The effect of muscular pre-tensing on the sprint start.

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Track & field sprinters are often told to press backward hard against the blocks while waiting for the starting gun in the "set" position. This pre-tenses the muscles that extend the legs, and thus may increase the forward forces received by the feet after the onset of motion. However, it also requires the sprinter's hands to press forward before the gun is fired; limitations in the rate of deactivation of the arm muscles may then result in the exertion of backward forces on the hands after the onset of motion. **PURPOSE**: To examine the horizontal forces received by sprinters through the feet and hands in starts using large and small amounts of pre-tensing, and to check if increased pre-tensing is advantageous. **METHODS**: Nineteen male sprinters (best 100 m mark = 11.09 ± 0.30 s) performed a "pre-tensed" start and a "conventional" start, respectively with large and small forces exerted against the blocks in the "set" position. The reaction forces exerted on the feet and on the hands were measured separately with two force plates. Horizontal acceleration was computed from the net horizontal force and the mass of each subject. Horizontal velocity and location throughout the start were calculated from the horizontal acceleration using trapezoidal integration. **RESULTS**: The forward force received by the feet in the "set" position was 0.186 ± 0.053 of body weight (BW) in the pre-tensed start, and 0.113 ± 0.041 BW in the conventional start ($p<0.001$). The pre-tensed start lasted slightly longer than the conventional start (0.386 ± 0.036 s vs. 0.375 ± 0.028 s, $p<0.05$) and used a slightly longer horizontal range of motion (0.619 ± 0.059 m vs. 0.600 ± 0.046 m, $p<0.02$), but produced no statistical difference in horizontal velocity at the end of the start (3.23 ± 0.25 m/s vs. 3.21 ± 0.22 m/s). The longer of each subject's two trials was then truncated to match the horizontal range of motion of the other trial. This made the difference between the durations of the pre-tensed and conventional starts non-significant (0.378 ± 0.032 s vs. 0.373 ± 0.029 s), and the difference between the final horizontal velocities remained non-significant (3.22 ± 0.24 m/s vs. 3.21 ± 0.22 m/s). At the onset of motion and for a short period afterward, the propulsive forces exerted on the feet were larger in the pre-tensed starts than in the conventional starts, but the resistive forces exerted on the hands were also larger during this period. This suggests that limitations in the capability for quick deactivation of the arm muscles after the onset of motion negated the advantage of the larger propulsive forces of the legs. **CONCLUSION**: The results suggest that pressing the feet hard against the blocks while waiting for the gun is not advantageous.