

GRADUAL INCREASE IN WEEKLY SETS DOES NOT ELICIT GREATER QUADRICEPS HYPERTROPHY ADAPTATIONS IN RESISTANCE-TRAINED MALES

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BACKGROUND

Resistance training (RT) volume is one of the most manipulated variable in RT programs aiming muscle hypertrophy. Moreover, progressive overload is considered essential to induce proper training stimuli over a training cycle and thus avoid a plateau in muscle development. However, the optimal progressive RT volume for maximizing hypertrophy remains unclear. Thus, this study investigated the effects of progressively adding sets targeting quadriceps femoris every two weeks versus performing a constant set volume in resistance trained-males over a 12-week study period.

METHODS

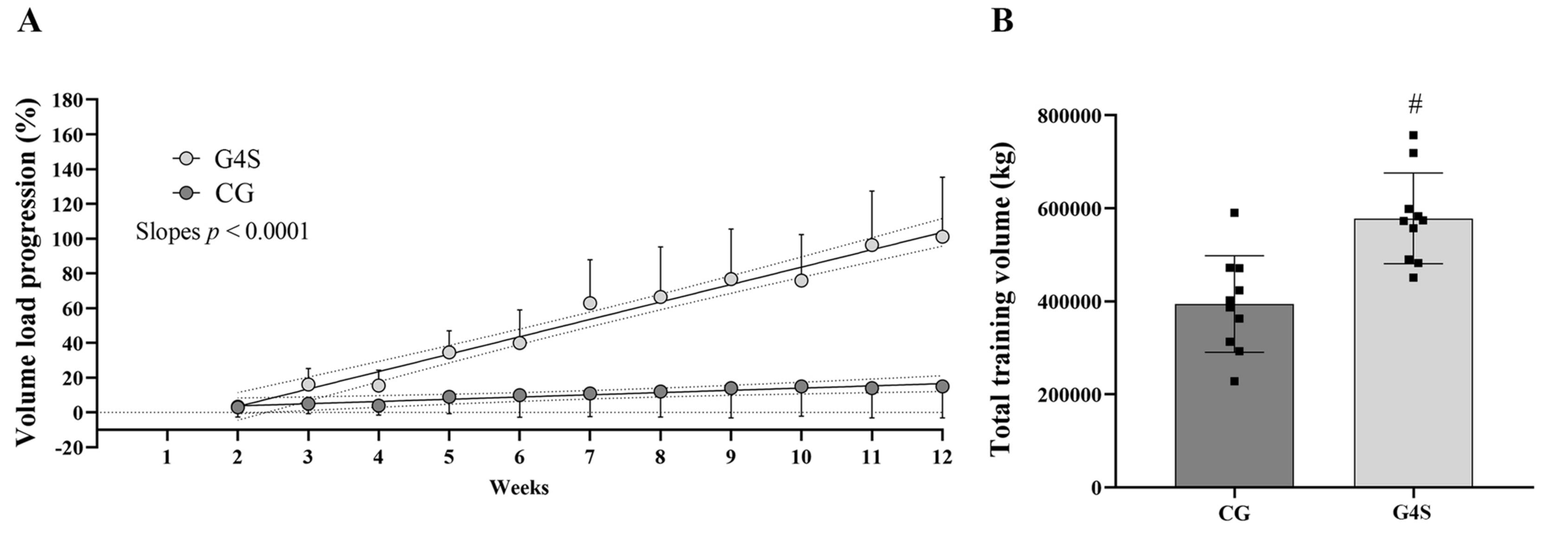
Twenty resistance-trained males (one repetition maximum barbell back squat:body mass ratio 1.8 ± 0.2 a.u.) were deemed eligible. Participants were randomly allocated to one of two groups: Constant Group (CG; n = 10) that performed a fixed volume of 22 sets for the quadriceps per week, or; 4 Sets (G4S; n = 10) progression group that increased four sets per week every 2 weeks.

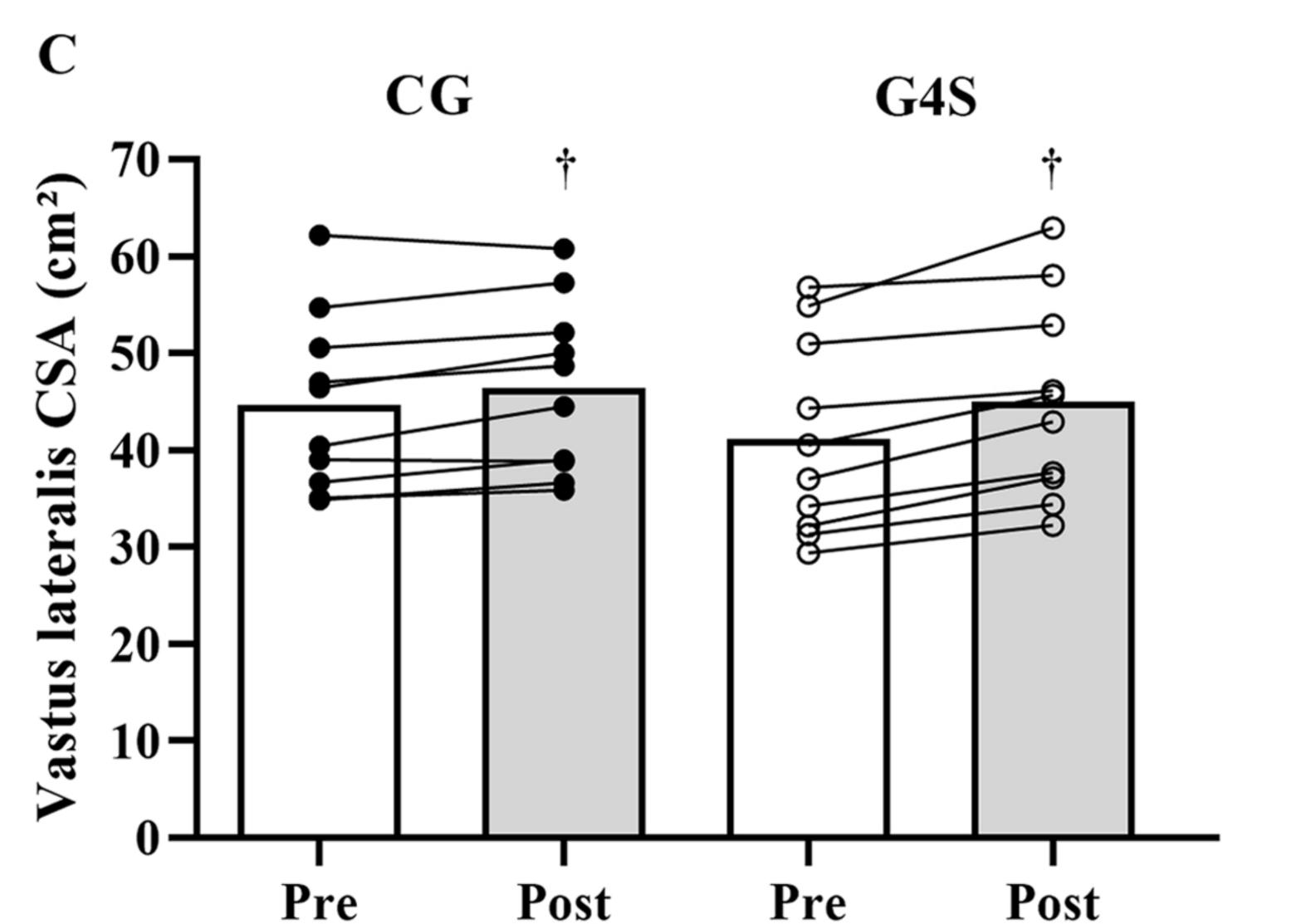
After a 2-week washout period and another 2-week familiarization period, participants performed a lower-limb training program (including barbell back squat, leg press 45, seated knee extension, Romanian deadlift and seated knee flexion) twice a week (loading scheme of 6-8 and 10-12 repetitions, respectively) for 12 weeks. Intensity of effort was fixed at two repetitions in reserve, with only the last set of each exercise performed to concentric failure. Vastus lateralis cross-sectional area (CSA) and sum of la-

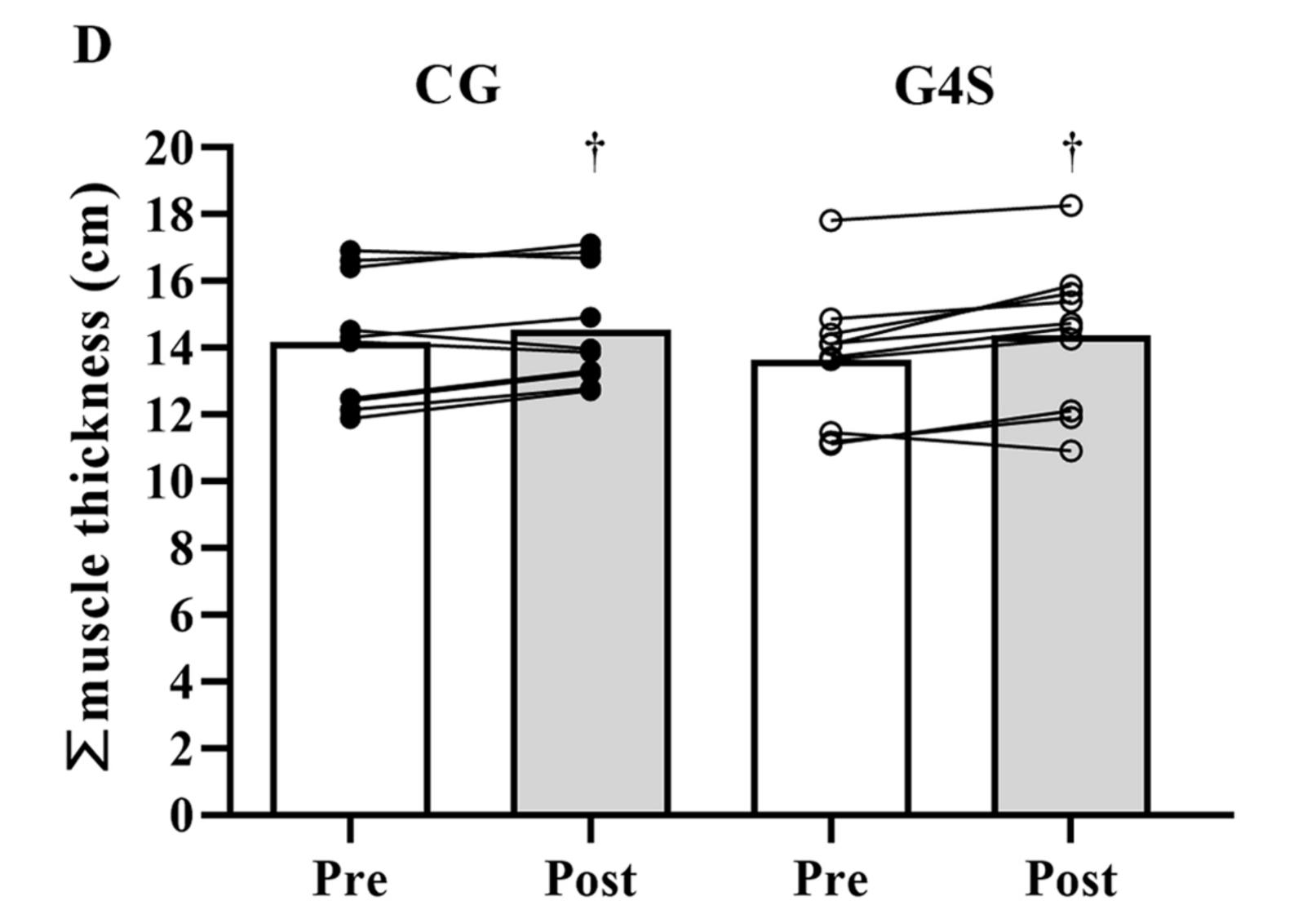
teral thigh muscle thickness (∑MT) at 30, 50 and 70% of the femur length (Scan QR code) were assesed at baseline and after 12 weeks of training program.

RESULTS

There was a between-group difference for total training volume (p = 0.0007) and volume load progression slopes (p < 0.0001) favoring the G4S group (Figures 1A and 1B). Mixed models analysis of variance that was a main effect of time for CSA changes (p < 0.001) but no group effects were detected (p = 0.573) (Figure 1C). In addition, there was a main effect of time for Σ MT (p < 0.001) but no group effects (p = 0.687) (Figure 1D).







CONCLUSIONS

Our findings suggest that progressively adding sets per week every 2 weeks does not elicit greater quadriceps hypertrophy adaptations in resistance-trained males over a 12-week training period.

PRACTICAL APPLICATIONS

Coaches and practitioners aiming for muscle hypertrophy can progress the weekly set number by 4 sets for quadriceps every 2 weeks or perform a fixed RT volume at 22 sets per week. However, opting for a fixed volume provides a more time-efficient training strategy.

Importantly, if coaches and practitioners select a fixed RT volume to develop muscular adaptations, it seems that progressing volume load (i.e. sets x repetitions x load) across a training cycle may be necessary to optimize hypertrophy gains.

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REFERENCES

Aube, D., Wadhi, T., Rauch, J., Anand, A., Barakat, C., Pearson, J., ... & De Souza, E. O. (2022). Progressive resistance training volume: Effects on muscle thickness, mass, and strength adaptations in resistance-trained individuals. Journal of Strength and Conditioning Research, 36(3), 600-607.

Nóbrega, S. R., Scarpelli, M. C., Barcelos, C., Chaves, T. S., & Libardi, C. A. (2023). Muscle hypertrophy is affected by volume load progression models. Journal of Strength and Conditioning Research, 37(1), 62-67.