

Journal Articles Pertaining to Body-Weight Training:

ARTICLE 1: Effects of bodyweight-based exercise training on muscle functions of leg multi-joint movement in elderly individuals Junichiro Yamauchi, Satoshi Nakayama, and Naokata Ishii *Geriatrics Gerontology International* 2009.

Abstract:

Background: Because demands of functional exercise training with using own body-weight for elderly individuals were increasing, the present study investigated the effects of bodyweight-based exercise training on muscle functions of leg multi-joint movements in elderly individuals. **Methods:** Twenty-seven untrained healthy elderly individuals (mean \pm standard deviation, 66.015.7 years) completed the training program for 10 months. The exercise program consisted mainly of exercises for large leg muscle groups without using external weight, performing 10–50 repetitions and 1–3 sets for each exercise. Before and after the training period, force–velocity relations of knee–hip extension movements were measured with a servo-controlled dynamometer and the maximum force (F_{max}), velocity (V_{max}) and power (P_{max}) were determined. **Results:** After the training, F_{max} and P_{max} increased and these increases represented 15% ($P < 0.001$) and 13% ($P < 0.01$) of pre-training value, respectively, while V_{max} did not change. Increases in F_{max} after the training were positively correlated with the initial exercise intensity determined from bodyweight (BW)/ F_{max} of pre-training values ($P < 0.05$). **Conclusion:** A training program using bodyweight can be substantially effective in improving lower limb muscle force and power in elderly individuals; however, the initial training status is important for progressive increases in muscle force.

Summary and Application to Training: This study lends support to the inclusion of bodyweight training in older adults. The participants performed weekly workouts both at home (unsupervised) and as a part of a supervised class. Participants performed body-weight squats, single-leg leg extensions, and lunges. One of the key strengths of the study was the 10-month duration; a long duration for a supervised strength training study. One of the primary take-aways from the study is that body weight training was effective for increasing muscle strength. It should be noted that participants who were weaker at the start of the study produced greater increases in strength over the 10-month period compared to those subjects who were stronger at the beginning of the study.

ARTICLE 2: Effect of resistance training using bodyweight in the elderly: Comparison of resistance exercise movement between slow and normal speed movement. Yuya Watanabe, Michiya Tanimoto, Naoko Oba, Kiyoshi Sanada, Motohiko Miyachi, and Naokata Ishii

Geriatrics Gerontology International 2015.

Abstract:

Aim: The present study investigated whether a slow movement protocol can be applied to resistance training using bodyweight. In addition, the intervention program combined plyometric exercise with resistance exercise to improve physical function overall. **Methods:** A total of 39 active elderly adults participated in a 16-week intervention. The program consisted of five resistance exercises and four plyometric exercises using their own bodyweight with a single set for each exercise. Participants were assigned to one of two experimental groups. One group carried out resistance exercise with slow movement and tonic force generation (3-s concentric, 3-s eccentric and 1-s isometric actions with no rest between each repetition). The other group as a movement comparison followed the same regimen, but at normal speed (1-s eccentric and 1-s concentric actions with 1-s rest between each repetition). Muscle size, strength and physical function were measured before and after the intervention period. **Results:** After the intervention, strengths of upper and lower limbs, and maximum leg extensor power were significantly improved in both groups. Muscle size did not change in either group. There were no significant differences in any of the

parameters between groups. **Conclusions:** The intervention program using only own bodyweight that comprised resistance exercise with slow movement and plyometric exercise can improve physical function in the elderly, even with single sets for each exercise. However, there was no enhanced muscle hypertrophic effect. Further attempts, such as increasing performing multiple sets, would be required to induce muscle hypertrophy.

Summary and Application to Training: This study used a subject group of older adults and compared the effects of 16-weeks of body-weight strength training with a 1/1 concentric/eccentric rep duration with a 3/3 rep duration (1 set per exercise). Participants in both groups significantly increased strength but neither group experienced muscle hypertrophy (surprising for untrained older adults). Participants did not train to muscle failure but gradually increased the number of repetitions performed over the course of the study.