Comparing the accuracy of ES-BC, EIS-GS, and ES Oxi on body composition, autonomic nervous system activity, and cardiac output to standardized assessments.

Abstract:

Background and Purpose:
The Electro Sensor Complex (ESC) is software that combines three devices using bioelectric impedance, galvanic skin response, and spectrophotometry: (1) ES-BC to assess body composition, (2) EIS to predict autonomic nervous system activity, and (3) ES Oxi to assess cardiac output. The objective of this study was to compare each to a standardized assessment: ES-BC to dual-energy x-ray absorptiometry (DEXA), EIS to heart rate variability (HRV), and ES Oxi to BioZ Dx.

Patients and methods:
The study was conducted in 2 waves. Fifty subjects were assessed for body composition and autonomic nervous system activity. Fifty-one subjects were assessed for cardiac output.

Results:
We found adequate relative and absolute agreement between ES-BC and DEXA for fat mass (r=0.97, p<0.001) with ES-BC overestimating fat mass by 0.2 pounds and for body fat percentage (r=0.92, p<0.001) with overestimation of fat percentage by 0.4%. For autonomic nervous system activity, we found marginal relative agreement between EIS and HRV by using EIS as the predictor in a linear regression equation (adjusted r^2=0.56, p=0.03). For cardiac output, adequate relative and absolute agreement was found between ES Oxi and BioZ Dx at baseline (r=0.60, p<0.001), after the first exercise stage (r=0.79, p<0.001), and after the second exercise stage (r=0.86, p<0.001), respectively. Absolute agreement was found at baseline and after both bouts of exercise; ES Oxi overestimated baseline and stage 1 exercise cardiac output by 0.3 and 0.1 l/min, respectively, but exactly estimated stage 2 exercise cardiac output.

Conclusion:
ES-BC and ES Oxi accurately assessed body composition and cardiac output compared to standardized instruments, whereas EIS showed marginal predictive ability for autonomic nervous system activity. The ESC software managing the 3 devices would be useful to help detect complications related to metabolic syndrome, diabetes, and cardiovascular disease and to non-invasively and rapidly manage treatment follow-up.