INTERVENTIONS FOR REDUCING LOW BACK MUSCLE FATIGUE

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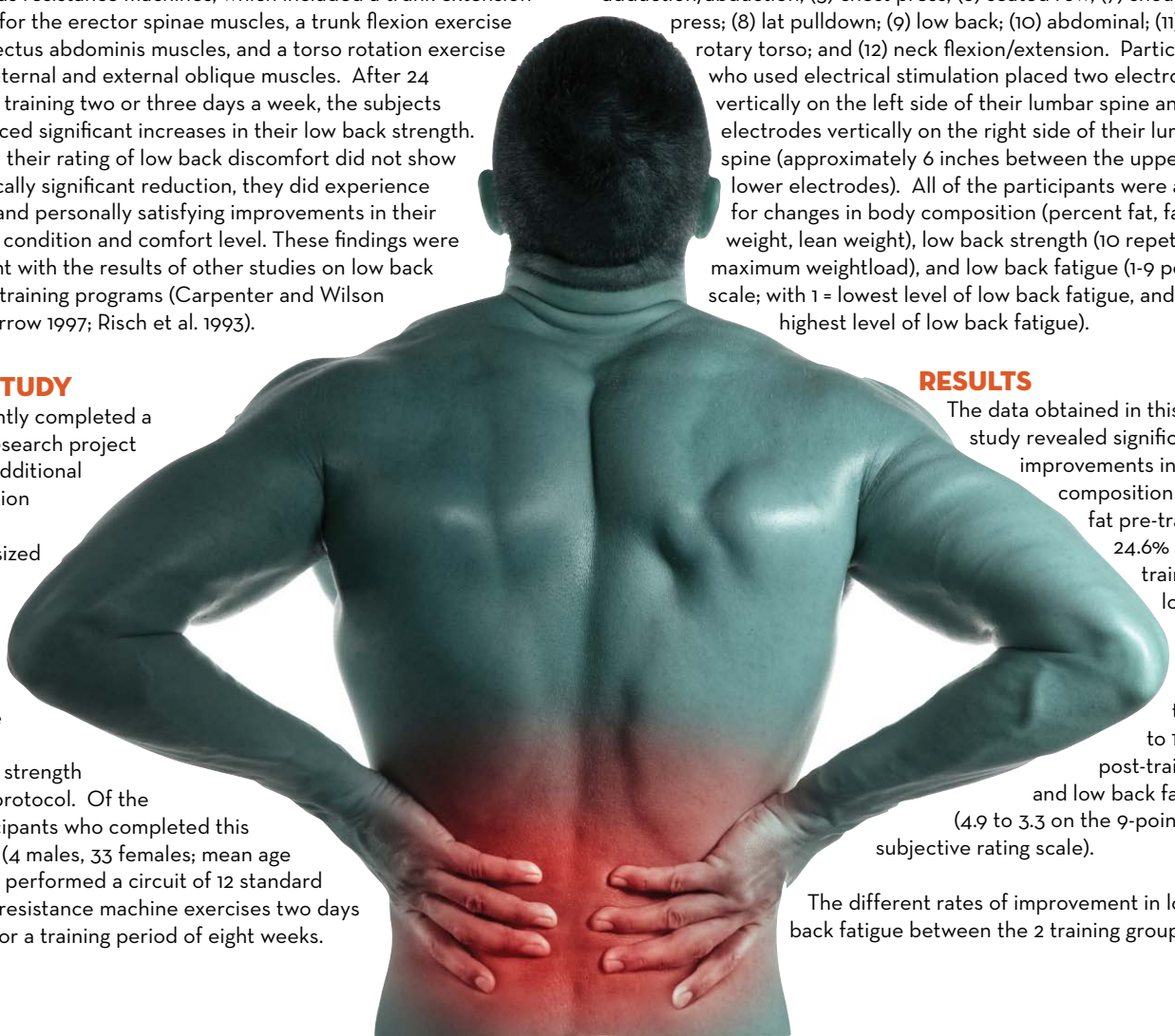
Numerous studies have demonstrated that appropriate progressive resistance exercise for the lumbar spine muscles can significantly increase trunk extension strength and reduce low back discomfort (Carpenter and Nelson 1999; Morrow 1997; Risch et al. 1993). The most effective exercise for strengthening the low back muscles appears to be full range (approximately 75 degrees) of controlled trunk extension performed in a semi-sitting position with posterior pelvic stabilization (Jones et al. 1988; Graves et al. 1994; San Juan et al. 2005; Lariviere et al. 2010).

In 2002, we were asked to design a low back weakness intervention program for afflicted employees at one of our nation's largest automotive plants. Twelve auto workers who experienced high levels of low back discomfort participated in our study. All of the study subjects performed one set of 8 to 12 repetitions on a standard line of Nautilus resistance machines, which included a trunk extension exercise for the erector spinae muscles, a trunk flexion exercise for the rectus abdominis muscles, and a torso rotation exercise for the internal and external oblique muscles. After 24 weeks of training two or three days a week, the subjects experienced significant increases in their low back strength. Although their rating of low back discomfort did not show a statistically significant reduction, they did experience positive and personally satisfying improvements in their low back condition and comfort level. These findings were consistent with the results of other studies on low back strength training programs (Carpenter and Wilson 1999; Morrow 1997; Risch et al. 1993).



NEW STUDY

We recently completed a similar research project with an additional intervention that we hypothesized would enhance low back muscle response to our standard strength training protocol. Of the 80 participants who completed this study, 37 (4 males, 33 females; mean age 58 years) performed a circuit of 12 standard Nautilus resistance machine exercises two days a week, for a training period of eight weeks.

The other 43 subjects (10 males, 33 females; mean age 59 years) performed the same circuit of standard Nautilus resistance machine exercises, two days a week, for an 8-week training period. However, these participants administered one-hour of electrical stimulation (MARC PRO™ device) to their low back muscles after each strength training session. The MARC PRO™ device provides a low voltage waveform that produces non-tetanizing and non-fatiguing muscle contractions in the application area.

Specifically, all of the study subjects performed 1 set of the following Nautilus resistance machine exercises, using a weightload that permitted 8 to 12 moderate-speed and full-range repetitions. When 12 repetitions were completed with correct technique, the resistance was increased by approximately five percent. The 12 resistance machines included: (1) leg extension; (2) leg curl; (3) leg press; (4) hip adduction/abduction; (5) chest press; (6) seated row; (7) shoulder press; (8) lat pulldown; (9) low back; (10) abdominal; (11) rotary torso; and (12) neck flexion/extension. Participants who used electrical stimulation placed two electrodes vertically on the left side of their lumbar spine and two electrodes vertically on the right side of their lumbar spine (approximately 6 inches between the upper and lower electrodes). All of the participants were assessed for changes in body composition (percent fat, fat weight, lean weight), low back strength (10 repetition maximum weightload), and low back fatigue (1-9 point scale; with 1 = lowest level of low back fatigue, and 9 = highest level of low back fatigue).

RESULTS

The data obtained in this study revealed significant improvements in body composition (26.1% fat pre-training to 24.6% fat post-training), low back strength (88.5 lbs pre-training to 105.5 lbs post-training, and low back fatigue (4.9 to 3.3 on the 9-point subjective rating scale).

The different rates of improvement in low back fatigue between the 2 training groups

demonstrated a definite trend (p<.09) favoring the subjects who did both strength exercise and electrical stimulation. It therefore appeared that the post-exercise MARC PRO™ treatments enhanced the positive effects of strength training on low back muscle fatigue.

CONCLUSION

Based on the results of this research, individuals who perform appropriate strength training programs (e.g., 1 set of 8 to 12 repetitions of 12 exercises for the major muscle groups, twice a week) should experience significant improvements in low back fatigue after 2 months of training. The findings further indicate that the rate of improvement in low back fatigue may be enhanced by administering 1 hour of electrical stimulation (MARC PRO™ device) to the low back muscles following each strength training session. It is noted that participants who started the study with higher levels of low back fatigue responded favorably to the complementary interventions of resistance exercise and electrical stimulation.

RECOMMENDATIONS

With respect to these research findings, we suggest that the most effective means for reducing low back fatigue is to perform a standard program of resistance exercise followed by an hour of electrical stimulation (MARC PRO™) to the low back muscles.

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