

## Psychological and emotional benefits of 3D printed MRI models of the fetus for high-risk preterm birth pregnancies: assessment of feasibility and study design

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3D ultrasound models are known to positively contribute to **parental-fetal bonding and outcomes for perinatal anxiety and depression** for mothers with high-risk pregnancies or experiencing a loss.

### CONTRIBUTIONS - Assessment of:

- the feasibility of **printing 3D fetal models from MRI**
- the acceptability of the printed models and the incorporation of feedback from patients at **high risk of preterm birth**

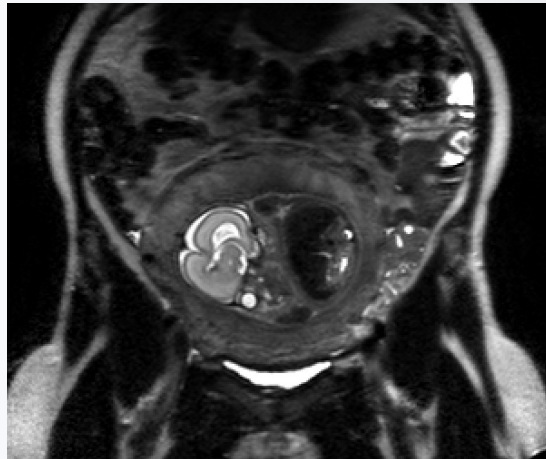
### METHODS:

- The pilot dataset includes **3 MRI scans of high-risk preterm birth cases** from the **“MRI studies for prediction of risks of adverse neonatal outcomes in preterm birth”** study [REC: 21/SS/0082] acquired on 3T MRI scanner at St. Thomas’ Hospital, London.
- **3D printing:** Deep learning segmentation of T2 MRI stacks was used to create 3D surface models. 3D printing of model in 50-75% of the real size was done using plastic materials on Ultimaker printer.
- **Feedback collection:** Clinicians asked the mothers if they would like to have the 3D model of their baby, and if they would like to share feedback informally.

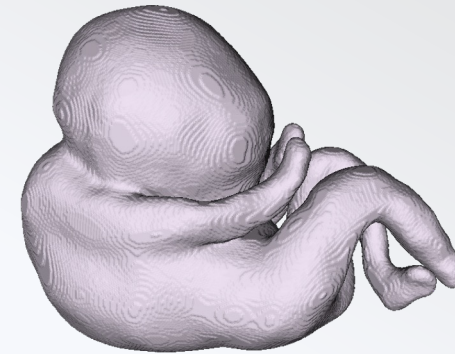
Quote from one of the participants:

*'Thank you also for the 3D print of Noah. I have placed it in a display dome and look at it daily.'*

T2w 3T MRI stack



3D segmentation-based surface model



3D printed model (75% of real-life size)



### RESULTS:

We successfully segmented MRI images and **printed 3D models for high-risk cases** (3-5 hours per ~10 cm in height model).

The written and verbal **feedback from the mothers was positive**. It suggested that a 3D MRI models of a baby could be a **meaningful emotional token and support for parents**.

A **formalised questionnaire protocol was incorporated into the study ethics** based on open-ended questions to qualitatively assess the **psychological benefits for antenatal anxiety, depression and fetal-maternal attachment**.