

In the race for safer, more reliable fetal monitoring continues

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Credit: Eindhoven University of Technology

Pregnancy is a major life event for most parents-to-be. Usually pregnancy proceeds without incidents, however, complications can occur. In those cases, fetal monitoring can be lifesaving.

Cardiotocography (CTG), the most frequently used method for fetal monitoring, has been implemented for more than fifty years, but its ability to accurately diagnose fetal distress is low. The race for safer and more reliable fetal monitoring technology during pregnancy and labor is still ongoing. TU/e researcher Lore Noben investigated the use of another method—fetal electrocardiography—with promising results. She defended her thesis on March 19th.

Due to recent advances in signal processing techniques, scientific interest in transabdominal fetal electrocardiography (FECG) has been revived. In FECG, an electrode patch is placed on the abdomen of the mother so that the fetal heart rate, the maternal heart rate, and uterine activity can be monitored non-invasively.

For her research, Noben first considered the role of transabdominal fetal electrocardiography for fetal monitoring during pregnancy and labor. During labor, FECG seems to provide a more accurate and reliable alternative to CTG, based on Doppler ultrasound. Furthermore, she found that performance measures are not influenced by the body mass index (BMI) of the [pregnant woman](#). This is essential to consider given that the prevalence of obesity is increasing in modern society.

The use of FECG was also explored in certain high-risk pregnancies such as twin pregnancies and pregnancies complicated with [preterm birth](#) and fetal growth restriction. Noben showed that manual separation of both individual fetuses in a twin [pregnancy](#) is possible, enabling monitoring of both fetuses with one electrode patch. This is a first step towards continuous monitoring of these high-risk pregnancies with FECG.

Besides continuous fetal heart rate monitoring, fetal electrocardiography provides beat-to-beat information of the fetal heart rate. This facilitates spectral analysis of fetal heart rate variability (FHRV), which is an

important indicator of fetal wellbeing.

Noben also studied fetal heart rate variability parameters in both threatened preterm labor as well as growth-restricted fetuses. She found that corticosteroids for fetal lung maturation in threatened preterm labor led to a transient decrease in FHRV. This is an important finding as it can prevent unnecessary medically indicated (preterm) birth. In fetal growth restriction, a decrease in fetal activity based on [fetal heart rate variability](#) parameters was found.

Finally, Noben explored the use of FECG for the diagnosis of congenital [heart](#) disease (CHD). Initial results from this study proved to be promising, and will serve to stimulate further research with regards to fetal electrocardiography characteristics that can be used to raise prenatal detection rates in the future.

Noben's research provides a number of encouraging perspectives on transabdominal [electrocardiography](#). It allows for more insight into the physiological background of several frequently occurring complications in pregnant women, and could aid in the diagnosis and follow-up of fetal compromise. According to Noben, this technology is a solid competitor in the race for safer fetal [monitoring](#).

Provided by Eindhoven University of Technology

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