

The effectiveness of resistance exercises performed on stable and unstable surfaces in relation to torso activation

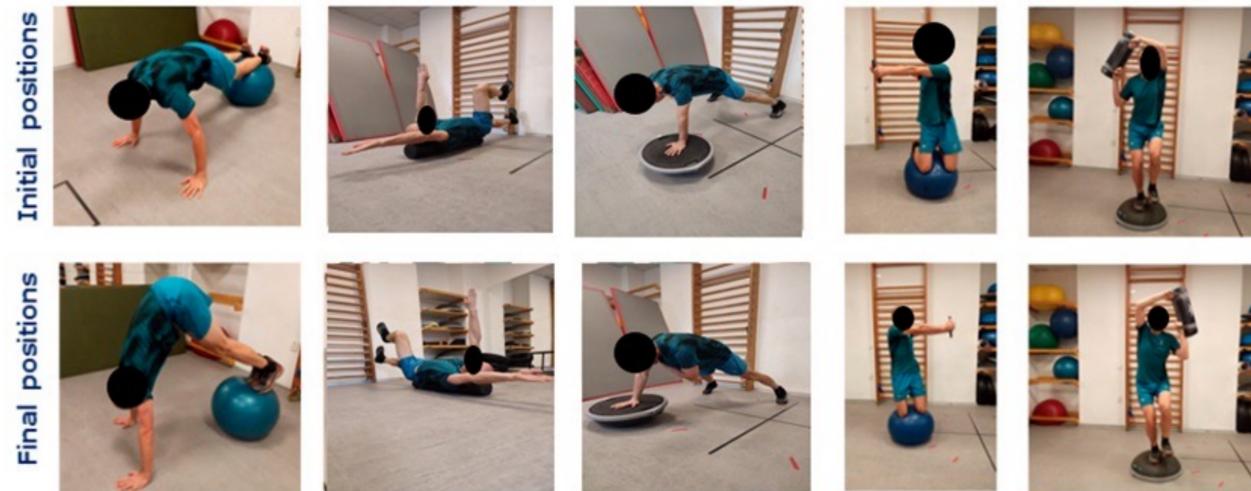
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Introduction: Deep stabilization system (DSS) strength and endurance are important component of training programs not only for injury prevention but also for maximizing athletic performance (1, 2). Training surfaces can influence training outcomes; therefore, this study aimed to compare the impact of performing strength trunk exercises on unstable and stable surfaces with conventional trunk exercises.

The unstable surface-oriented exercises



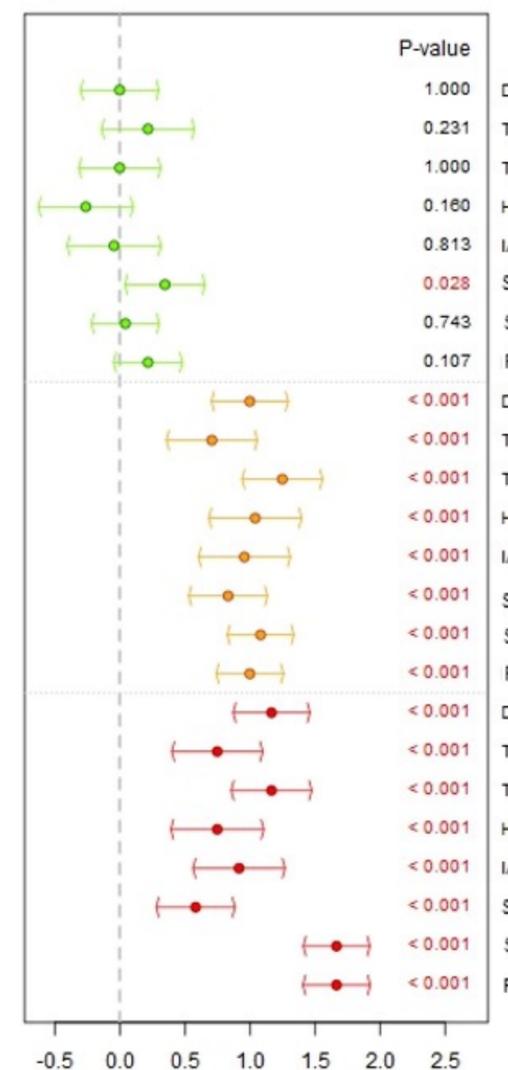
Methods: In a 3-year counterbalanced crossover study, the impact of different trunk strengthening exercises on DSS stability was evaluated among 20 elite futsal players. Exercises were grouped into three variants: conventional exercises (CE) like sit-ups, complex exercises on labile aids (US), and similar exercises on stable mats (SS). Each variant was practiced for 10 weeks per year, 2-3 times a week, with 25 sessions annually (75 total). CE exercises used a 1-0-1-0 tempo, while US and SS followed a 2-2-2-0 tempo, adjusting repetitions to equalize Time Under Tension. Testing occurred at the start, midpoint, and end of each annual cycle, assessing metrics like trunk flexibility, strength, and intraabdominal pressure. Pre- and post-tests encompassed various measurements, including diaphragm, trunk flexion, trunk back extension, hip flexion, intraabdominal pressure, side plank, pronation, and supination tests (3).

Results: Conventional exercises showed a significant improvement only in the side plank test. In contrast, un-stable and stable surface conditions exhibited notable enhancements in all tests, displaying superior trunk stability compared to conventional exercises. The stable surface condition demonstrated significantly greater improvements in the pronation and supination tests compared to the unstable surface condition.

Conclusions: Except for the side plank test, dynamic conventional exercises did not yield substantial improvements in the assessed tests. Deep stabilization system training enhances trunk stability when performed on both unstable and stable surfaces, with unstable surfaces potentially yielding greater improvements in m. transversus stabilization functions.

Estimated 95% confidence intervals and corresponding p-values for the overall improvement in scores separately for each test and for each training variant. Red color and * marks significant results ($p < 0.05$). DT = Diaphragm Test, TF = Trunk Flexion Test, TE = Trunk Extension Test, HF = Hip Flexion Test, IAP = Intraabdominal Pressure Test, SP = Side Plank Test, PT = Pronation Test, ST = Supination Test

Improvement between Enter and Final



The stable surface-oriented exercises

