

**Effects of resistance training leading or not leading to concentric failure on muscle strenght, hypertrophy and power output: a systematic review with meta-analysis**

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### **PubMed database search strategy**

"Humans"[Mesh] OR "Humans" OR "Homo sapiens" OR "Man (Taxonomy)" OR "Man, Modern" OR "Modern Man" OR "Human" AND "Adult"[Mesh] OR "Adult" OR "Adults" OR "Aged"[Mesh] OR "Aged" OR "Elderly" AND "Resistance Training"[Mesh] OR "Resistance Training" OR "Training, Resistance" OR "Strength Training" OR "Training, Strength" OR "Weight-Lifting Strengthening Program" OR "Strengthening Program, Weight-Lifting" OR "Strengthening Programs, Weight-Lifting" OR "Weight Lifting Strengthening Program" OR "Weight-Lifting Strengthening Programs" OR "Weight-Lifting Exercise Program" OR "Exercise Program, Weight-Lifting" OR "Exercise Programs, Weight-Lifting" OR "Weight Lifting Exercise Program" OR "Weight-Lifting Exercise Programs" OR "Weight-Bearing Strengthening Program" OR "Strengthening Program, Weight-Bearing" OR "Strengthening Programs, Weight-Bearing" OR "Weight Bearing Strengthening Program" OR "Weight-Bearing Strengthening Programs" OR "Weight-Bearing Exercise Program" OR "Exercise Program, Weight-Bearing" OR "Exercise Programs, Weight-Bearing" OR "Weight Bearing Exercise Program" OR "Weight-Bearing Exercise Programs" AND "Muscle Fatigue"[Mesh] OR "Muscle Fatigue" OR "Muscular Fatigue" OR "Fatigue, Muscular" OR "Fatigue, Muscle" OR "Muscular Failure" OR "Muscular Exhaustion" OR "Repetition Failure" OR "Failure" OR "Repetition Exhaustion" OR "Repetition Maximum" OR "Maximal Repetitions"

Table S1. Summary of risk of bias of the studies included

| Studies                         | Adequate random sequence generation | Allocation concealment | Blinding of participants and/or personnel | Blinding of outcome assessment | Description of losses and exclusions | Intention-to-treat analysis |
|---------------------------------|-------------------------------------|------------------------|-------------------------------------------|--------------------------------|--------------------------------------|-----------------------------|
| Cadore et al., 2018a,b          | yes                                 | yes                    | unclear                                   | yes                            | yes                                  | no                          |
| Da Silva et al, 2018a,b         | unclear                             | yes                    | unclear                                   | strength: no hypertrophy: yes  | yes                                  | no                          |
| Drinkwater et al., 2005         | unclear                             | unclear                | unclear                                   | unclear                        | no                                   | no                          |
| Drinkwater et al., 2007         | unclear                             | unclear                | unclear                                   | unclear                        | no                                   | no                          |
| Folland et al., 2002            | no                                  | unclear                | unclear                                   | unclear                        | no                                   | no                          |
| Izquierdo et al., 2006          | unclear                             | unclear                | unclear                                   | unclear                        | no                                   | no                          |
| Izquierdo-Gabarren et al., 2010 | unclear                             | unclear                | unclear                                   | unclear                        | no                                   | no                          |
| Kramer et al., 1997             | unclear                             | unclear                | unclear                                   | unclear                        | yes                                  | no                          |
| Martorelli et al., 2017a,b      | yes                                 | unclear                | unclear                                   | unclear                        | no                                   | no                          |
| Nóbrega et al., 2017            | unclear                             | unclear                | unclear                                   | unclear                        | yes                                  | no                          |
| Rooney et al., 1994             | unclear                             | unclear                | unclear                                   | unclear                        | no                                   | no                          |
| Sampson & Groeller, 2015        | unclear                             | unclear                | unclear                                   | unclear                        | no                                   | no                          |
| Sanborn et al., 2000            | unclear                             | unclear                | unclear                                   | unclear                        | yes                                  | no                          |

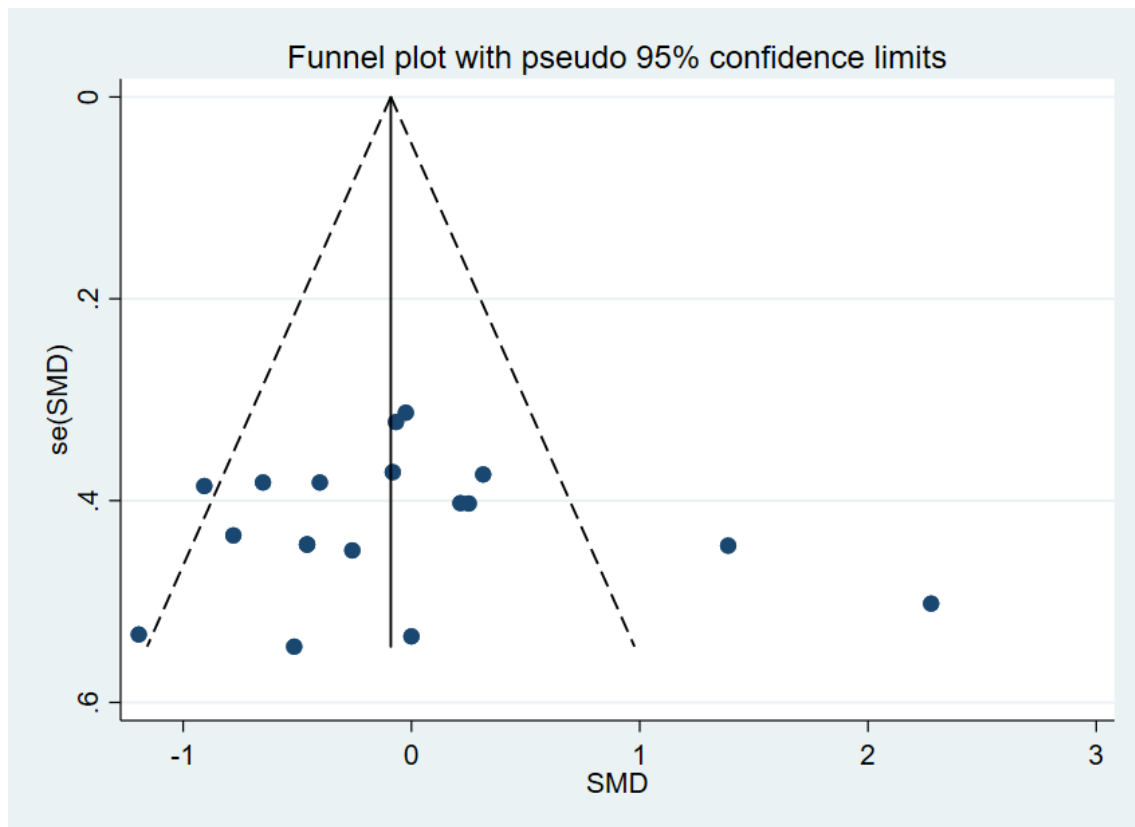


Figure S1. Funnel plot of the effect of resistance training performed to concentric failure or not to failure on maximal strength. The solid line represents the pooled effect estimate expressed as the standardized mean difference (SMD) for each analysis. Dashed lines present pseudo-95% confidence intervals and the circles represent effect estimates for each included study.

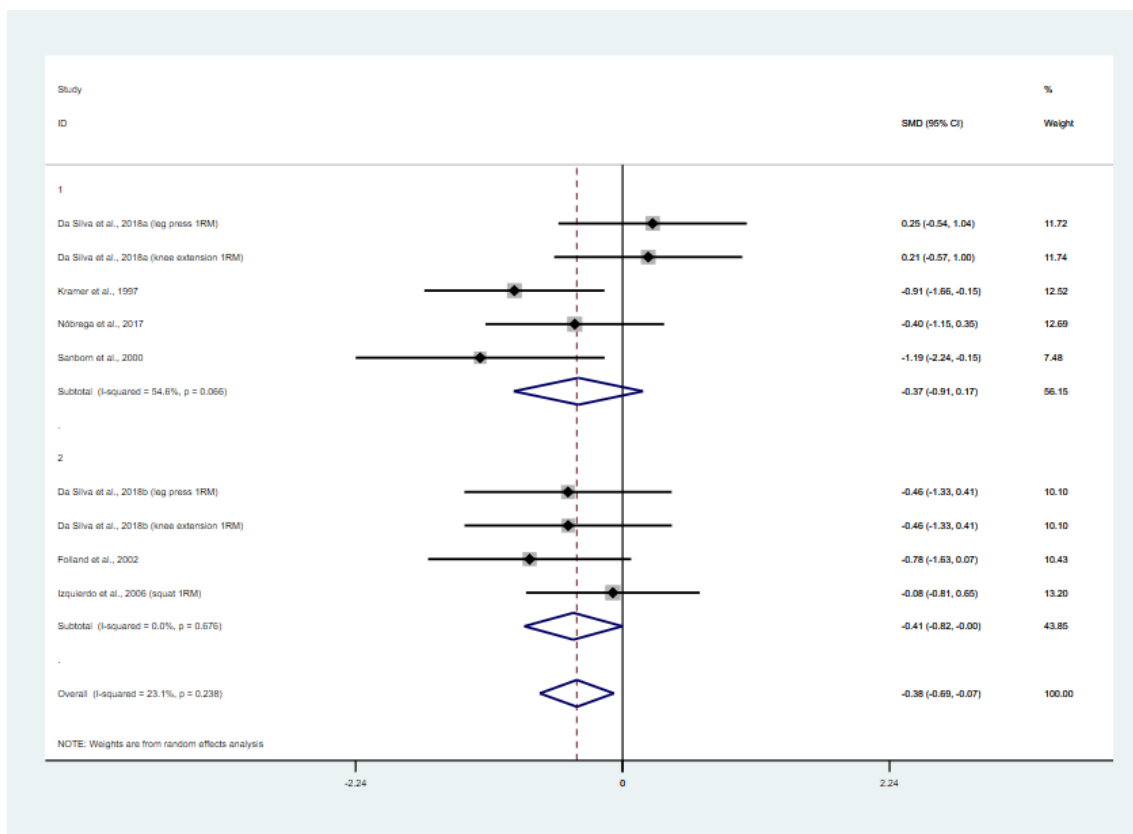


Figure S2. Forest plot of the lower-body maximal strength promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure. The estimation for each subgroup (1: non equalized volume; 2: equalized volume) and combined effect (overall) are detailed. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

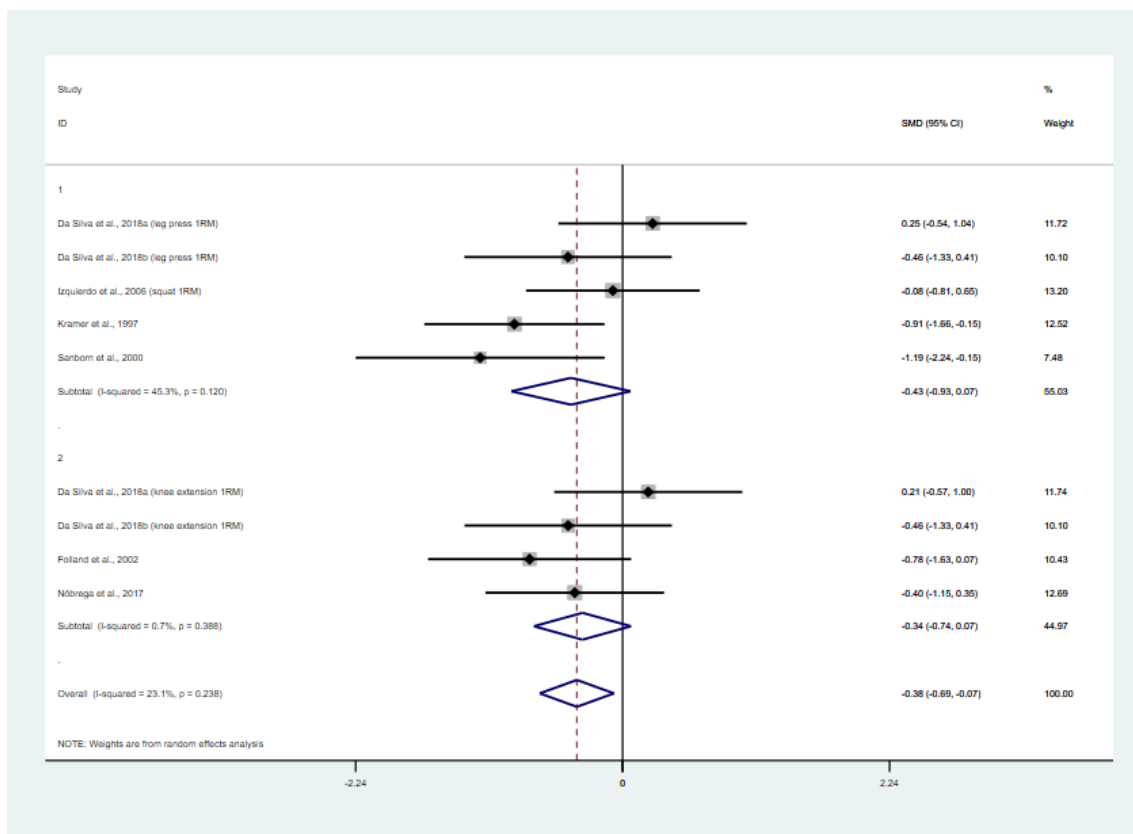


Figure S3. Forest plot of the lower-body maximal strength promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure. The estimation for each subgroup (1: multi-joints exercises; 2: single joints exercises) and combined effect (overall) are detailed. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

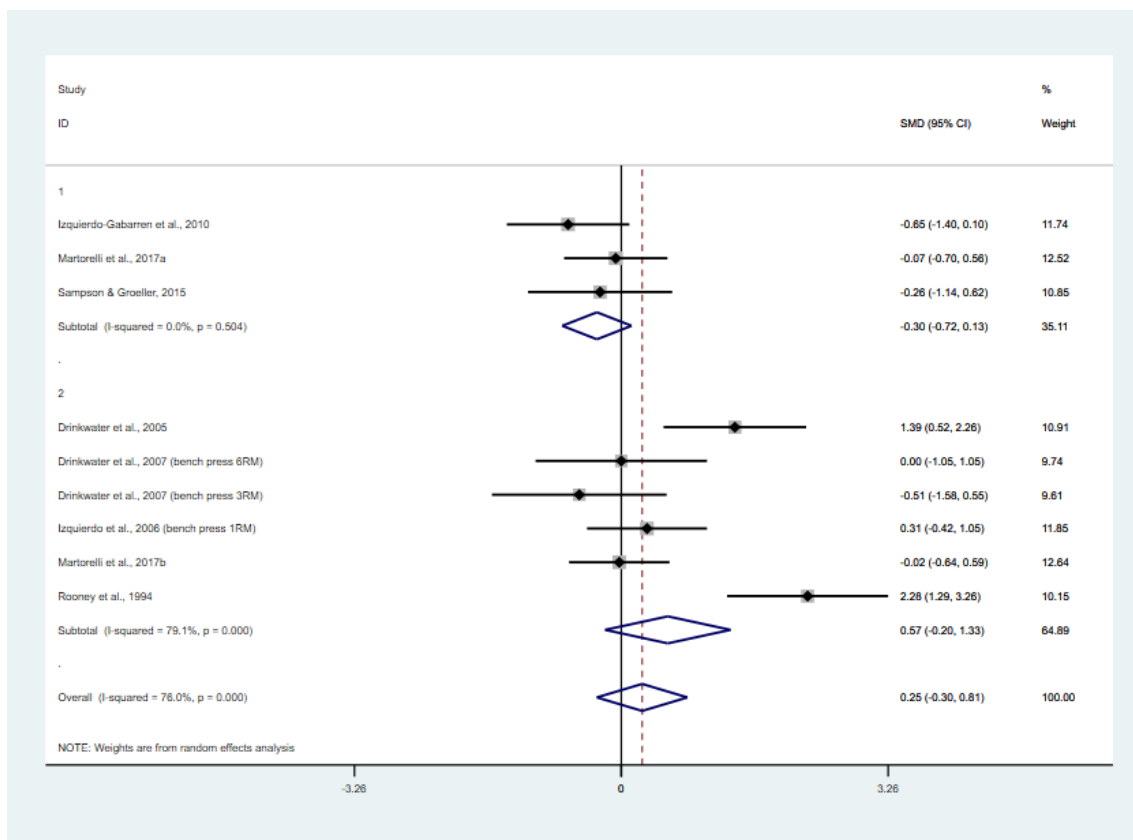


Figure S4. Forest plot of the upper-body maximal strength promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure. The estimation for each subgroup (1: non equalized volume; 2: equalized volume) and combined effect (overall) are detailed. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

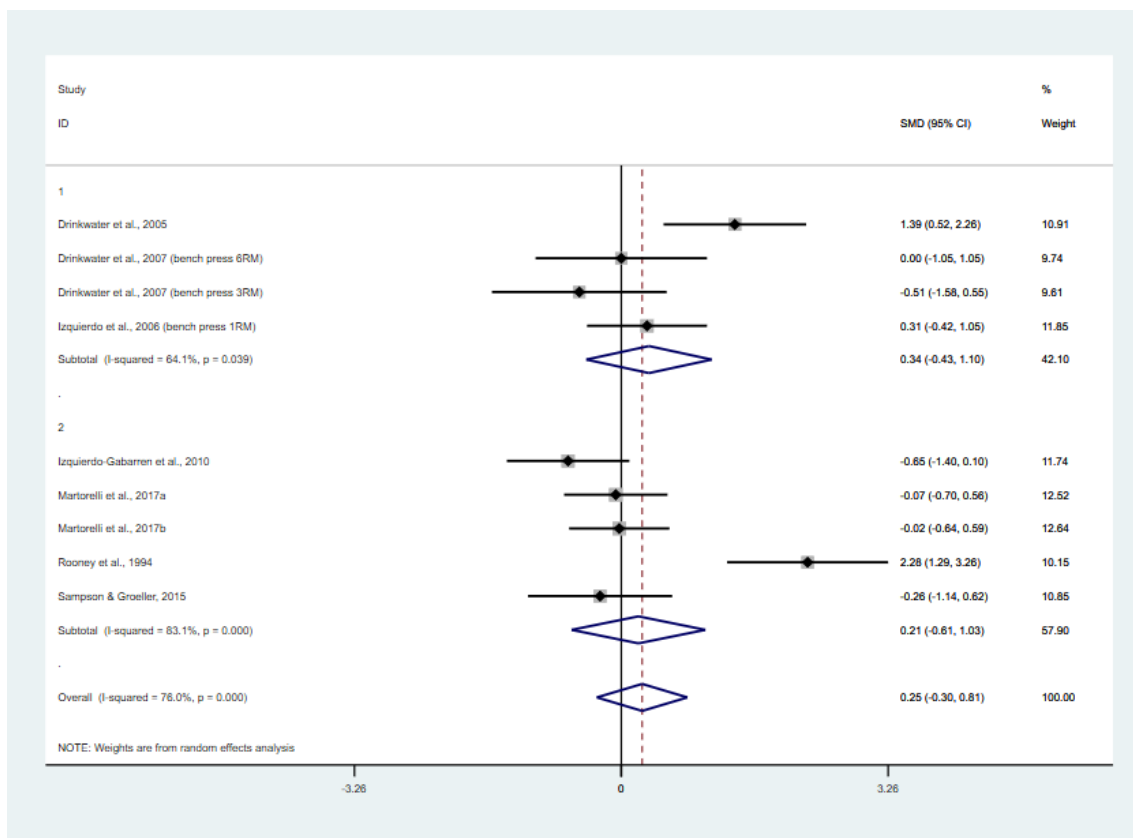


Figure S5. Forest plot of the upper-body maximal strength promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure. The estimation for each subgroup (1: multi-joints exercises; 2: single joints exercises) and combined effect (overall) are detailed. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.



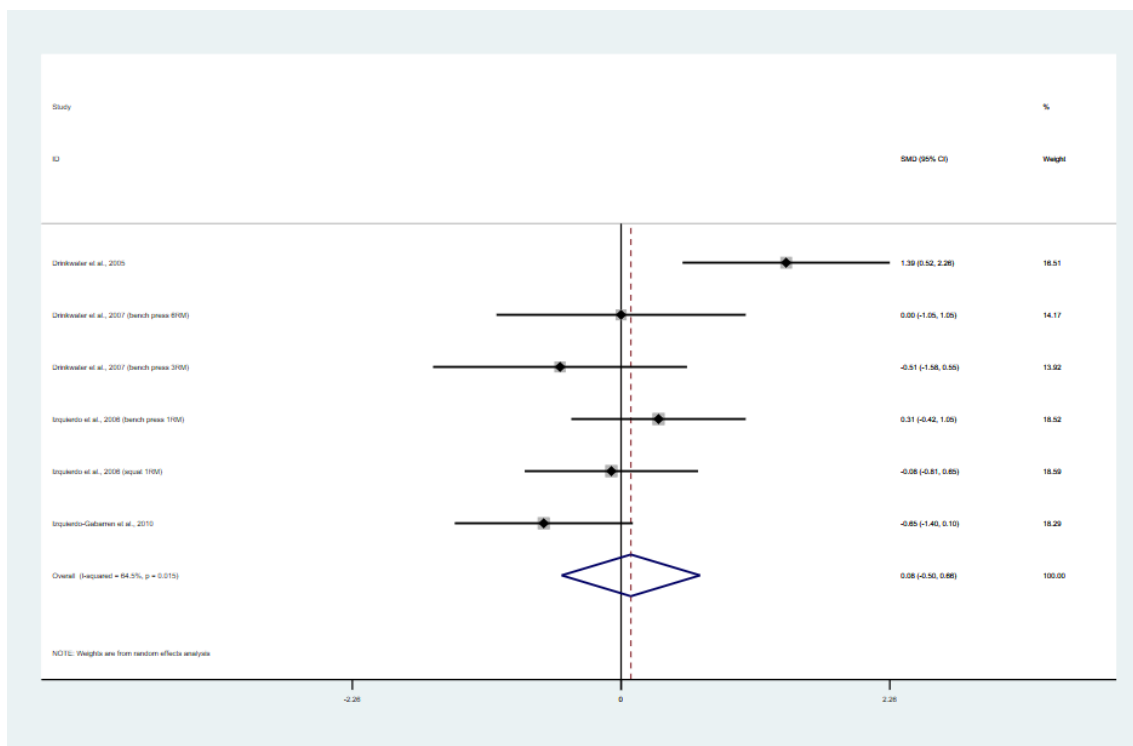


Figure S6. Forest plot of the maximal strength promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure in sports athletes. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

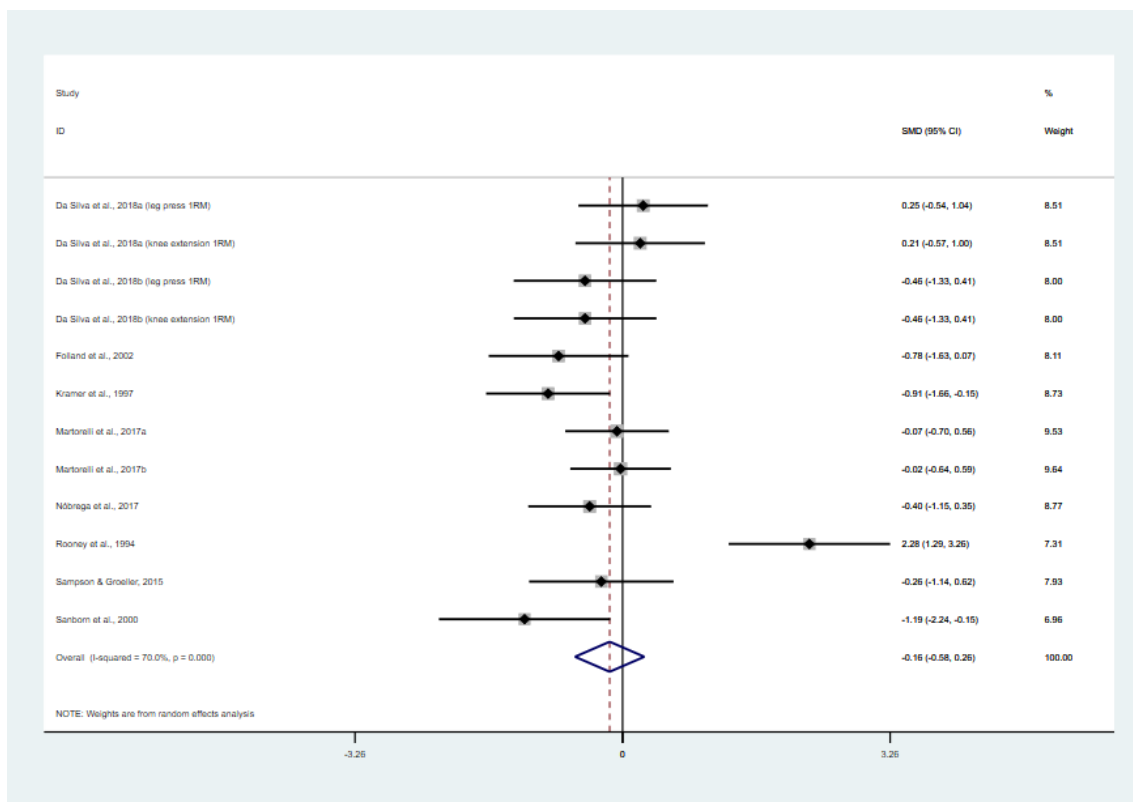


Figure S7. Forest plot of the maximal strength promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure in non-athletes. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

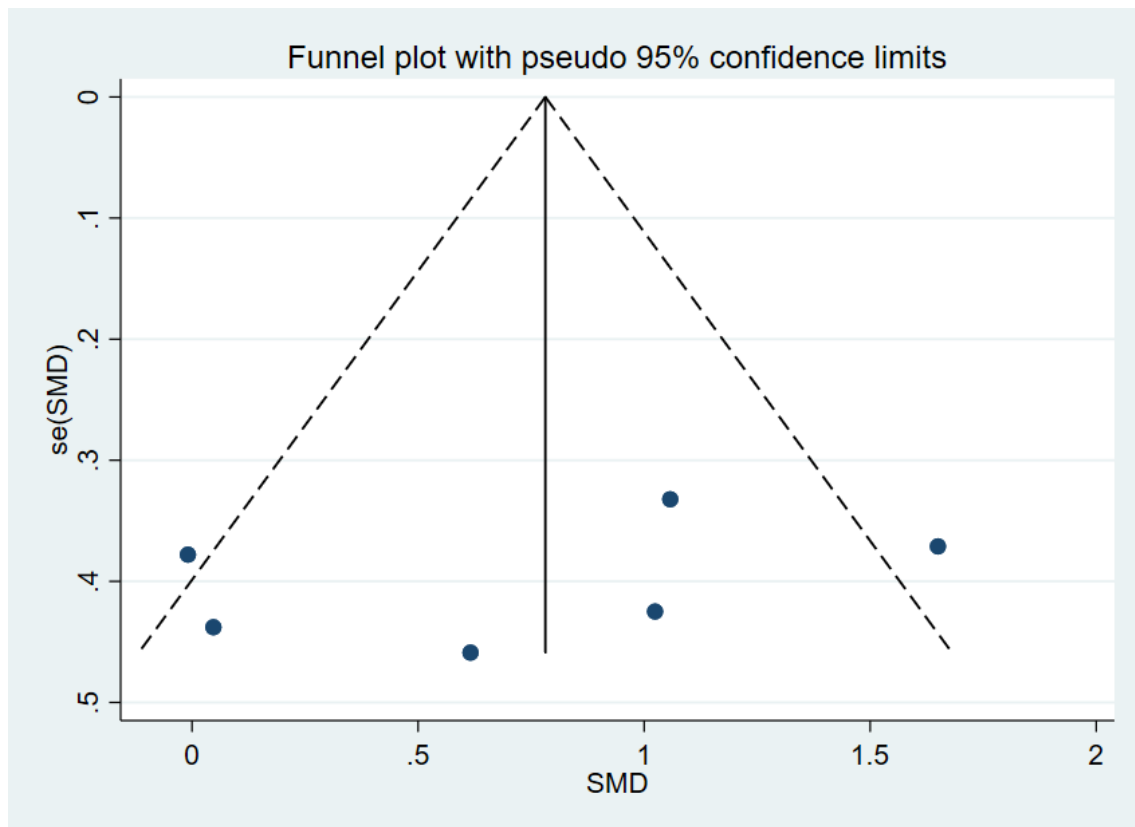


Figure S8. Funnel plot of the effect of resistance training performed to concentric failure or not to failure on muscle hypertrophy. The solid line represents the pooled effect estimate expressed as the standardized mean difference (SMD) for each analysis. Dashed lines present pseudo-95% confidence intervals and the circles represent effect estimates for each included study.

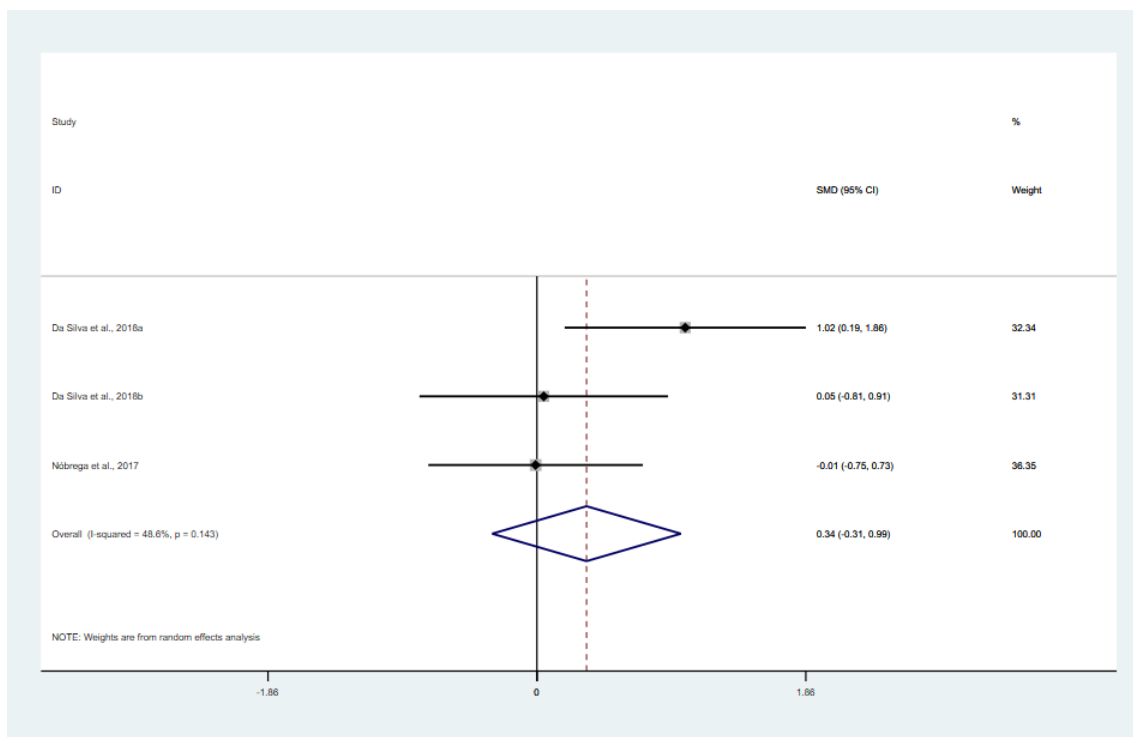


Figure S9. Forest plot of the lower-body muscle hypertrophy promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

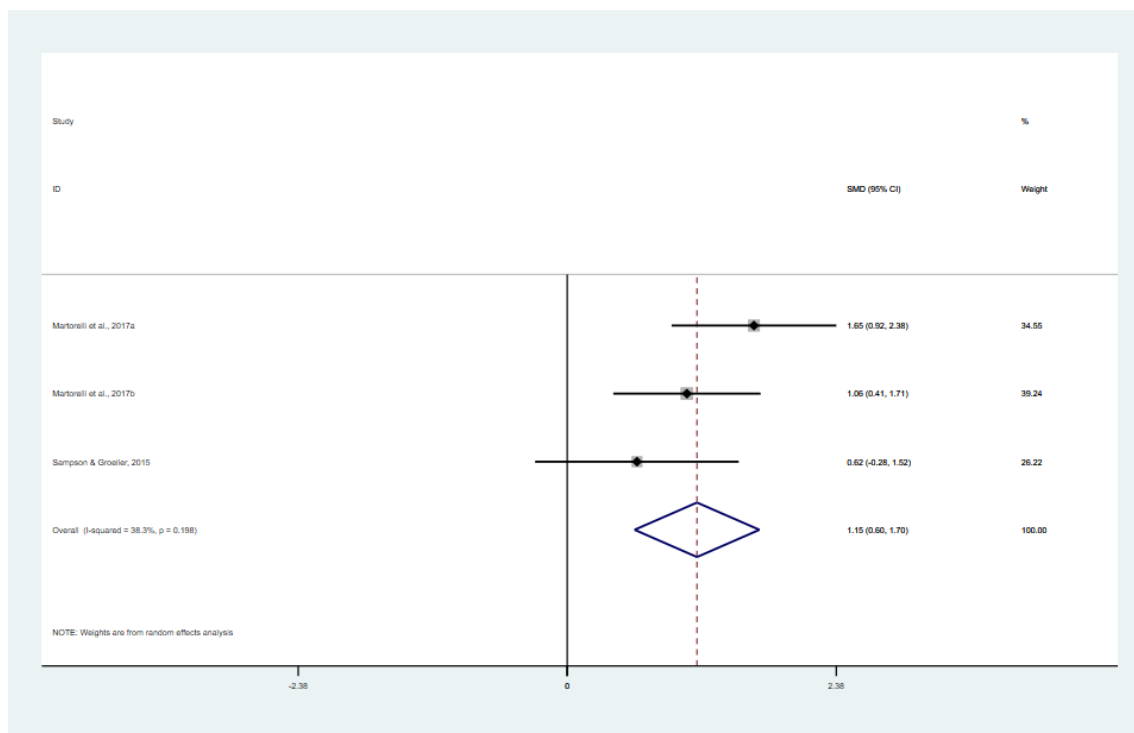


Figure S10. Forest plot of the upper-body muscle hypertrophy promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

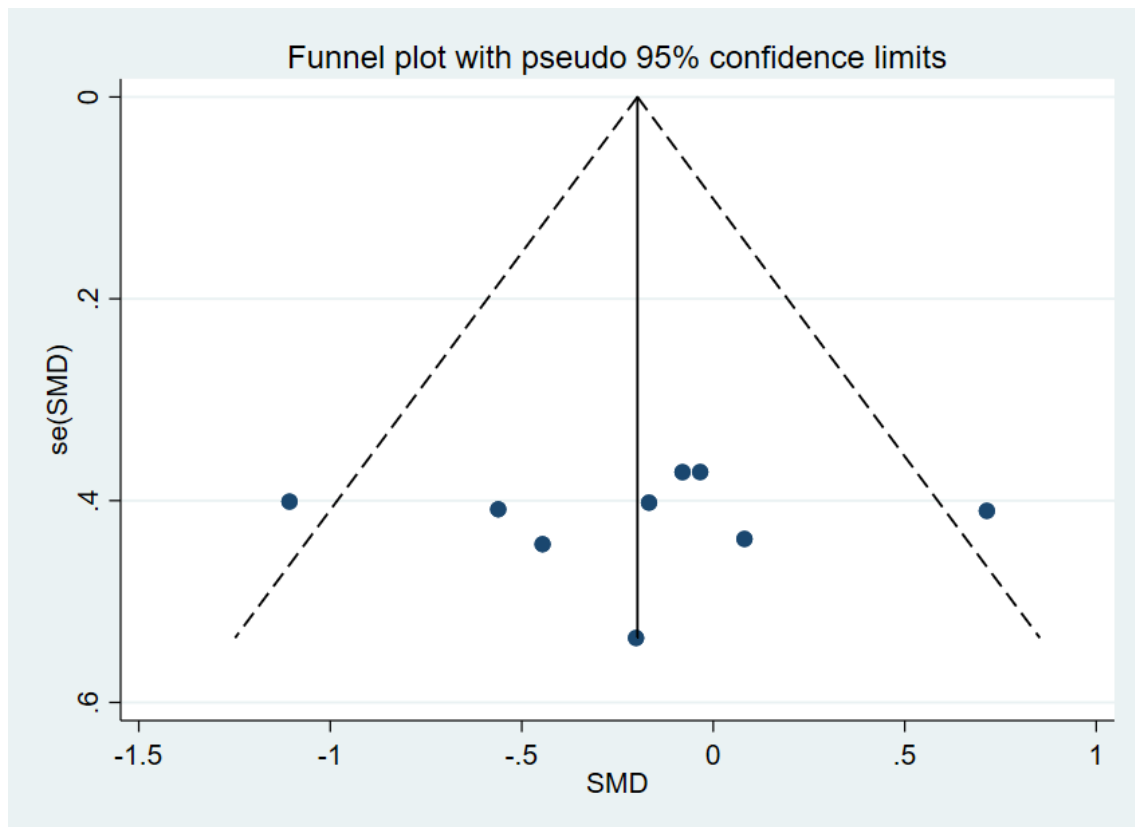


Figure S11. Funnel plot of the effect of resistance training performed to concentric failure or not to failure on maximal power output. The solid line represents the pooled effect estimate expressed as the standardized mean difference (SMD) for each analysis. Dashed lines present pseudo-95% confidence intervals and the circles represent effect estimates for each included study.

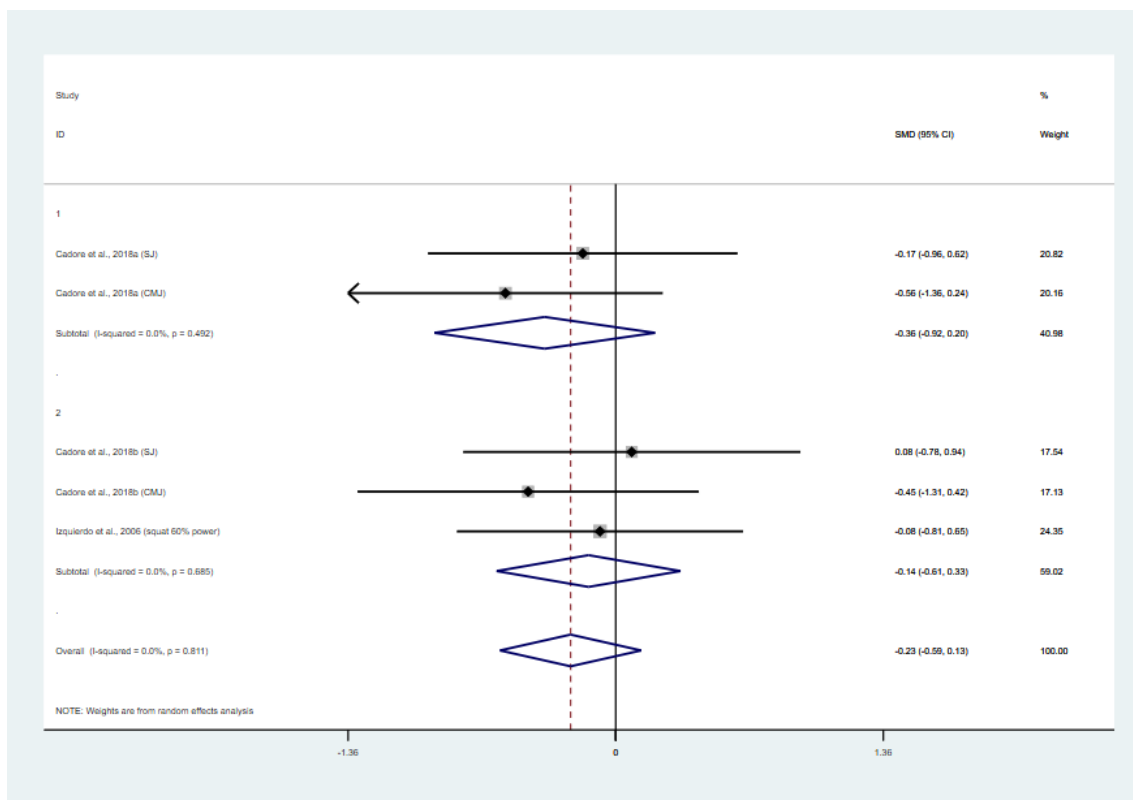


Figure S12. Forest plot of the lower-body maximal power output promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure. The estimation for each subgroup (1: non equalized volume; 2: equalized volume) and combined effect (overall) are detailed. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

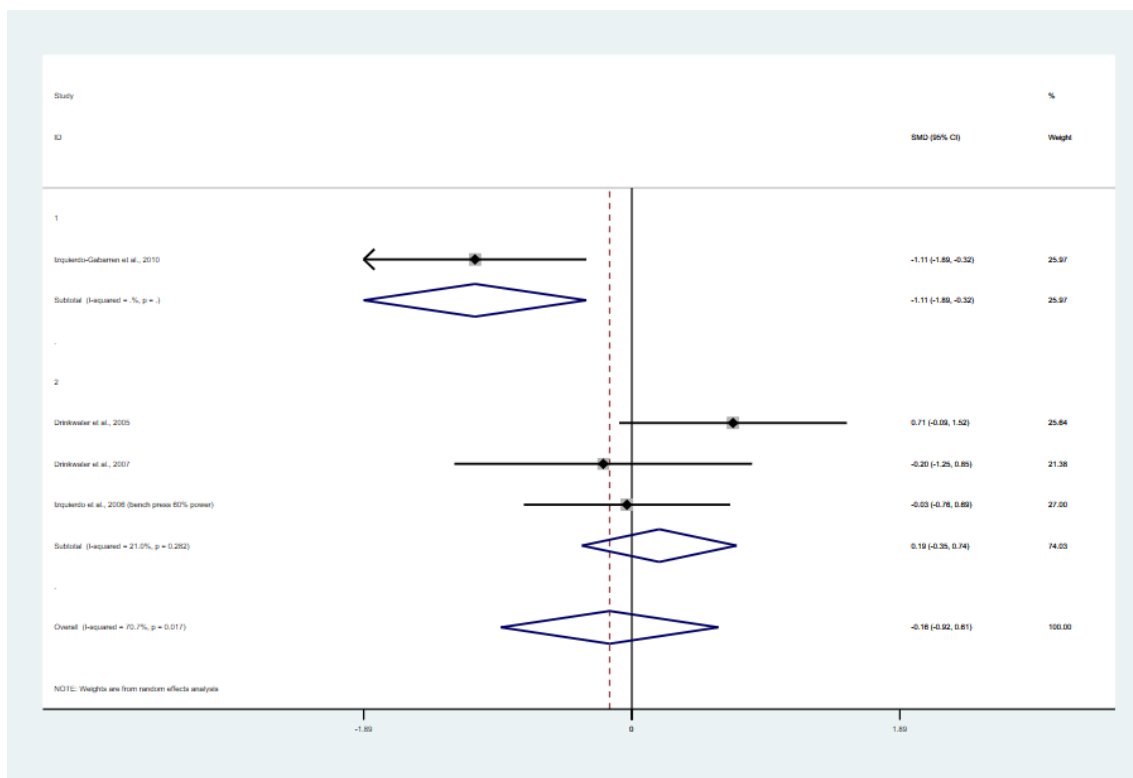


Figure S13. Forest plot of the upper-body maximal power output promoted by resistance training (RT) performed to concentric failure versus RT performed to not failure. The estimation for each subgroup (1: non equalized volume; 2: equalized volume) and combined effect (overall) are detailed. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.



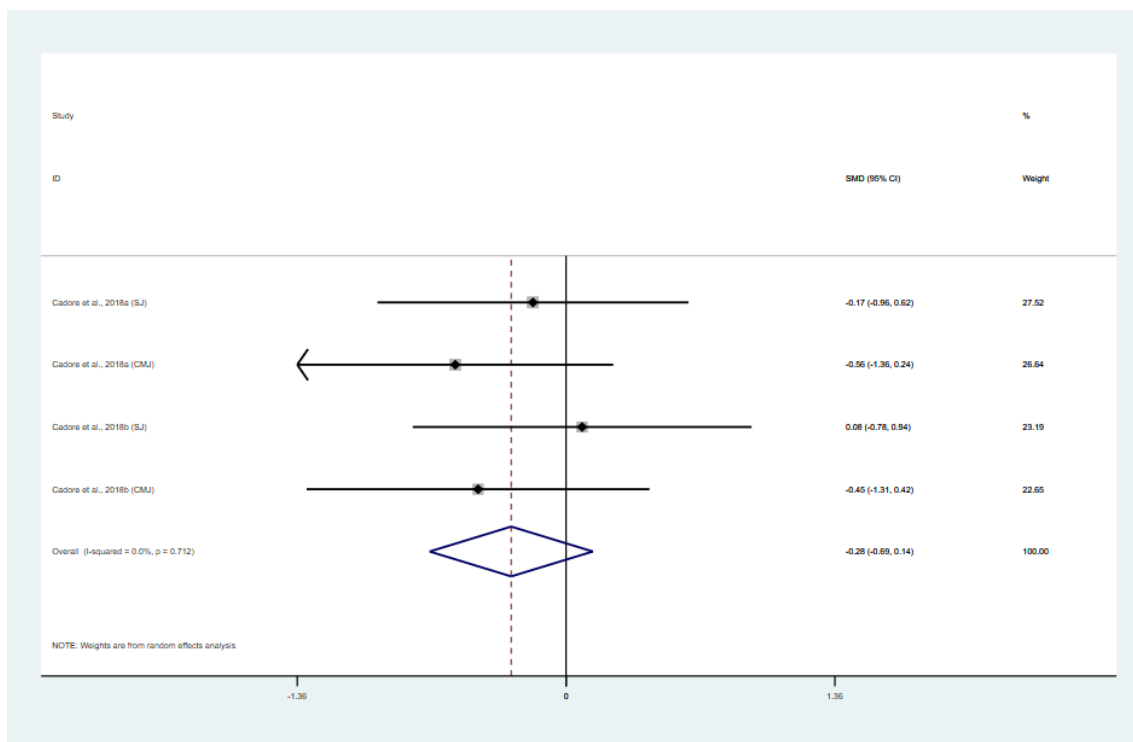


Figure S14. Forest plot of the jump power output promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

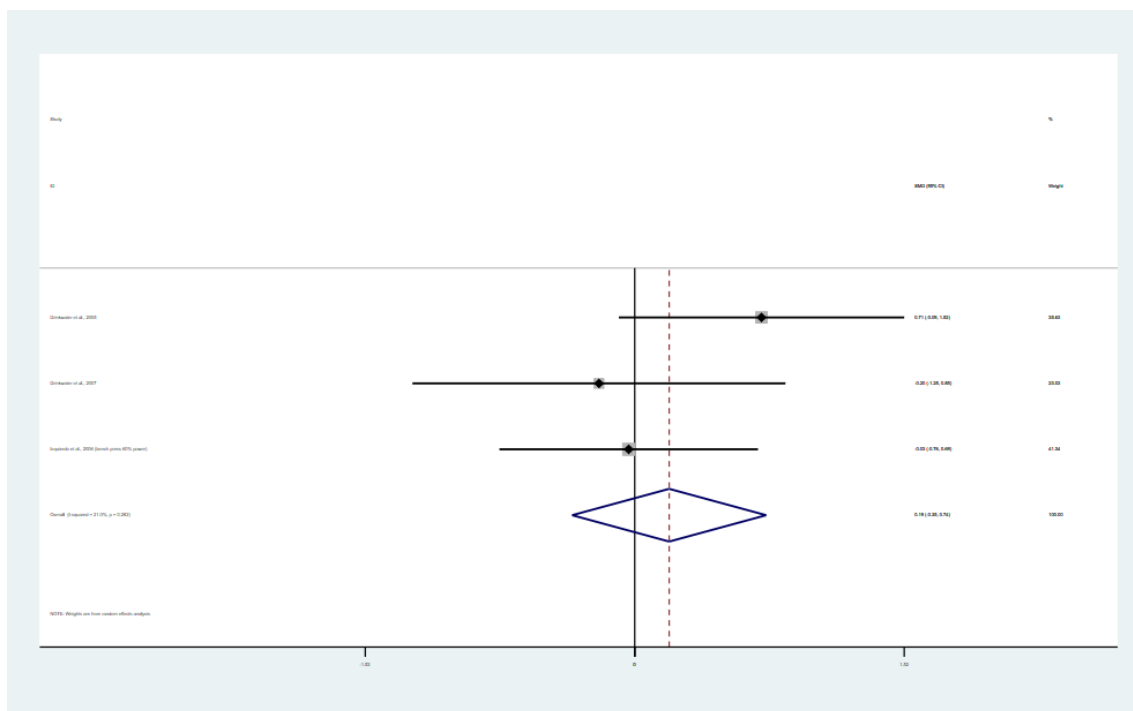


Figure S15. Forest plot of the bench press power output promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

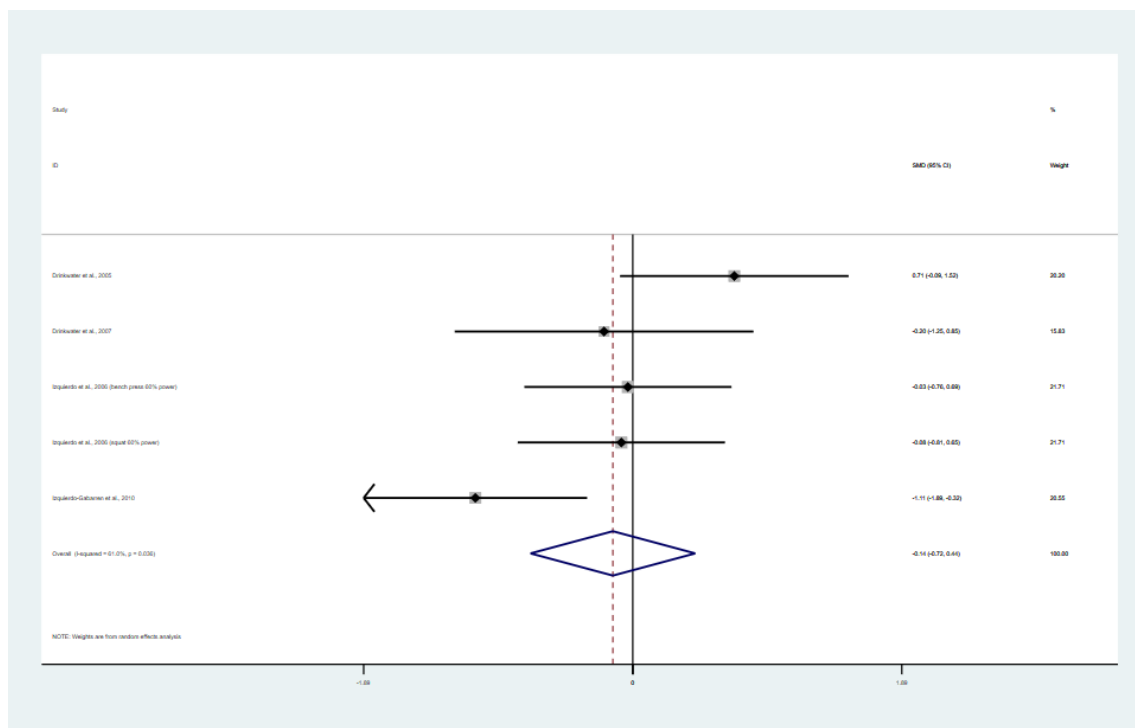


Figure S16. Forest plot of the maximal power output promoted by resistance training (RT) performed to concentric failure versus RT performed to not failure in athletes. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.

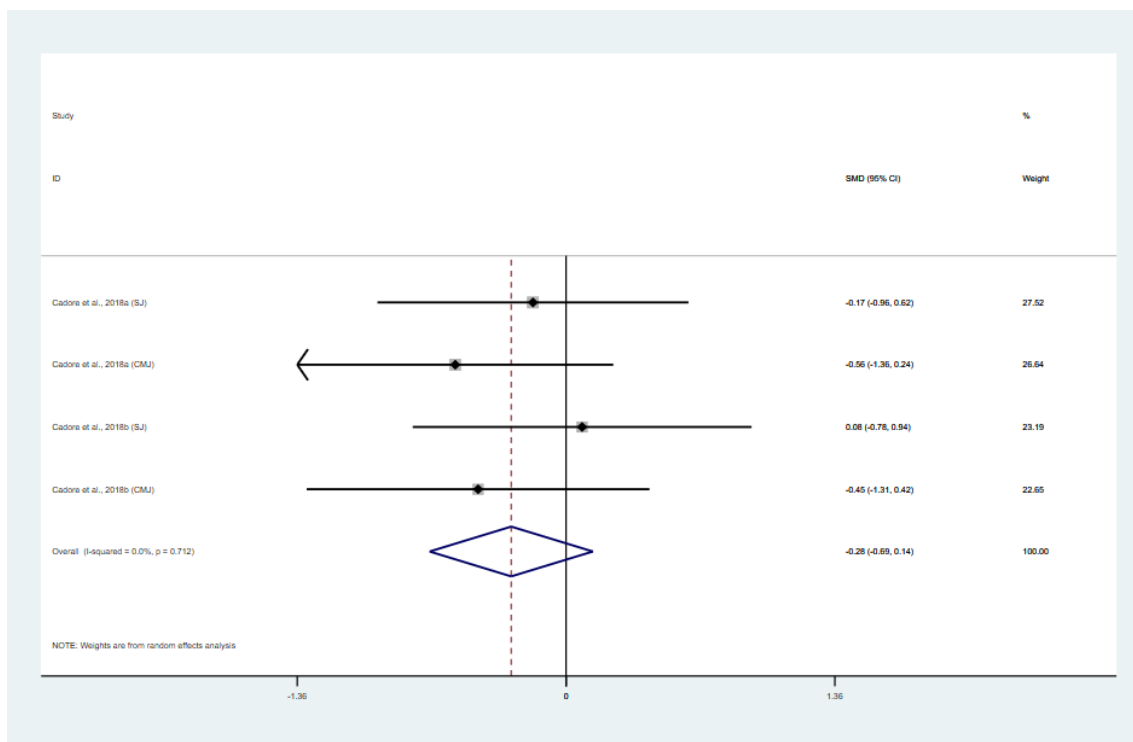


Figure S17. Forest plot of the maximal power output promoted by resistance training (RT) performed to concentric failure versus RT performed not to failure in non-athletes. The squares and error bars signify the standardized difference in the means (SMD) and 95% confidence interval (95% CI) values; The diamonds represent the pooled estimates of random-effects meta analyses.