



Novel Method of Feto-Maternal Monitoring Using Music Therapy - A Non-Stress Test

Sarwan Kumar*
Research Scholar,
Centre for Biomedical Engineering,
Indian Institute of Technology Delhi
pahuja@gmail.com

Amit Sengupta
Professor
Centre for Biomedical Engineering,
Indian Institute of Technology
Delhi, India

Sneh Anand
Professor
Centre for Biomedical Engineering,
Indian Institute of Technology,
Delhi, India

Abstract: Music changes physiological state for the better by relaxing people. This also contributes to patient treatment through music therapy. Music is widely used for various purposes, such as music application as entertainment, or back ground music in workplace to ease workers load. Music is considered to ameliorate physiological states as it relaxes people. It contributes to the treatment of patients since people appreciate it and use it for music therapy. In this paper the music therapy was given to the pregnant women to record the fetal movement non-invasively using pressure sensor. This is a novel and alternative (other than ultrasound) attempt of a non-stress test (NST) in which heart rate increases because of fetus movements during trimester pregnancy. Also the increase in heart rate was verified with ultrasound recording.

Keywords: fetal movement, fecg, sensors

I. INTRODUCTION

Music changes physiological state for the better by relaxing people or contributing to patient treatment through music therapy. Music is widely used for various purposes, such as music application as entertainment, or back ground music in workplace to ease workers load. Music is considered to ameliorate physiological states as it relaxes people; it contributes to the treatment of patients since people appreciate it and use it for music therapy. The same therapy was applied to the pregnant women to monitor the fetal status [5,10]. By twenty-four weeks of gestation, auditory sense of the fetus is developed. In twenty-six weeks of gestation mostly fetus responds to sound stimulation in term of increase in heart rate. This is the indication that the fetus is able to perceive sounds and the ear and peripheral sensory organs are fully developed and functioning properly [10]. The sound around fetus is normally dominated by mother's voice and other internal noises such as the mother's breathing, cardiovascular and intestinal activity, physical movements, and fetal cardiovascular pulsations at very low frequency [Abrams]. Therefore, outside sounds must be louder than the sounds in and around fetus environment. The fetus cannot hear sounds for the frequency above 500 Hz and responds to lower frequency sounds when the music listens by mother [Abrams]. By the 7th month, the nervous system has matured to the point that it controls movements. Also during this month, there is movement in the fetus to the rhythm of music and prefers some types of music to others. Here is the new and alternative attempt to perform non stress test for the feto-maternal well being. The test is performing with music and without music to monitor the fetal movements [1,8]. The following paragraphs explain the complete set up and recording procedure.

II. EXPERIMENTAL SETUP

Play music by placing the earphones of a walkman around the abdomen of the pregnant woman. As the amniotic fluid is a good conductor of sound [9], it will pass the sound wave to the ears of the fetus. The volume of the music was kept at moderate level not more than 70 decibels. The music we played during the experiment was Om bhu bhuwa Suva tat savitur varainium bhargo devasy dhi mahi dhiyo yo Na parchodyat. As this is a safe and have the right mix of new sounds and repetitions that baby will enjoy. Discordant rap, grunge or hard rock should be avoided as this may cause chaotic, discordant music negatively alters the brain's structure.

III. RECORDING

Nine patients in age group 22-35 years with gestation age 26-32 weeks were registered in the study after consents taken from the patients as per the guidelines. The complete procedure was told to every body before putting the pressure sensors for recording fetus movements and regarding music therapy. The head phone speakers were put on the mother abdomen by adhesive tape. The fetal movements are measured by the pressure sensors like toco [1,7]. The sensors were placed on the mother abdomen by the adhesive tape. The transducer is based on the principle of pressure to voltage conversion. The sensor converts pressure exerted by the fetal movements into equivalent voltage. The voltages obtained with and without music were amplified by AD620 and fed to NI 6015 for monitoring and storage purpose on the PC with sampling time of 200ms using Labview environment. The complete experimental setup is shown in figure 1.

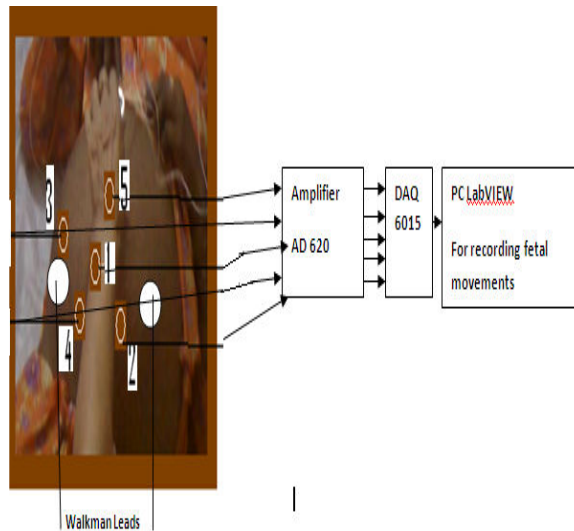


Figure 1 complete experimental setup

IV. RESULT

Figure 2(a) shows the fetus movement when the mother is not given any music. This indicates seven movements which are recorded by the pressure sensors put at various places on the mother abdomen [2]. Figure 2(b) shows the result with music. In this case there is increase in movements to eleven per minutes. This is the case where the heart rate should increase for the well-being of the fetus. The heart rate was monitored with the help of ultrasound [1-2]. With music it has increased from 146 bpm to 169 bp [4,6]. The test is reactive if there is minimum increase in 10-15 bpm from the normal heart rate during the fetal movements otherwise the test is non-reactive [11]. This state has also been verified by the ultrasound imaging as shown in figure 3. This test is reactive and good for fetus health.

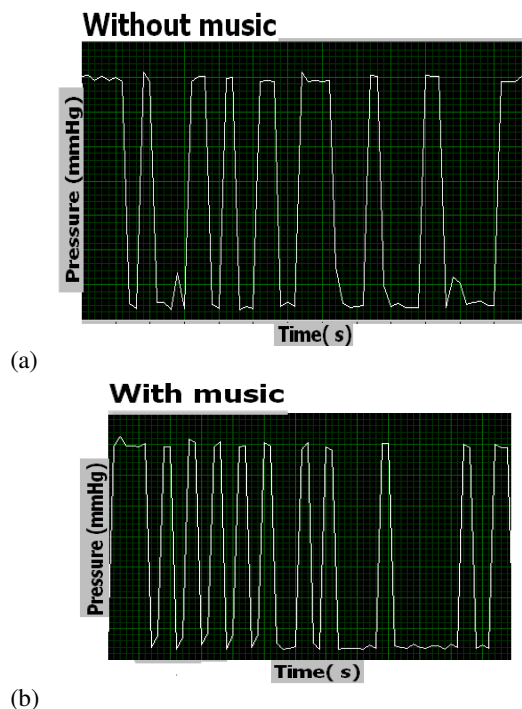


Figure 2 Fetal movements (a) without music (b) with music

V. DISCUSSION AND CONCLUSION

Many interpretative criteria have been developed between fetal heart rate and fetal movements. The test is reactive if there is minimum increased in 10-15 bpm from the normal heart rate during the fetal movement, otherwise the test is non reactive. A normal non stress test includes sustain tachycardia ($> 160\text{bpm}$) or bradycardia ($< 110\text{bpm}$)[11]. The indications of non reactive under NST also include prolonged pregnancy, maternal hypertensive disorder, IGUR, multiple gestation, renal disease and cardiac disease. There are no major contraindications for the NST.

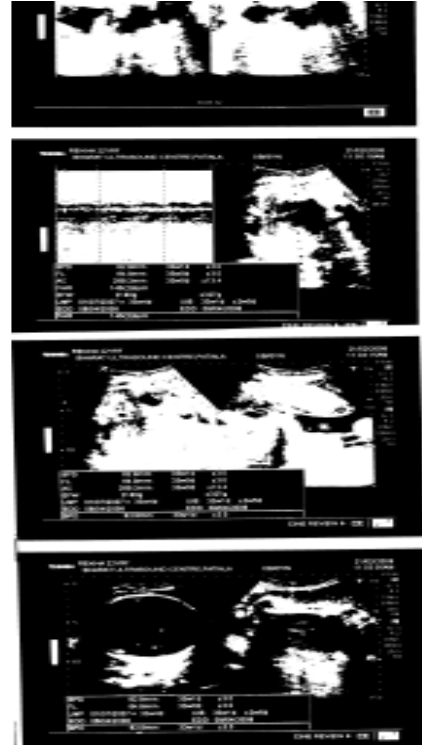


Figure 3 Ultrasound pictures of the subject

Hence heart rate variability of fetus [2-3] under fetal movements conveys critical information in term of fetal nervous system under music therapy. Also a human fetus in the womb can actually hear, and can distinguish it's mother's voice. The discussion continues as to whether parents should talk to their unborn child, and whether they should play music to it. If so, should they play Mozart—or is rap good for a fetus too? The health of a fetus during the pre-natal period is obviously of vital importance hence needs continuously monitoring. The results which are obtained from this study will be useful in long term fetomaternal monitoring as the ultrasound radiations may be harmful to the fetus as it carries energy. Moreover the music therapy will help in the study of peripheral sensory organs as a human fetus in the womb can actually hear, and can distinguish it's mother's voice. Thus music can serve as a means of communicating with the unborn child through sounds and voices, prenatal stimulation is a process that encourages learning in unborn babies by optimizing mental and sensory development which will may enhance the development of the child's brain before birth through stimuli such as stroking the fetus through the belly, producing soft and melodious sounds and using lights and vibrations that are pleasurable for baby these stimuli are in an organized and pleasurable pattern.

VI. REFERENCES

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