Feet training in young elite handball players: a step forward?

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Acceleration | Change of direction | "Feet training" | Handball

Headline

Acceleration, change of direction (COD) speed and jumping abilities are among the most important physical traits for successful participation at the elite level in many team sports (1-4). In addition to muscle fibber types, morphological characteristics and optimal running/jumping technique, there is a common belief that feet strength and flexibility are key factors for appropriate running propulsion and/or jumping impulsion (5-7). There is, however, limited scientific evidence to support this empirical belief, and whether feet efficiency could be trained remains also unclear.

Aim. The aim of the present study was to examine the effect of a specific feet training program on acceleration, change of direction speed, jumping abilities and high-intensity intermittent performance (including CODs) in young elite handball players.

Methods

Athletes. Twenty seven elite adolescents handball players (14 girls, 13 boys; 15.5±1.1 y; 69.8±9.4 kg; 1.75±0.1 m; 10 h.week-1 + 1 game) representative of an elite regional center in France participated in the study. These data arose as a condition of player monitoring in which player activities are routinely measured over the course of the competitive season;(8) therefore, ethics committee clearance was not required. The study conformed nevertheless to the recommendations of the Declaration of Helsinki.

Design. Pre-post parallel group trial. Players were assigned to either a Feet (Feet; n=15) or a Core (C; n=12) training group. During 13 weeks, Feet consisted in 30-45 min/week (mainly Tuesday or Thursday afternoon) of specific feet drills including proprioception exercises, barefoot walking (on the inside, outside, toes up, on the heels, etc.), plyometric jumps (hopping, knees kept in extension, light additional weight or not, Table 1) and few key static stretches of calf and foot arch muscles (9); Core consisted of non feet-specific tasks over the same duration (e.g., core training, upper-body strength training). Except for the specific feet or core sequences, groups maintained similar external training programs.

Methodology. Before and after the training interventions, physical performance was assessed by a 10-m sprint time (10m) and an agility test (T-test) (Wireless Timing-Radio Controlled, Brower Timing System, Colorado, USA), a counter movement jump (CMJ, Ergojump, Globus Italia, Codogne, Italy), a hopping test (6 repeated jumps) from which average jumping height, leg stiffness (K) (10) and jump technique on a 3-points scale (0: bad, 3: excellent [body straight and toes up during flying time]) were examined), and the 30-15 Intermittent Fitness test (11).

Analyses. Since there is no clear evidence on the impact of sex on responses to those types of interventions, data from boys and girls were pooled to increase statistical power. Data in the figures are presented as means with 90% confidence limits (CL). All data were first log-transformed to reduce bias arising from non-uniformity error. Between-group standarized differences in the change in the different performance measures were compared to the smallest worthwile change (SWC, 0.2 multiplied by the pooled pre-training between-subject deviation, based on Cohens d principle) using magnitude based inferences. These probabilities were used to make a qualitative probabilistic mechanistic inference about the true effect: if the probabilities of the effect being substantially positive and negative were both >5%, the effect was reported as unclear; the effect was otherwise clear and reported as the magnitude of the observed value. Threshold values for standarized diferences were >0.2 (small), >0.6 (moderate), >1.2 (large) and very large (>2) (12). Pre-training performances were used as covariables for all analyses.

Results

All between-group differences in the changes were either trivial or unclear (Figure 1).

Discussion

Results showed that performing the present feet-specific training, in addition to usual training commitments, failed to substantially improve acceleration, jumping performance, COD speed and high-intensity intermittent running performance in-

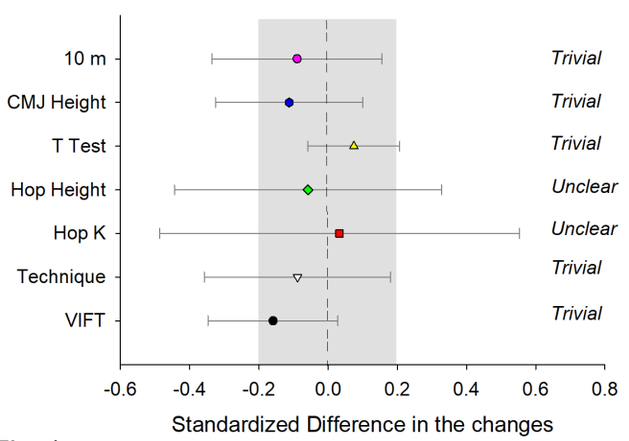

Fig. 1. Standardized difference in the changes in performance for Feet vs. Core Training groups. 10 m: 10-m sprint time, CMJ height: counter movement jump height, T Test: T-test time, Hop Height: average hopping height, Hop K: vertical stiffness calculated during hopping, Technique: subjective assessment of feet work during hopping and VIFT: final speed reached at the 30-15 Intermittent Fitness Test.

Table 1. Training program for the Feet group.

Week	Main Hopping exercise	Reps	Series	Volume
S1	2-legs, hands free	8	4	32
S2	2-legs, hands on hip	8	4	32
S3	2-legs, hands on hip	12	4	48
S4	2-legs, 15-kg barbell on shoulder	8	3	24
S5	2-legs, 15-kg barbell on shoulder	8	4	32
S6	Week off (school holidays)	0		
S7	Jump Rope (jogging)	20 s	4	40
S8	2-legs, hands on hip	14	4	56
S9	2-legs, hands on hip	16	4	64
S10	2-legs, 15-kg barbell on shoulder	10	4	40
S11	1-leg, hands on hip	10	4	40
S12	1-leg, 15-kg barbell on shoulder	10	4	40
S13	2-legs, 15-kg barbell on shoulder	8	4	32

cluding CODs. It is possible that the amount of feet-specific training (i.e., 30-45 min a week) was too low to observe beneficial changes in those well-trained young elite players, or that the exercises chosen were not optimal. The impact of greater exercise loads and/or other exercises needs to be investigated in the future.

Practical applications

- Performing 30 to 45-min weekly of feet work (including proprioception, hopping and stretching) is unlikely to impact jumping, acceleration and overall change of direction ability in elite adolescent handball players.
- Practitioners may need to either increase the load (e.g., same program twice a week) or more likely include exercises involving horizontally-oriented force production, which may transfer better to running performance (13, 14).

Limitations

- Individual training load was not controlled but irrespective of the experimental group 1) all players participated in the same training sessions throughout the study and 2) being the best in their age categories, played most of the games every week ends.

Dataset

Dataset available on SportPerfSci.com

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