

Ethical considerations and advisory regarding 3D-printed reproductions of human tissues

Background: Technological advances have allowed reproduction of human body parts via 3D printing. These anatomical reproductions can be useful educational adjuncts. Because 3D printed body parts arise from body donors and other bodies acquired by anatomy departments, anatomists should be aware of the ethical issues surrounding their manufacture and use.

Domains of Ethical Relevance:

- **Consent:** Did consent specifically include 3D printing. Other issues include permission to commercialize or distribute prints or associated data, and consent considerations common to anatomical donation such as identification or disposition.
- **Social license:** To some persons, and in some cultures, the generation of digital data and 3D reproduction of their body or body parts is contrary to their beliefs. The existence of social license, or social approval of generating or using 3D prints, should be considered when making decisions around scanning and 3D printing.
- **Appropriate use:** While 3D prints are not made of human tissue, they are derived from human tissue and should be afforded an appropriate level of dignity and respect. For example, a 3D printed bone being used to educate children in a school setting will probably require different management and standards compared to printed reproductive organs or faces being used in tertiary education scenarios.
- **Commercialization:** The commercialization of 3D printed body parts should be carefully examined when encountered, as there is the potential for it to be interpreted as a form of exploitation. Copyright around scans and prints should be explored to ensure use is lawful.
- **Commodification:** The commodification of 3D prints, or treating these as mere ‘items’, is ethically problematic if it reduces the dignity and respect of the original persons. Appropriate oversight, handling, and management of 3D printed items is important.
- **Appropriate use of digital data:** Since 3D prints are based on data arising from a person it is prudent to adopt good ethical management around these data. This includes transparency around the acquisition, use, storage, distribution, and destruction of these data.

Conclusion: Being aware of ethical issues will help support ethical anatomical practice and promote appropriate, respectful, and dignified use of 3D printed body parts. Individual settings and circumstances guide how 3D prints are most appropriately utilized, with the understanding that the type of 3D print and the setting of their use will provide the context for ethically appropriate management on a case-by-case basis.

Further reading: Deane AS, Byers KT. A review of the ethical considerations for the use of 3D printed materials in medical and allied health education and a proposed collective path forward. *Anatomical Sciences Education*. 2024 Sep;17(6):1164-73.