

With serious running, training errors might often lead to overuse injuries of lower extremities and as a result, the inability to train, and the loss of physiological adaptations to training. Deep water running (DWR) has become an alternative method for injured runners and other special groups of population (such as pregnant women) to improve and maintain their fitness.

In our study of the effects of DWR on running performance, we wanted to investigate if a correlation existed between supplementing one's training with once-a-week DWR workout, and running performance for 5K distance, and stride length and hip range of motion (ROM).

Here are a few factors that affect one's ability to run fast:

Certain anthropometric variables have been linked to better running performance - low body fat, smaller feet, low body weight/height ration and narrow pelvis.

The surface on which we run can also be a factor.

Greater hip extension.

While we have no control of how long are our legs and how bit are our feet and often run on a variety of running surfaces the hip extension is one factor that affects the running speed that we can control and change.

In the literature, water exercises have been linked to improved mobility.

In addition to this, studies show, that DWR is a good training method to improve and maintain running economy (submaximal aerobic demand at a given running velocity).

We studied a group of 14 active adults (6 male and 8 female), who were recruited from a pool of local runners to participate in our study. All subjects were trained recreational runners with a previous experience in participating in 5K races.

During the first testing we measured active ROM. Then all subjects participated in a 5K time trial. Upon completion of the time trial, the subjects were randomly divided into two groups. One group continued their usual training routine. Members of the second group replaced one of their training session per week with a DWR training session and otherwise continued their normal training schedule.

After 7 weeks the ROM measurements and 5K time trial were repeated.

Results

Twelve out of fourteen participants finished the study. One subject from each group (land-based running and DWR), both females, could not come to the final testing due to an illness. These two subjects were, therefore, excluded from the study.

The total number of participants who finished the study was 12, six male and six female. The age of the participants ranged from 29y.o to 49y.o. (mean age 36.7y.o.).

One subject from the DWR group donated blood two days prior to the second testing, and felt “tired and sluggish” on the day of the second 5K run. This subject’s 5K time was slower than at the first time trial (23 min. 00 sec. vs. 23min. 54 sec.), and could possibly have been affected by the fact that he was still experiencing the side effects from donating blood.

One subject from the land-based running group ran Chicago marathon on October 10th, 3 weeks before the first testing. Her 5K time improved after the 7 weeks of our experiment (23 min. 30 sec. vs. 22 min. 22 sec.). This improvement can be attributed to her continued recovery from the marathon. Therefore we excluded those two subjects from our final statistical analysis of the data.

Running performance:

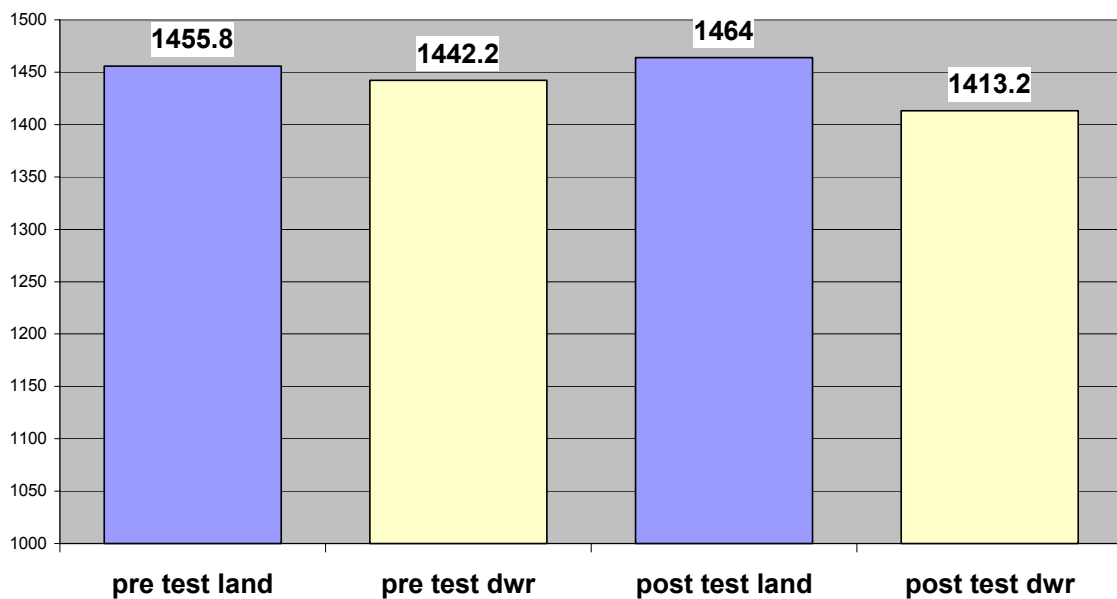
Time for the 5K time trial was very similar in both groups at the first testing (1455.8 sec. vs. 1442.2 sec). After 7 weeks of our study, the mean time for the DWR group improved

(decreased) and the mean time for the land-based training group increased. (See Table 1 and “Mean performance Land and DWR 5K times” chart).

Table 1

Deep Water Running group			land-based training group		
first testing	second testing	difference	first testing	second testing	difference
1182	1160	-22	1150	1155	5
1395	1345	-50	1365	1307	-58
1519	1564	45	1606	1648	42
1560	1505	-55	1448	1500	52
1555	1492	-63	1710	1710	0
7211	7066	-145	7279	7320	41
1442.2	1413.2	-29	1455.8	1464	8.2

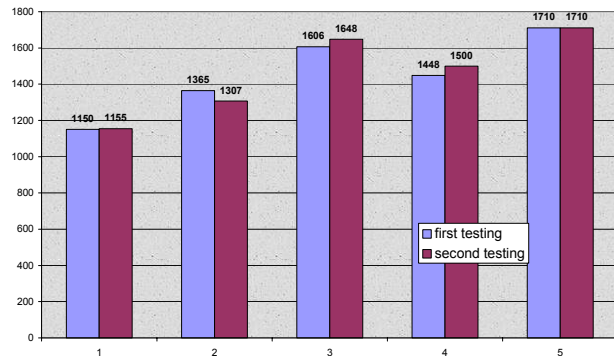
Mean Performance Land and DWR 5K Times (in seconds) pre and post test



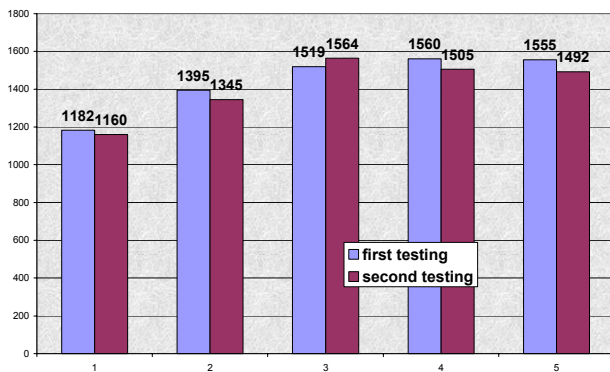
Three out of five subjects in the land-based training group demonstrated increased times at the second testing, one subject showed no difference and one showed a faster time (see chart above “Land Based Training Group Times”).

Four from five subjects in the DWR group demonstrated faster 5K times after 7 weeks of the study and one subject ran with a slower time (see chart above “DWR group 5K times). The statistical significance level (one-tailed Fisher exact test) of these results is 0.32417, which does not satisfy the

Land Based Training Group 5K Times (in seconds)



Deep Water Running 5K Times



0.05 threshold for statistical significance. This, however, can be explained by a small number of participants in our study.

It was our hypothesis, that supplementing one’s training with once-a-week DWR training session can improve a 5-K running

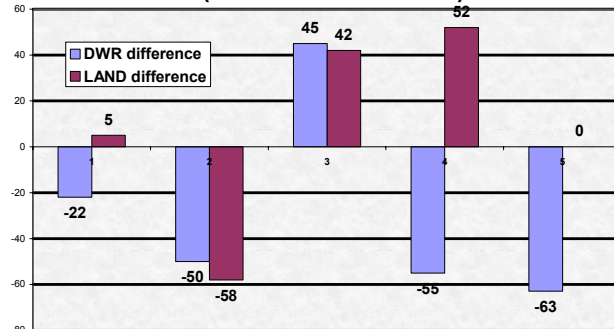
performance through the following two factors:

- ◆ Maintaining their oxygen capacity
- ◆ Improving their hip range of motion

The improved ROM would then increase the stride length (SL).

The findings of our study in measuring the SL and ROM are equivocal. Mean

Comparison of Changes in Performance Deep Water Running and Land Training (difference in seconds)



SL decreased for both DWR and land-based running group, more significantly so for the land-based group (Table 2).

There was a dramatic increase in hip extension ROM during the second testing in both DWR and land-based groups. This can only be explained by a measuring mistake (Table 3).

Table 2

Number of Steps per 100 Yards		
	FIRST TESTING	SECOND TESTING
DWR	Mean 32.17	Mean 31
LAND	Mean 32.6	Mean 30.9

Table 3

RANGE OF MOTION			
		FIRST TESTING	SECOND TESTING
DWR	FL	RL mean 110.7 degrees LL mean 109.8 degrees	RL mean 112.7 degrees LL mean 119.3 degrees
	EX	RL mean 12 degrees LL mean 12.7 degrees	RL mean 31.3 degrees LL mean 22 degrees
LAND	FL	RL mean 117.7 degrees LL mean 113 degrees	RL mean 117.8 degrees LL mean 113.7 degrees
	EX	RL mean 13.2 degrees LL 13.3 degrees	RL mean 25 degrees LL mean 23.5 degrees

Conclusion

Findings of our study are similar to other studies that examined training effects of DWR on oxygen capacity . The training intensity and form resemblance of land running make DWR a valid addition to a training regiment of a runner. Whether or not it increase ROM is yet to be proven.

In order to have more accurate results, the SL had to be measured during running the 5K time trial. That would have reflected the actual SL in relation to the running time. The subjects of this study were instructed to run 100 yards at a “fast” pace, which can vary significantly person to person and represent a different percentage of their VO2 max. The SL count took place shortly after the 5K time trial, so fatigue, and fatigue tolerance are other factors that affected the accuracy of our SL count.

All ROM data– first and second testing, flexion and extension – fits into the normal range ROM. It also should be noted, that different sources show different values for ROM. For instance, hip hyperextension normal values are 10 degrees or 30 degrees according to different authors.

These topics need to be further investigated.