cold, flu, visual impairment
- Allergies to the material of the equipment

Conclusion

The scientific use of VR offers new possibilities for research but creates new ethical concerns and possible harms for participants. More research about the effects of VR exposure is needed. Until now, these guidelines and principles are just recommendations that can assist in designing and implementing experiments using VR and may result in an elaborated code of conduct in the future.

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