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Audio-Motio Tachograph: A New Device for Assessing Fetal Brain Function in Low-Income Facilities

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A new device for assessing fetal brain function in low income facilities

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Background

- Medical imaging with ultrasound and MRI can provide rich knowledge on the developing fetus
- However, these tools are expensive and not accessible to many people in low income countries
- Our goal is to create an affordable device that will assess fetal brain function
- We will do this by measuring changes in fetal movement and heart rate in response to sounds

Objectives

- ***To develop a wearable device for measuring fetal responses***
- ***Proof-of principle: Do fetuses discriminate different complex sounds? Can we measure fetal learning and memory?***

Audio-Motio Tachograph

- Prototype of lightweight, wearable device able to record fetal movement
- Strain-sensing fabric was used to measure deformation of the abdomen.

Image 1

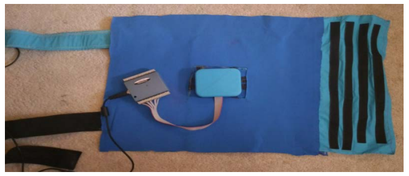
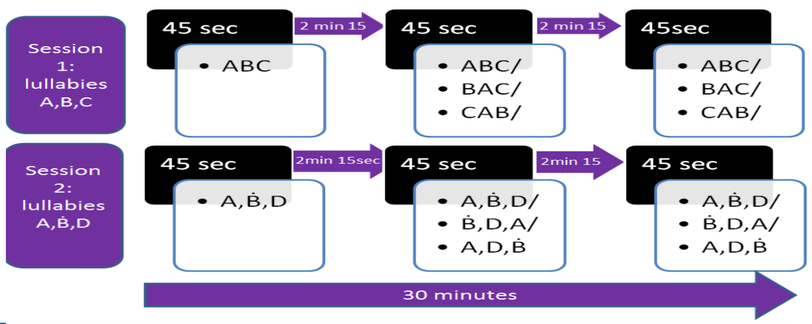


Image 2

Methods

42 healthy pregnant women at 32 to 38 weeks of gestational age at **Gahini Hospital, Rwanda/Africa** were recruited and tested after their informed consent was obtained.



Signal Analysis

- The sensors record movements that come from a mixture of sources, including maternal breathing, maternal posture adjustment, and fetal movement.
- These sources have different patterns in time, and so can be separated to some degree using a frequency analysis
- As they are not perfectly regular, and are sometimes clustered in time, we used a *wavelet transform.*

Preliminary Results

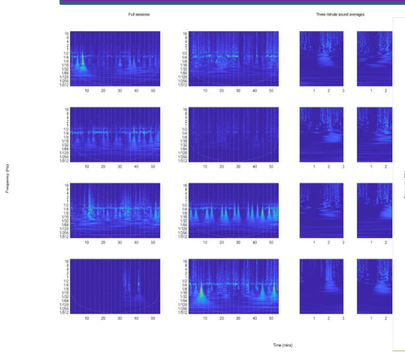


Figure 1

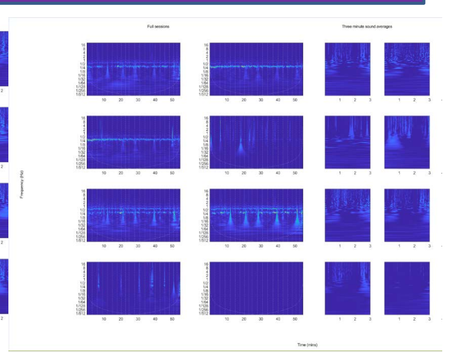


Figure 2

- The device was sensitive to movement and detected maternal breathing in most of our participants
- In some mothers, fetal movement was also seen at the offset of sounds.
- This suggests that fetus responded to acoustic stimuli by an increase in fetal activity.

Conclusions

- The results are a proof-of-principle that an affordable, wearable device, recording for a relatively long period of time can detect sound-evoked fetal movement.
- However, we believe increased sensitivity is possible with improvements in the design of the device.
- Future recording and testing will then evaluate which brain functions can be probed with this method.