

# The Effectiveness of Utilizing an Underwater Treadmill to Reduce Overuse Injuries and Improve Race Times in High School Cross Country Runners



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## ABSTRACT

Underwater treadmill (UTM) exercise is emerging as an innovative method of injury rehabilitation , but there has been little research on performance and injury prevention. The low-impact nature of UTM has been suggested to expedite recovery while providing a cardiovascular training effect. Our aim was to test our hypothesis that UTM would decrease overuse symptoms and increase performance in high school cross country runners. 16 subjects ( $16 \pm 2$  yr) exercised on a HydroWorx™ UTM in small groups for 30-45 minutes, 1-2 times per week for 10 weeks in place of a dry-land practice. Sessions began with a dynamic warm-up and emphasized either recovery or speed. Daily questionnaires regarding injuries, discomfort and performance were administered before dry land and UTM practices. Race times were gathered at the conclusion of the season. We observed a rate of 1.8 injuries/1000 athletic exposures. This injury rate was an improvement over the previous season (2.8/1000) as well as historical controls (17/1000). Significant improvements in average race times from the previous season were seen at 3 races. We cannot say for sure that the benefits we observed were due to the UTM. Future research needs to be done on a larger sample over several seasons.

## INTRODUCTION

Performing physical activity while partially submerged under water can be a functional and efficient mode of exercise for many different populations (2, 5). The UTM can be used to perform a variety of exercises, such as running, walking, stretching, resistance training, and even hydro massage.

The primary benefit of underwater exercise is that the buoyancy effect of the water reduces impact and stress on muscles and joints (3). UTM training may also elicit a greater physiological response than land based exercise because the resistance of the water helps increase exercise intensity (1, 4, 6, 9). As a result, cardiovascular fitness can be improved without impact forces on the lower limbs. Thus, UTM exercise may be especially effective for people suffering from lower extremity injuries or physical limitations (5).

Very little information is available concerning the use of UTM exercise in younger or athletic populations. We believe UTM exercise may especially benefit cross-country runners in several ways: By decreasing the pounding their bodies receive from the enormous amounts of running they do over the course of a season, providing an intense cardiovascular stimulus, and allowing greater recovery from the high-mileage training involved in the sport.



## METHODS

### Subjects

- n = 16 (8 male, 8 female)
- 14 to 18 years old
- All members of the same cross-country team
- Recruited by the Dove Healthcare aquatics director
- All subjects provided written informed consent according to the guidelines of the University of Wisconsin - Eau Claire.

### Procedures

Baseline assessments included recording age, height, weight, BMI, and injury history for all subjects. During the study the subjects filled out questionnaires regarding injuries, discomfort and performance before dry land and UTM practices. We also monitored and recorded the RPE of all UTM sessions. Following the study we collected follow-up questionnaires, counted total numbers of practices, races and workouts from each subject to calculate athletic exposures for the 2010 season. Finally, we obtained the athletic exposure and race times from 12 subjects who had competed in the previous season (2009).

UTM training lasted 10 weeks, during which the subjects participated in 1-2, 30-45 minute sessions per week. The subjects ran in groups of 2-4 separated depending on their height to keep the water depth near the xyphoid process.

Each session began with a 6 to 8 minute warm-up using mobility exercises and slow jogging (RPE 1-2 / 10). The bulk of the workout then focused on either recovery or speed. Recovery workouts consisted of steady-state running for 20 to 35 minutes (RPE 3-6 / 10). Cool-downs were prolonged with 4-5 minutes of slow jogging and 1-2 minutes of walking. Liberal use of the massage hose followed. Speed workouts consisted of 15 to 20 minutes of steady state running (RPE 5-7 / 10). After their steady state run the subjects completed sprints which were either alternating 1-2 minutes at race intensity (RPE 6-8 / 10) with an equal amount of active rest or alternating 30 seconds of maximal effort sprinting (RPE 8-10 / 10) with 30 seconds of active rest. The active rest consisted of either a slow jog, mobility exercises, or easy core exercises with aquatic dumbbells or balance boards. Following their sprints, the subjects would cool-down with 2 minutes of slow jogging and 1 minute of walking before choosing to use the massage hose.

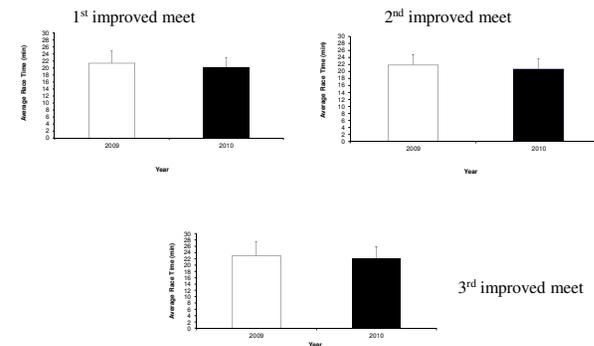
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## RESULTS

There were two major injuries resulting in missed practices and meets, resulting in an injury rate of 1.8 per 1,000 athletic exposures. The corresponding rate the previous season was 2.8 injuries per 1,000 exposures. Both these rates are well below the 17/1,000 exposures as reported in the literature for high school runners (8).

Though it is difficult to compare race times between seasons, we were able to find improvements in 3 of 10 races, where the runners averaged 1 min 20 sec, 1 min 6 sec, and 1 min 7 sec faster.



## DISCUSSION AND CONCLUSIONS

We saw little difference in the injury rate between 2009 and 2010, though the rate was extremely low. Differences might be more apparent in a larger sample of runners. There are several possible reasons for the results in this study. First, there is simply maturation. Our subjects were more physically mature this year, which may explain their fewer injuries and improved running times. Second, they had more time to practice running and their skill may have improved. In addition to these, we would like to think that the UTM experience was also an important contributing factor.

Based on the overwhelming appreciation we heard from both runners and coaches, we think the UTM effects are not just physical, but also psychological (e.g., stress reduction, positive affect, kinesthetic awareness) resulting in more knowledgeable and effective overall training habits.

To our knowledge, this study was the first of its kind to assess the use of UTM exercise protocols to improve performance and reduce injury rate in runners. More research on the UTM mode of exercise will hopefully provide greater insight into its effectiveness.

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