# Long jumpers do better with a spring in their step

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Athletes test the effectiveness of different take-off surfaces. Credit: Dr. Lewis Halsey

Long jumpers and triple jumpers spend hours training to perfect their take-off. But what influences their performance? Scientists have discovered that taking off from a compliant surface (such as a springboard) compared with a firm, unyielding surface, reduces the energy cost of jumping over long distances.

Dr Lewis Halsey and his colleagues conducted the study on trained athletes, capable of undertaking jumps repeatedly. The participants jumped a set distance (1.2 or 1.8 m), taking off from a range of different surfaces. Each wore a portable gas analyser to measure oxygen consumption, a good indication of energy expenditure. As predicted, the highest energy costs were caused by taking off from soft surfaces, such as thick crash mats. For the longer distance, however, jumping from a springboard was less energetically expensive than using a firm surface.

There are two possible explanations for this. Firstly, a compliant surface allows the angle of take-off to be closer to the optimum of 45 degrees, which gives maximum energy efficiency. Alternatively, firm surfaces cause the calf muscle to be used more, which produces energy less efficiently than the thigh muscle because it has to contract more quickly. Surprisingly, for the shorter distance, no difference was observed in the energy expenditure for firm and springy surfaces. Dr Halsey believes this may be due to the jumps being "too easy" for the athletes such that the take-off angle or muscle group used had little effect.

This work is to be presented at the Society for Experimental Biology Annual Meeting 2014 in Manchester on Thursday 3rd July.

Provided by Society for Experimental Biology

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