

THE HAMSTRING TO QUADRICEPS STRENGTH RATIO ACROSS A POLICE TRAINING ACADEMY

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BACKGROUND

- Prior to becoming a law enforcement officer, civilians are required to undergo a multi-month training academy experience
- This encompasses both academic and physical components
- Previous works have indicated that similar tactical training academies have divergent impacts on physical performance¹
- Previous reports have suggested that lower extremity muscle function may be associated with occupational performance^{2,3}
- Hamstring to quadricep strength ratio (H:Q) is commonly assessed to indicate injury risk in athletes

PURPOSE: The purpose of this study was to quantify the change in the hamstring to quadriceps strength ratio in police officer recruits across a training academy

PRACTICAL APPLICATIONS

The police training academy did not influence the H:Q ratio. Police academies may want to evaluate their training protocols to ensure an acceptable H:Q strength ratio in efforts to minimize injury risk. Indeed, for individuals with particularly low H:Q ratios (and who may be most at risk of injury) the **academy cadre may consider focused strength training lower extremity.**

METHODS

PARTICIPANTS

- Twenty-eight participants across two academy classes
- Age = 26 ± 6 years
- BMI = 28.2 ± 4.5 kg/m²
- Completed three laboratory visits to assess isometric muscle strength
- Each visit was separated by approximately 10-weeks

POLICE TRAINING ACADEMY

- The local police training academy was designed to prepare recruits, both academically and physically, for a career law enforcement
- The length of the academy was ~28 weeks, where recruits worked 4 days per week
- Each day included mandatory physical training
 - The police training academy utilized high-intensity functional training paradigms.
 - A heavy emphasis was placed on running, row ergometry, moving with a load and other calisthenics
- The recruit physical training was supervised by an experienced instructor cadre

ISOMETRIC STRENGTH PROCEDURE

- Isometric knee extensor (PT_{EXT}) and flexor (PT_{FLX}) strength was assessed using an isokinetic dynamometer (HUMAC NORM, CSMi, Stoughton, MA)
- Following a brief warm-up, participants performed 2 maximal voluntary contractions (MVCs)
 - Participants were asked to “kick out” or “pull back” as hard and as fast as possible and hold for 3-5 seconds while strong external motivation was provided
 - Knee joint angle was secured at 60 and 30 below the horizontal plane for PT_{EXT} and PT_{FLX} strength, respectively.
- Each MVC was separated by a one-minute rest

SIGNAL PROCESSING

- Torque signals were analyzed offline using custom written software (LabVIEW 22.3; NI, Austin, TX).
- Peak Torque (PT) was defined as the highest 500ms epoch during the MVC
 - The highest PT from the MVC’s was selected for further analyses
 - The H:Q ratio was quantified as PT_{EXT} / PT_{FLX}

STATISTICAL ANALYSIS

- A one-way analysis of variance (ANOVA) was employed to assess the effect of time (pre-, mid-, and post-academy) on H:Q in police recruits
- An *a priori* alpha level of $p < 0.05$ determined statistical significance

RESULTS

- The average \pm SD H:Q ratio was 0.65 ± 0.12 % at PRE-testing values
- There were no statistically significant changes in H:Q across the police training academy ($F = 0.356$, $p = 0.705$).

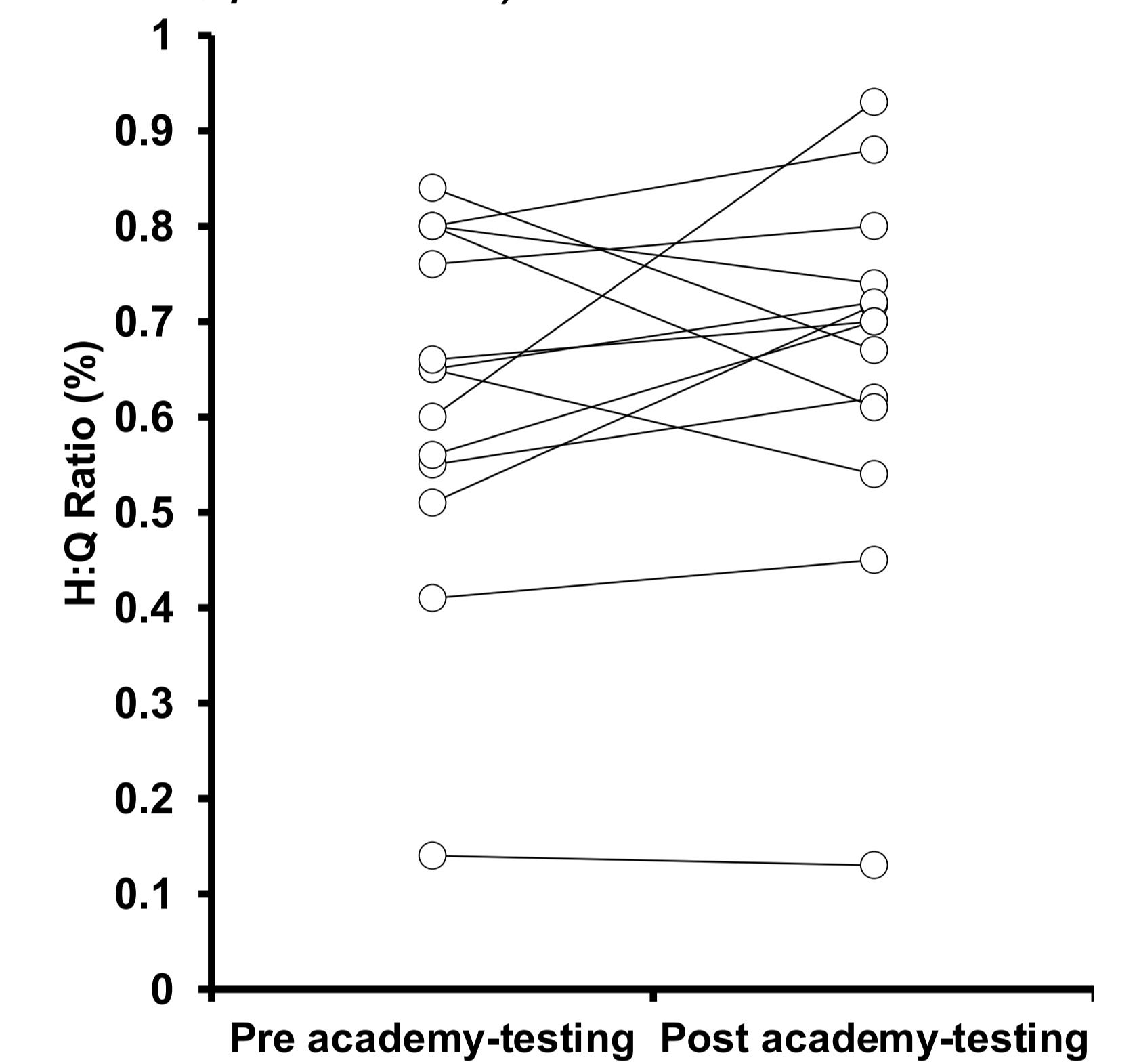


Table 1. Individual subject H:Q ratios tracked across the academy (pre- and post-academy values shown).

CONCLUSION

- The average H:Q ratio did not change across the police academy
 - In some instances, substantial improvements in the H:Q ratio were noted
- Tactical athletes who may be at risk of injury may be mindful of quantifying the H:Q ratio.
- Intentional lower-extremity strength training may be required to improve these outcomes further

References

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