

Underwater Treadmill

- A Small Scale Literature Review
 - Very little literature exists on the subject of hydrotherapy protocols for dogs and anecdotal recommendations are widely propagated in the industry

Edge-Hughes LM. 2007, Underwater treadmill (UWT) therapy in dogs: Finding the evidence to create a protocol for its use. A small-scale sample literature review. The CHAP Newsletter. Summer 2007.

Underwater Treadmill

- WATER PARAMETERS in the UWT
 - Jackson et al. 2002
 - Joint flexion was greatest when the water is filled at or higher than the joint of interest (hip, stifle, shoulder and elbow). The flexion obtained compares to flexion ranges achieved during swimming.
 - Water height at the greater trochanter reduces end stage propulsion (extension in the hip, stifle and shoulder).
 - Water height to tarsus or stifle results in full active joint extension of the hip, stifle and tarsus when compared to walking on land at the levels of the lateral malleolus and stifle

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- WATER PARAMETERS in the UWT

- Tragauer et al. 2002

- Land weight bearing ratio of front legs: hind legs was 64:36.
- This same ratio was maintained with water heights at the lateral malleolus and lateral femoral condyle at the stifle.
- However, the ratio changed to 71:29 with water at the height of the greater trochanter.



Underwater Treadmill

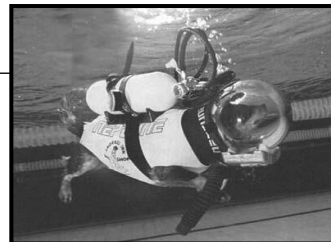
- WATER PARAMETERS in the UWT

- Tragauer et al. 2002

- Table 1 describes the percentage of land weight resultant from partial water immersion at varying depths in the dog.

Table 1. Percentage of body weight on land during partial immersion at various water depths in dogs

<i>Water Height</i>	<i>% of land body weight</i>
Lateral malleolus	91%
Lateral femoral condyle	85%
Greater trochanter	38%



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- WATER PARAMETERS in the UWT
 - Dunning et al. 2004
 - There was no significant difference in heart rate, respiratory rate, rectal temperature and perceived exertion score in dogs exercising for 10 minutes in an underwater treadmill at temperatures of 30, 31.1, 32.2, 33.3, 34.4 °C.



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- WATER PARAMETERS in the UWT

Table 2. Parameters used for aquatic exercise studies in dogs

<i>Study</i>	<i>Condition for which water therapy was chosen</i>	<i>When started on water therapy</i>	<i>Type of exercise</i>	<i>Water height</i>	<i>Water temp.</i>	<i>Exercise time</i>	<i>Frequency</i>
Marsolais et al. 2002	Post operative cruciate repair	3 weeks post-op	Swimming	N/A	32.3 – 33.3°C	10 – 20 mins	2x/day 5days/wk
Hamilton 2002	Osteoarthritis	Immed. upon referral	UWT walking	Not reported	Not reported	Up to 40 mins	2x/day 2 - 3days / wk
Marsolais et al. 2003	Post-operative cruciate repair	3 weeks post-op	Swimming	N/A	32.2 – 33.3°C	10 – 20 mins	2x/day 5days/wk
Gandini et al. 2003	Fibrocartilaginous embolus	As soon as possible	UWT	Not reported	Not reported	10 minutes	2x/day

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Hudson et al. 2004	Osteoarthritis	Immediately upon referral	UWT walking	Greater trochanter	94°F (appx 34 °C)	2 x 3mins with 10 mins of standing in water btwn sessions	2days/wk
Monk et al. 2006	Post operative cruciate repair	After suture removal day 10 post op	UWT walking	Greater trochanter	32 °C	Wk 2 - 3x3min Wk 3 - 2x5min Wk 4 - 2x7min Wk 5 - 1x15min Wk 6 - 1x20min	1x/day

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- WATER PARAMETERS in the UWT

Table 3. Anecdotal recommendation from literature sources for aquatic exercising in dogs

<i>Source</i>	<i>Type of exercise</i>	<i>Water parameters</i>	<i>Exercise time / frequency</i>
Tangner 1984	Swimming	Warm water	10 – 20 mins, 2 x / day
Millis et al 1997	Swimming	Not reported	Start 1 – 3 mins, 1x / day 3 – 7 days / week
Steiss 2003	Swimming or UWT	Tissue relaxation at 95 °F (36 °C) Lower temp for swimming or exercise	5 – 10 mins Only a few minutes if animal is deconditioned or debilitated
Bockstahler 2004	UWT	25 – 35 °C	Start 3 x 2 mins Increase by 10% weekly 2 – 3 days / week Adjust according to fitness levels Include warm up and cool down for 2 mins each either in or out of the water

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- *Variables for water exercising from human literature*
 - Exercise prescriptions for water-work may not be as clear as one would expect and cannot be transferred directly from land.
 - Energy expenditure in water may be increased when exercising in cold water due to shivering which occurs in humans at temperatures of 28 - 34°C. (Curtain 1997)
 - Evans (1978) found that $\frac{1}{2}$ to $\frac{1}{3}$ of the speed was needed to walk or jog across a pool in waist deep water at 31°C to achieve the same energy expenditure as walking or jogging on a dry treadmill.

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- *Variables for water exercising from human literature*
 - Monitoring of heart rate may yield invalid conclusions, as it has been shown to be lower by approximately 10 beats per minute with strenuous exercise in water.(Craig & Dvorak, 1970; Evans 1978)
 - This same phenomena was observed in dogs walking in water as compared to land treadmills at the same velocity and length of time.(Levine, 2004)



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- *Variables for water exercising from human literature*
 - Resting heart rates in humans are lower in water but were increased with temperature increases to 36°C as compared to 28°C.(Johnson et al 1977; Hall et al 1998)
 - Optimal water temperatures for exercising for humans is reported between 28 - 30°C.(Edlich et al. 1987)



Underwater Treadmill

- Discussion and Conclusion
 - Literature is lacking in the area of water exercising and therapy in canine literature.
 - Within the existing literature, huge variability exists as to hydrotherapy parameters and recommendations.
 - Surveys and controlled studies would be beneficial to further the collective knowledge-base regarding the use of UWT or swimming in animal rehab practice!

Questions?



Go Drinking!

