decrease triacylglycerol (TAG) levels, DHA specifically tends to slightly increase HDL and LDL particle size. DHA is also more efficient at reducing blood pressure, heart rate, and platelet aggregation than EPA.

Fish oils improve cardiovascular health by altering lipid metabolism, decreasing arrhythmia, modulating platelet function, and inhibiting inflammatory pathways. EPA is specifically associated with anti-inflammatory compounds that aid joint health and mood regulation, whereas DHA is essential for brain development, cognitive function, and retinal health.

Conclusion

This study highlights a significant gap between general awareness and detailed scientific understanding of cholesterol and Omega-3 fatty acids. While participants recognize broad health associations, their knowledge of the underlying mechanisms and specific dietary management is limited. Strengthening public education with evidence-based nutritional information is essential for improving long-term public health.

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SOUND TRANSMISSION IN THE STETHOSCOPE: ACOUSTIC ANALYSIS OF SOUND AMPLIFICATION IN A MEDICAL STETHOSCOPE

Introduction

Auscultation remains one of the most fundamental diagnostic methods in clinical medicine. The stethoscope, invented in the early nineteenth century by René Laennec, allows physicians to evaluate cardiovascular and respiratory sounds transmitted through the human body. Despite the development of modern imaging technologies, the stethoscope continues to be widely used due to its simplicity, portability, and diagnostic value.

Heart sounds and lung sounds are mechanical vibrations produced within the body and transmitted through tissues to the chest wall. These vibrations are typically within the frequency range of 20–1000 Hz, with most cardiac sounds occurring between 50–200 Hz. Efficient transmission of these sounds is essential for accurate auscultation.

The acoustic performance of a stethoscope depends on several physical factors including diaphragm properties, tubing length, internal air column resonance, and chest-piece design. Modern acoustic stethoscopes such as the Littmann Classic III are engineered to enhance sound amplification and reduce external noise.

However, the physical mechanisms governing sound transmission through the stethoscope system remain an interesting topic of investigation in biomedical physics. Understanding these acoustic characteristics can improve diagnostic accuracy and inform the development of more efficient medical instruments [1–5].

Goal

The aim of this study was to investigate the acoustic transmission properties and sound amplification characteristics of a Littmann Classic III stethoscope using controlled experimental sound measurements.

Material and methods of research

Littmann Classic III stethoscope, Digital sound level measurement system, Smartphone signal generator application, External speaker for tone generation, Elastic membrane simulating the chest wall, Quiet laboratory environment.

An artificial acoustic model was constructed to simulate the transmission of body sounds. A speaker positioned beneath a thin elastic membrane generated acoustic signals at controlled frequencies. The diaphragm of the stethoscope was placed directly on the membrane surface, replicating the conditions of clinical auscultation. Sound intensity at the output of the stethoscope earpieces was measured using a calibrated sound sensor. Experiments were conducted using both the diaphragm mode and bell mode of the stethoscope.

Experimental procedure: acoustic signals of varying frequencies were generated in the range of 20–1200 Hz, corresponding to typical physiological heart and lung sound frequencies. For each frequency: 1. A constant sound intensity of 60 dB was produced by the speaker. 2. The transmitted sound intensity through the stethoscope was measured. 3. Measurements were repeated using both diaphragm and bell configurations.

The amplification value was calculated as the difference between output and input sound intensity.

The results of the research and their discussion

The experimental results demonstrate that the stethoscope exhibits frequency-dependent acoustic amplification. Maximum amplification was observed in the frequency range corresponding to physiological cardiac sounds.

Table 1 – Sound transmission measurements of the Littmann Classic III stethoscope

Frequency (Hz)	Input (dB)	Diaphragm Output (dB)	Bell Output (dB)
20	60	62	66
50	60	65	69
100	60	68	71
200	60	70	69
400	60	69	65
800	60	66	60
1200	60	63	56

The results show that the bell mode provides stronger amplification of low-frequency sounds, particularly below 100 Hz. This property is consistent with the clinical use of the bell for detecting low-frequency cardiac sounds such as S3 and S4 gallops.

Conversely, the diaphragm mode demonstrated better transmission of mid- and higher-frequency sounds, which are commonly associated with lung auscultation and certain cardiac murmurs. The acoustic response curves obtained in the experiment are shown in Figures 1.

The experimental results confirm that the stethoscope acts as an acoustic filter, selectively amplifying frequencies relevant to medical diagnostics. The internal air column of the tubing and the mechanical properties of the diaphragm contribute to resonance phenomena that enhance sound transmission within specific frequency ranges. These findings correspond with previously published studies demonstrating that acoustic stethoscopes are optimised for frequencies between 50 and 500 Hz, which represent the most clinically relevant cardiopulmonary sound range.

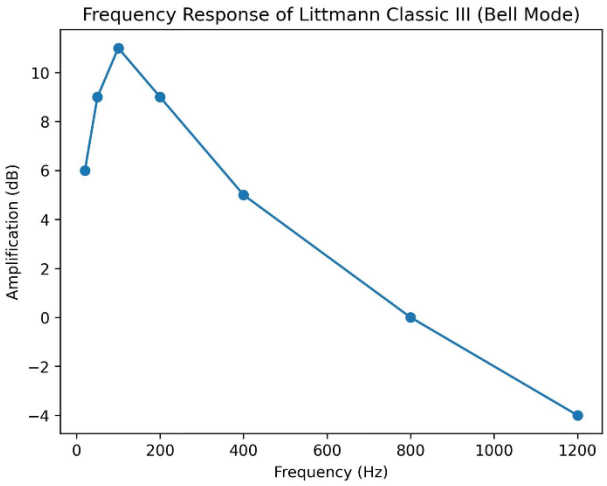


Figure 1 – Frequency response of the Littmann Classic III stethoscope in diaphragm mode

Conclusions

The Littmann Classic III stethoscope demonstrates frequency-dependent acoustic amplification. Maximum sound amplification was observed within the 100–200 Hz range, corresponding to typical cardiac auscultation frequencies. The bell mode provides improved transmission of low-frequency sounds, while the diaphragm enhances mid-frequency sound detection. The stethoscope functions as an acoustic filtering system optimised for clinically relevant physiological sound frequencies.

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SOFT DRINKS CONSUMPTION AND METABOLIC CONSEQUENCES

Introduction

There has been a big change in eating habits around the world, and this is linked to the rise in non-communicable diseases (NCDs). One of the biggest changes is that people are eating more processed foods and drinks with added sugar. Sodas, fruit juices, and energy drinks are some of the most common sources of extra sugars in the modern diet. Their high glycaemic load and the presence of sweeteners such as high-fructose corn syrup have been associated with various detrimental