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Resistance training: the multifaceted side of exercise

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TO THE EDITOR: I read with great interest the article by Slentz et al. (13) titled "Effects of aerobic vs. resistance training on visceral and liver fat stores, liver enzymes, and insulin resistance by HOMA in overweight adults from STRRIDE AT/RT" published in the November 2011 issue of *AJP-Endocrinology and Metabolism*.

This article demonstrates clearly that aerobic training had a significantly greater effect than resistance training on liver fat, visceral fat, alanine aminotransferase, HOMA, and both total and subcutaneous abdominal fat. Undoubtedly, aerobic training is a useful training method that can improve body composition (4) and, as well demonstrated by Slentz et al. (13), has a beneficial effect on liver fat. I agree in general with the findings of Slentz et al. (13) but also with Sundell's statement, "Resistance training has a favourable effect on metabolic syndrome since it decreases fat mass, including abdominal fat. It also enhances insulin sensitivity, improves glucose tolerance, and reduces blood pressure values" (14). This is only an apparent contradiction because there are some unresolved questions about exercise variables. The conflicting results regarding the effects on body composition and insulin sensitivity of resistance training and aerobic training (5, 6, 10, 12) can be explained by the extremely wide range of exercise variables; for example, aerobic training may be performed in many different ways to achieve the same results (3). Also, resistance training may be carried out via different methods that have been shown to have differing effects on muscle metabolism and signaling pathways related to insulin (9). Recently, our group has demonstrated the different effects of circuit training carried out at low or high intensity on some anthropometric and metabolic variables (8). In my opinion, there is something that may be best described as a "scotoma" in research on various training methodologies; if we don't consider the extremely wide range of different exercise executions, we risk underestimating the importance and the effects of the different kinds of exercise. In the study by Slentz et al. (13) the classical three sets of eight to 12 repetitions scheme was used, but its effectiveness is at least questionable (1). A resistance training program is a composite of several important variables, including *1*) muscle action used, *2*) type of resistance used, *3*) volume (total number of sets and repetitions), *4*) exercises selected and workout structure (e.g., the number of muscle groups trained), *5*) the sequence of exercise performance, *6*) rest intervals between sets, *7*) repetition velocity, and *8*) training frequency (7, 9, 12). It is in the interests of the researcher to carefully consider the exercise study design with specific regard to these variables to avoid underestimating the effectiveness of certain kinds of exercise. The following sentence, "...in sedentary, overweight, and obese adults, aerobic training was consistently more effective than resistance training at improving visceral fat, total abdominal fat, liver fat, and the liver-derived enzyme alanine aminotransferase," should contain the adjunctive information "aerobic training performed at 75% $\dot{V}O_{2max}$, three times/wk, 117 min/wk" and "resistance training performed three times/wk, three sets for eight to 12 reps." I hope that this invitation to greater precision in training description can be taken into account to better define the most effective kinds of exercise, especially for resistance training that may be considered the multifaceted side of exercise.

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DISCLOSURES

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