

The Effects of Flywheel Squat Training on Water Polo Athletes' Jump Height Out of the Water

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Abstract

This study investigated the effects of flywheel squat training on water polo athletes' jump height out of the water. This was a prospective cohort design with a control period that involved testing sessions at weeks 0 (Pre), 4 (Pre2) and 8 (Post) of the study. Each testing session assessed maximum jump height on land and in-water (WJH) and foot speed during the in-water jump. The first four-week block served as a control period with no intervention, and the second four-week block was the experimental period where the subjects performed flywheel squat training twice a week. There was no significant main effect for peak or average foot speed, with insignificance and small effect sizes between all trials. There was a significant main effect ($p = .001$) interaction for the in-water jump height variable (WJH), with significant interaction between Pre1 and Post ($p < .0001$) with a Cohen's d of .4, but between other phases there showed no significant differences and small effect sizes.

Methods

- The in-water vertical jump height (WJH) was assessed using a private therapy pool in a university laboratory with subjects wearing their swimsuits.
- Subjects performed a standard warm-up of 2-min of treading water and one in-water warm-up jump. Then three jumps were performed for maximum jump height, with an extra trial performed if the three trials varied by more than $\pm 10\%$. The jump protocol involved the subjects treading underneath a modified Vertec jump tester placed on the edge of the pool. (See figure 1)
- The kinematic and spatio-temporal data was assessed underwater using the NightOwl software in order to assess vertical foot speed.
- Foot speed was then calculated from the digitization of the scaled marker using the motion analysis program Logger Pro 3.8.4 (Vernier Software & Technology, Beaverton, OR).



Figure 1

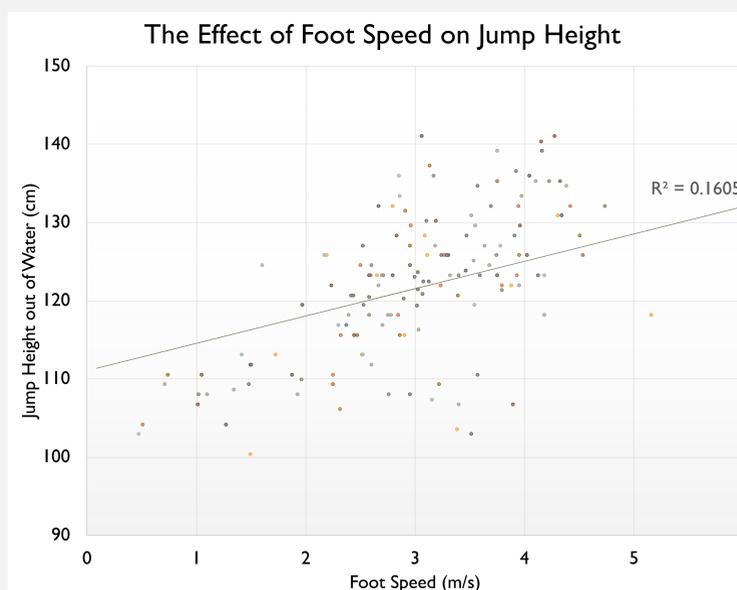
Background

Due to its unique physiological training characteristics, flywheel-based training may be a useful means to improve a variety of muscle performance abilities in a short amount of time and may also transfer performance gains to sport-specific tasks, such as the in-water boost maneuver. Therefore, the purpose of this study is to examine the effectiveness of a four-week lower body flywheel resistance training program on muscle function adaptations and sport-specific performance parameters of collegiate club water polo players.

We hypothesize that flywheel training performed by water polo players would induce large improvements in muscle function (power) and favorable changes on the in-water boost skill, as measured by in-water jump height.

Results

There was no significant main effect for peak or average foot speed, with insignificance and small effect sizes between all trials. There was a significant main effect ($p = .001$) interaction for the in-water jump height variable (WJH). In the post-hoc analysis, there was significant interaction between Pre1 and Post ($p < .0001$) with a Cohen's d of .4, but between other phases there showed no significant differences and small effect sizes.



Conclusions

- There was a significant change in jump height out of the water between Pre1 and Post, not directly after the 4-week intervention
- A lack of improvement in foot speed may be explained by the principle of specificity, in that we did not specifically train foot speed, but just general lower body strength. Additionally, as the flywheel is a land-based exercise, perhaps it simply did not allow for transfer to the water, or the intervention period was not long enough to elicit any changes in the water
- We did not have the tools to evaluate biomechanics but based this on the general idea that greater years of experience and playing at a higher level in a sport should yield better treading biomechanics.

