© National Strength & Conditioning Association
Volume 21, Number 2, pages 28–32

Strength Training for Outrigger Canoe Paddlers

Robert Stanton
School of Health and Human Performance
Central Queensland University
Rockhampton, Australia

Keywords: outrigger canoe; paddling; outrigging; strength training.

OUTRIGGER CANOE PADDLING is a popular watercraft sport around the world. However, it is a relatively new sport in Australia. The sport's national governing body, the Australian Outrigger Canoe Racing Association (AOCRA), was formed on the Gold Coast in 1978. In 1994, approximately 3,000 paddlers were registered with AOCRA, and the number is now estimated to be over 7,000.

Races are held for individuals (OC1) or for teams of 6 (OC6). Races have distances ranging from sprints of 250–3,000 m to marathons of up to 42 km. The Australian season starts in February and runs until September.

Unfortunately for outrigger canoeing, better-known sports, such as kayaking and flatwater or whitewater canoeing, benefit immensely from their Olympic status because these sports receive more input from sports science research. In contrast, outrigger canoe paddling receives little of the sports science research effort. Currently, little published research can be found on any aspect of this emerging sport. The purpose of this paper is to present a strength training program based on both injury prevention and the performance aspects of the sport.

Rationale

My own previous research has identified the shoulder and lumbar regions as common injury sites in outrigger canoe paddlers. Based on this research and on my personal involvement as a consultant strength coach for a successful outrigger canoe club, I have developed a year-long training program to address both the prevention of injuries and the performance enhancement aspects of the sport. My previous research also suggests that although many outrigger canoe paddlers employ strength training for performance enhancement, for injury prevention, or both, few, if any, outrigger canoe paddlers cite the prevention of injuries as the sole purpose of their strength training program.

Strength Training Strategy

Elsewhere, I have recommended a 3-step strategy for the development of strength training programs for athletes (4).

Prevention of Injuries

The first priority is injury prevention, since a paddler who becomes injured because of training errors will be unable to train effectively and will consequently suffer in performance. Preventing injuries requires consideration of the needs analysis and the preseason screening data. Exploration of issues such as personal injury history, energy system contribution to performance, and musculoskeletal profile become paramount in designing an individualized training program. For example, outrigger canoe paddlers are prone to overuse injuries in the rotator cuff. Therefore, treating and preventing muscular imbalances in this area are priorities.

Performance Enhancement

Second, performance-related outcomes caused by adaptations in the neural and muscular systems allow for greater economy of performance because there is less im-

pact on the strength reserve (3). Similarly, enhanced force development qualities, such as strength and power, allow the paddler to paddle faster and with more force per stroke, thus increasing the speed of the canoe.

Personal Rewards

An injury-free athlete who performs well will experience personal rewards in the form of athletic success and will be eager to continue training.

As with the addition of any supplementary training, athletes should be monitored for signs of staleness. A profile such as the Profile Of Mood States (POMS) may be used for monitoring; POMS has been successfully used with elite canoeists to monitor the effect of excessive training loads following the addition of resistance training (1).

■ Program Design

Analysis of outrigger canoe paddling reveals that the major joints and actions involved during the propulsive phase include trunk extension/rotation, horizontal shoulder flexion, shoulder extension, and isometric elbow extension. During the recovery phase, trunk flexion/rotation, shoulder flexion, and shoulder abduction occurs. The muscle groups and their function in outrigger canoe paddling are described in Table 1.

In order to apply a periodized approach to resistance training, the training year can be broken into 5 phases. These phases are termed transition, preseason, specific preparatory, special preparatory, and competitive (2). Table 2 depicts a selection of exercise and program variables used in strength training programs for outrigger canoe paddlers.

Table 1
Description of Muscle Groups and Their Functions in Outrigger Canoe Paddling

Muscle group	Function
Erector spinae	Trunk extension/rotation
Internal/external obliques	Trunk rotation
Rectus and transverse abdominis	Pelvic stabilization and trunk flexion
Latissimus dorsi	Shoulder extension
Anterior, medial, and posterior deltoid	Control and movement of the paddle into and out of the water
Rhomboids, serratus anterior, lower and middle trapezius	Scapular stabilization
Quads, hamstrings, gluteals	Stabilization of the body in the canoe

Transition Phase

Transition commences following the final regatta of the year. In Australia, this period runs from the beginning of September until the beginning of October. The goal during the transition phase is active rest. Managed injuries are allowed to fully heal, and physical and psychological rest is programmed. Strength training is minimized or ceased and is replaced with low-intensity cross training such as swimming or cycling.

Preseason Phase

In Australia, preseason training commences in early October. Paddlers should be fully screened by a sports medicine team that includes physiotherapists, exercise physiologists, biomechanists, physicians, and dieticians. Inadequacies identified by these experts should be addressed. Strength training during this period is aimed at eliminating muscular imbalances and increasing muscular strength and endurance. Anatomical adaptation of tendons and ligaments also occurs during this time. Athletes' choices of exercises are based on the results of screening and previous training history. The exercises are performed using the straight sets method; that is, all sets of 1 exercise are completed before moving on to the next exercise.

Specific Preparatory Phase

Following the successful completion of a 6- to 8-week preseason phase, the paddler moves into a specific preparatory phase. The emphasis is on specific exercises that more closely mimic the paddling action (Figure 1). This allows for a greater transfer of strength developed in the gymnasium to the paddling action. Exercises for the prevention of injuries remain important throughout this and future training phases. The order of core exercises may use the vertical sequence method, in which the paddler performs 1 set of each exercise in the order listed, then commences with the second sequence, and so on. This method is recommended where the development of maximal strength is desired (2). In Australia, the specific preparatory period continues until late December.

Table 2
Strength Training Exercises and Program Variables for Outrigger Canoe Paddlers

Period	Exercise	Set	Reps	Tempo	Rest	Frequency
Transition (4 weeks)	Miminal resistance exercise. Active rest and easy cross training.					
Preseason (6–8 weeks)	Ext sh rotation Upright row Bench press Pullover Lat pulldown Lateral raise Leg press Leg curl Pelvic tilt Knee up Back extension	2–3	8–12	2/1/2	1 minute	3 ×/week
Specific (6–8 weeks)	Ext sh rotation Upright row Pullover Leg press Pelvic tilt Dumbbell bench Leg curl Russian twist Back extension	3–5	5–8	2/1/x	1 minute	3–4 ×/week
Special Power/endurance (4–5 weeks)	Paddle simulator Isometric leg press Pelvic tilt Upright row Leg curl	2–3	10–50	1/x	3 minutes	2 ×/week
Special Strength/endurance (4–5 weeks)	Paddle simulator Russian twist Inc dumbbell bench Upright row Back extension	2–3	10–50	1/0/1	1 minute	2 ×/week
Competitive	1 special phase program and 1 specific phase program per week					

Tempo refers to the length of time in seconds, that each exercise is performed during the eccentric, amortization, and concentric phases, respectively.

Ext sh rotation refers to external shoulder rotation exercises. These are only used for paddlers where a preexisting imbalance exists.

Special Preparatory Phase

In Australia, paddlers enter the special preparatory phase of their resistance training in January. Exercises become highly specific. Emphasis is on the maintenance of muscular strength and the promotion of either muscular endurance or power development, depending on the nature of the races attempted by the paddler. For the sprint paddler, power or power–endurance should be the method of choice. For the distance paddler, strength–endurance training will predominate. When necessary, injury prevention exercises, such as external shoulder rotation exercises, are performed first in the workout (Figure 2). However, the volume of these exercises is reduced to 1 to 2 sets of 10 repetitions. If the paddler desires to develop power, the use of medicine balls to perform exercises such as rotary torso throws or overhead throws is encouraged (Figure 3). This facilitates a maximal rate of force development throughout the whole range of movement, unlike

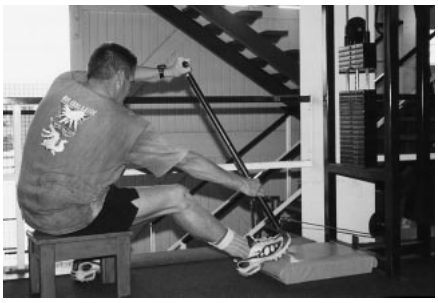

Figure 1a. **Resisted paddle simulator: start.**

Figure 1b. **Resisted paddle simulator: finish.**

conventional resistance training exercises, which are characterized by longer deceleration phases (3).

For medicine ball exercises, 1 to 2 sets of 10 repetitions appears sufficient. For the development of strength–endurance, the variable load method described by Wilson (5) should be employed. The variable load method calls for the use of decreasing loads in successive sets. For example, a set of 10 repetitions may be performed with a load approximating 70% of the paddler's 10-repetition maximum for a particular exercise. At the completion of this set, the load is immediately reduced by approximately 10%, and the exercise is continued for another 10 repetitions. Two or 3 successive reductions in load constitute 1 set. The use of the straight sets method is most appropriate for the development of either power–endurance or strength–endurance. While this program is being performed twice per week, the previous program (specific preparatory) is also being performed once per week to ensure the maintenance of previous strength gains.

Figure 2. **External shoulder rotation.**

Competitive Phase

Upon the commencement of the competitive season, which occurs in February in Australia, the strength training shifts to maintenance-only mode. Typically, paddlers perform 2 workouts per week, 1 workout from each of the specific and special preparatory phases in order to maintain strength and either strength–endurance or power–endurance. This reduced training load compensates for the increased amount and intensity of on-water paddling and minimizes the risk of overtraining (Table 2).

■ Conclusions

Resistance exercise has become an important component of training programs for both endurance and sprint athletes. The importance of resistance exercise can be attributed not only to enhanced performance but also to the role such exercises play in injury prevention. Current evidence shows that outrigger canoe paddlers are actively engaging in strength training programs for both injury prevention and performance enhancement. The application of the principles of periodization allows the dominant strength quality to be developed with minimal interference on endurance and skill performance. Prescreening athletes before strength training ensures an individualized injury prevention and performance-based program. The outrigging coach should ensure that athletes are monitored for signs of overreaching and overtraining following the implementation of a strength training program. Fur-

Figure 3. **Rotary torso throws.**

Figure 4a. **Russian twist: start.**

Figure 4b. **Russian twist: finish.**

thermore, the sport of outrigger canoe paddling should encourage greater input from sports science to secure its future development and its international competitive standing. ▲

References

1. Berglund, B., and H. Safstrom. Psychological monitoring and modulation of training load of world class canoeists. *Med. Sci. Sports Exerc.* 26:1036–1040. 1994.
2. Bompa, T. O. *Periodisation of Strength: The New Wave in Strength Training.* Toronto, Canada: Veratis Publishing, 1993.
3. Bompa, T. O. *Power Training for Sport: Plyometrics for Maximum Power Development.* Ontario, Canada: Coaching Association of Canada, 1994.
4. Stanton, R. Resistance training for endurance athletes. Endurance Training Discussion Group, Central Queensland University, Rockhampton, Australia, 1997.
5. Wilson, G. Resistance training for strength-endurance athletes. *Strength Cond. Coach* 1:3–6. 1993.

Stanton

Robert Stanton is a gymnasium instructor in Rockhampton, Queensland, Australia. He is a registered fitness instructor and an accredited powerlifting, weightlifting, and strength and conditioning coach. Robert is currently an undergraduate student in Human Movement Science at Central Queensland University.

Advertisers' Index