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Adoptability of Orchard Ladders with Short Rung Spacing

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Abstract: Orchard ladders of modified rung spacing designs were tested in a lab study with thirteen human subjects. The ladders were nominally three-legged, 10 feet-long standard design, intended for uneven soft terrain typically found in orchards. The modification consisted of shorter spacing between rungs. Five ladders, each with rungs of 10, 10.5, 11, 11.5, or the standard 12 inch spacing, were custom built for this project by a commercial manufacturer of orchard ladders. Study subjects climbed the ladders that were secured into an laboratory apparatus at angles of 72, 68, and 64 degrees. Data collected included subject anthropometry, subject preference of ladder and angle, subject's rating of perceived exertion (Borg), heart rate (Polar chest strap), electromyography (BIOPAC MP150), and three-dimensional motion (YEI Technology 3-Space sensor system). No subject in the study preferred the standard ladder. This paper includes presents data on anthropometry, preference of ladder/angle combinations, heart rate, and rating of perceived exertion.

Keywords: ladder, ratings of perceived exertion, spacing design

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