Name(s)	Project Number
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Project Title

Best Shock Absorbing Shoe Sole Material

Abstract

Objectives/Goals

Many athletes and even casual runners develop leg joint, hip, and spine problems due to high impact stress on the foot and leg muscles. Shoe soles play an important role in absorbing ground reaction force (GRF) exerted by the ground on the body. Every person has his or her own capacity for absorbing GRF and current market forces do not allow consumers to make shoe choices based on their individual GRF needs. To help consumers make informed choices, this project defines Absorption Index and measures it for varying shoe sole types such as polyurethane, Ethylene Vinyl Acetate foam (EVA), leather, and thermoplastic rubber using a specifically designed test apparatus. Polyurethane will absorb the most shock because it is flexible, can compress and decompress, and has a high load bearing capacity.

Methods/Materials

The GRF acts on the outer shoe sole when the shoe comes in contact with the ground. To mimic GRF acting on shoe soles, the test apparatus with a mobile ground board and steady shoe sole were built. The ground board was pulled using different weights emulating different GRF values. When the ground board hit the outer shoe sole, a ball put on the inner sole was displaced depending upon the energy not absorbed by the shoe sole. The vertical displacement of the ball is proportional to the energy not absorbed, or transmitted, by the shoe sole. The Absorption Index (AI) is computed by normalizing the difference between flight height with and without the shoe sole. The Absorption index of varying sole types is computed and compared.

Results

The result shows that AI for shoe sole material made from polyurethane is the highest, at above 70% which is more than twice the AI of leather and thermoplastic rubber. The AI of EVA foam is between 65% to 70%. The low-density polyurethane is an excellent shock absorber and is used in midsole due to its sponge-like properties of compression and decompression.

Conclusions/Discussion

The AI information available to consumers can help them make informed decisions in selecting their soles. It will also be helpful to find AI during Impact Force (IF) and combine absorption indices of both IF and GRF to tabulate the total absorption characteristics of a shoe.

Summary Statement

This project has defined and measured shock absorption index for different shoe sole materials and concluded that polyurethane absorbed the most Ground Reaction Force.

Help Received

Received help from my dad to build testing apparatus and lift heavy weights.