Longitudinal Changes In Skinfold Thickness In Relation To Body Fat Changes Assessed with DXA

Juan R. López-Taylor[1], Roberto Gabriel González-Mendoza[2], Alejandro Gaytán-González, Juan Antonio Jiménez-Alvarado, Marisol Villegas-Balcázar, Edtna Elvira Jauregui-Ulloa, Francisco Torres-Naranjo

Institute of Applied Sciences of Physical Activity and Sport. University Center of Health Sciences. University of Guadalajara. Guadalajara, Jalisco, México.

1) taylor@cucs.udg.mx

2) roberto.gonzalez@academicos.udg.mx

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INTRODUCTION

Anthropometry is widely used to estimate body composition in the field of nutrition, exercise and sports (1). There are several studies addressed to develop anthropometric equations to estimate body fat mass and percentage (2). However, the evidence is scant about the relation of longitudinal changes in body fat estimations through anthropometric equations and the change of it measured with more precise and accurate methods (3). Also, the evidence that analyze the possible relation and equivalence between the changes in skinfold thickness with the changes in body fat is even more scant. Therefore, the purpose of this work was to analyze the relation and equivalence between the changes in the summed skinfold thickness and the changes in body fat measured with DXA in professional male soccer players.

METHODS

Subjects

A total of 66 professional male soccer players (16 to 36 years old) were evaluated with a whole body composition scan and 10 skinfold thickness assessments in two occasions, with a time difference between one to five years.

Body composition

A whole body scan was performed with a DXA equipment (Hologic Discovery QDR 4500) and analyzed with the software version 12.2.1 for both time different assessments. The machine was calibrated following the manufacturer instructions. Subjects were asked to attend with at least two hours of fasting.

The body mass was measured with a Tanita scale (TBF-410) with a 0.1 kg approximation and stature with a stadiometer (SECA 210) with 1 mm approximation, and were measured following standardized protocols.

Skinfold thickness

A total of ten skinfolds (triceps, subscapular, biceps, chest, mid-axilla, iliac crest, supraspinal, abdomen, thigh and calf, 10SKF) were measured with a Harpenden caliper by duplicate, following standardized procedures. These evaluations were performed by certified professionals (anthropometrists ISAK level 2 and 3) for both time different assessments. The absolute and relative changes between evaluation one and two were calculated for the summed 10SKF, body fat percentage (%BF) and body fat mass (BF) for every subject, according to the next equation.

Absolute changes = V2— V1

Relative changes = (V2—V1) / V1

Where V2 is the obtained value at the second evaluation, and V1 is the obtained value at the first evaluation.

Statistical analysis

The determination coefficient (assuming a zero intercept), slope and SEE were calculated where the changes in 10SKF predicted the changes in BF or %BF. Data are reported as mean ±SD (minimum—maximum).

RESULTS

The 10SKF (in mm) at evaluations one and two were 84 ± 31 and 89 ± 27, respectively (Δ 5 ± 22 [-57 to 74]). The BF (in kg) at evaluation one and two were 10 ± 3 and 11 ± 3 (Δ 1 ± 2 [-6 to 8]). The %BF at evaluation one and two were 14 ± 3 and 15 ± 3 (Δ 1 ± 3 [-7 to 9]). The absolute change in body fat (ΔA%BF), expressed as percentage, was 14 ± 25 (-40 to 92). There was a strong relationship between the absolute changes in skinfold thicknesses (ΔA10SKF) and the absolute changes in body fat (ΔABF) and body fat percentage (ΔA%BF) body fat, but the best estimation was observed with the relative changes in the sum of ten skinfolds (ΔR10SKF) and the relative changes in body fat (ΔRBF) (Table 1, Figure 1).

Table 1. Determination coefficient and slope for absolute and relative changes in skinfold thicknesses and body fat mass and percentage.

	R^2	Slope	SEE
ΔA10SKF —ΔABF	0.81	Y=0.11x	0.93
ΔR10SKF —ΔABF	0.78	Y=0.08x	1.16
ΔA10SKF —ΔRBF	0.66	Y=1.11x	11.95
ΔR10SKF —ΔRBF	0.80	Y=0.94x	10.44
ΔA10SKF —ΔA%BF	0.78	Y=0.11x	1.19
ΔR10SKF —ΔA%BF	0.76	Y=0.09x	1.36

ΔA10SKF: Absolute changes in the sum of 10 skinfolds (mm).
ΔR10SKF: Relative changes in the sum of 10 skinfolds (%).
ΔABF: Absolute changes in body fat (kg).
ΔRBF: Relative changes in body (%).
ΔA%BF: Absolute changes in body fat percentage (%).

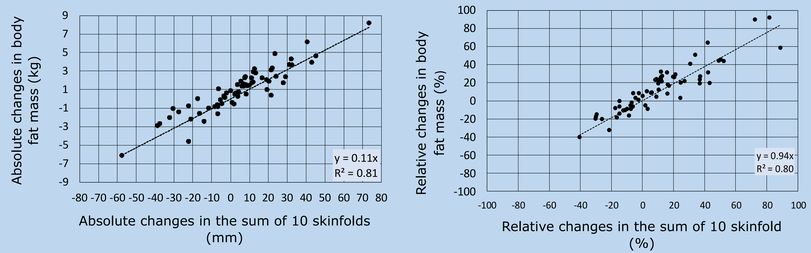

Figure 1. Scatter plots for absolute changes in body fat mass estimated by absolute changes in the sum of ten skindolds (left), and for relative changes in body fat mass estimated by relative changes in the sum of 10 skinfolds (right).

CONCLUSIONS

The absolute and relative changes in body fat and body fat percentage were well estimated with the absolute and relative changes in 10SKF through time. The ΔR10SKF had a ≈1% of change for every 1% in ΔRBF, which is an easier relationship to remember. However these changes had an error estimate threshold to overcome for increasing the chance to assess a significant change in the daily living practice.

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