What problems did the researchers set out to study, and why?
High-level resistance training is a key component of many rehabilitation programs. Strength training effectiveness depends on the level of muscle activation achieved through application of the proper training intensity. Many traditional resistance training devices are not feasible for home programs, and there is a lack of information about how the more user-friendly exercise methods load muscles. Thus, the researchers set out to compare the level of muscle activation and perceived loading achieved during dumbbell exercise with that of elastic band resistance.

Who participated in this study?
16 healthy adult women without serious musculoskeletal pathology served as subjects for this trial.

What new information does this study offer?
There was no significant difference in normalized electromyographic (EMG) activity of the prime muscles between dumbbells and elastic resistance exercise. Perceived loading was moderately to very strongly related to EMG activity.

What new information does this study offer for patients?
Patients may choose to use elastic bands as a more user-friendly form of strength training as part of their home programs. This trial also provides information that patients can accurately rate their muscle activation by using a scale that measures perceived loading during exercise. This information can help patients to maximize the effectiveness of rehabilitation programs.

How did the researchers go about this study?
The researchers tested 3 exercises—lateral shoulder raise, wrist extension, and shoulder external rotation—to examine the difference between 2 resistance training devices: dumbbells (2–7.5 kg) and elastic bands (TheraBand, red to silver resistance). The order of the exercises was randomized for each individual, and 3 repetitions were performed. Immediately following the 3 repetitions, the participants rated their perceived loading using the Borg CR10 scale. During data analysis, the EMG activity recorded during the 3 repetitions was normalized to previously assessed maximal voluntary isometric contractions.

How might the results be applied to physical therapist practice?
This study suggests that physical therapists can confidently assign home programs using elastic bands and a rating system using perceived loading via the Borg CR10 scale to effectively load target muscles in a similar fashion to dumbbells.

What are the limitations of the study, and what further research is needed?
The study design may not have captured all the differences that may exist between dumbbells and elastic bands. For example, elastic bands provide resistance that increases linearly with the stretch of the band, whereas dumbbells provide isotonic resistance throughout the range, and this might impact strength training. In addition, the results may not generalize beyond the muscles investigated. Some measurement error exists when using surface EMG versus fine-needle EMG.

The Bottom Line is a translation of study findings for application to clinical practice. It is not intended to substitute for a critical reading of the research article.


E.K. Robertson, PT, DPT, OCS, is Assistant Professor, Department of Physical Therapy, Texas State University, San Marcos, Texas.