Queen City Wheelmen

Cincinnati, Ohio

December 5, 1980

SEASON'S GREETINGS from the Queen City Wheelmen. For those people on your list who have everything, may we suggest:

CYCLE JOURNEY: A first-class bicycle trip is being organized by Michael Albrinck. This trip leaves Cincinnati on June 14--destination Niagra Falls. Points of interest on the 1000-mile, 14-day tour include the Football Hall of Fame in Canton, Ohio, the Peace Bridge between Buffalo, New York, and Ontario, Canada, and of course, Niagra Falls. The itinerary calls for 80 - 100 miles of cycling each day, except for a full day of resting and swimming on one of the Ontario beaches. Return to Cincinnati on June 27th. A fee of $275.00 includes food, sightseeing fees, ferry crossing, insurance, camping fees, non-personal camping gear, baggage shuttle, routing, enroute bicycle maintenance, and the opportunity to travel extensively by bicycle. For more information, you may reach Mike Albrinck at 761-6425 between 10:00 - 4:00.

CAMPUS CYCLE & SKI: Everything from beautiful jackets and vests, quilted overalls and wool socks for cross country skiing to excellent bicycle equipment and service is available for anyone on your list, even yourself. Is it true that Dave Gecks found a Colnago in his stocking?

Good news for riders with "pro" bikes, also. Campus Cyclery has a full set of Campagnolo tools including both English and Italian threads (sorry, no French). Frame prep, assemblies and repairs can now be accomplished with remarkable precision. Rumor has it that the kit was acquired for nearly $2,000 through a cooperative arrangement!

OR HOW ABOUT a subscription to:

MIDWEST BICYCLE REVIEW
P.O. Box 383
Ripon, WI 54971
1 Year--$8.00
2 Years-$15.00

CYCLING U.S.A.
c/o USCF
1750 E. Boulder
Colorado Springs, CO 80909
$6/Year USCF Members
$10/Year Non-Members

We last left you at the Awards Banquet which proved to be quite an affair. Our thanks to those who attended and our sympathy to those who didn't. It will be an annual event, dues permitting, so we hope to see you again next year. It cost the Queen City Wheelmen slightly over $100.00 to present to you certificates, long, overdue results of time trials, information on the club, drinks and good food. If you have any questions or need any information on the club and past events, need to get involved, please fill in the form attached and join one of the best bicycling clubs. We'd love to get to know you and your bike.

Training rides are not history. If anyone out there is training anytime, give someone a call. We are all in need of some motivation this time of year. For a Sunday ride leaving Clifton at approximately 9:15 AM, call Ellen Lady for route information. Due to H. William Mirbach's physical condition, Ellen has graciously taken over the Sunday organization until Bill feels like Ross again. We heard it is just more comfortable in a Corvett than on a Gios. Whatever, Bill, a speedy recovery to you from the QCW.

Dan Mocsny at #559-1105 from 7 - 10 PM week nights, would be pleased to plan and post his Saturday and Sunday rides. Give Dan a call. He rides approximately 300 miles per week.

Maggie Watanabe & Art have a motorcycle bought for motor pacing & they would like to share it with the club for the cost of gas & maintenance upkeep. Kent Fraizer was in the process of fixing a roller for it for training. Call them for more information: 871-1813 or 559-4363.

CINCINNATI CRITERIUM: Once again, the Queen City Wheelmen will be presenting the Cincinnati Criterium. Under the gracious leadership abilities of Jack Schmidt and Greg Hanfbauer, the club has set the date: APRIL 12, 1981. The Park Board has given official approval for the use of Burnet Woods; the Cincinnati Police Department has given official approval for use of the streets; Dan Humpert has once again given his support through Campus Cycle, and we look forward to a great race! As the applications become available from Jon Spicker, we will mail them to you and make them available through all feasible outlets in Cincinnati by the end of January. Hope to see you all there. And do let us know if we can count on you for some volunteer help. Fill in the attached form.

TOSRV: Speaking of that time of year, look for your TOSRV applications to arrive in your mailbox. Through the generosity of a local business sponsor, the club was able to send in a self-addressed, stamped envelope in your name so you may receive the applications post haste. Get ready for the annual pilgrimage to Columbus. We'll look for you there!

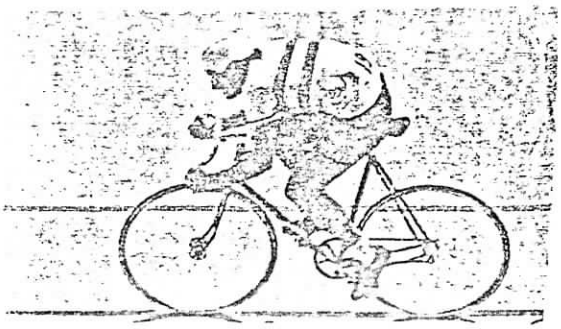
KENT FRAZIER deserves a great big thanks for getting the QCW on TV last month. The pack performed a training ride to Ross for Channel 12. Due to the unique bicycling style of the Queen City Wheelmen under the experience of thosefew like Kent, Channel 12 gave QCW the opportunity to show the efficient form of bicycling.

Physiological Characteristics of Competitive Cyclists

Edmund R. Burke, PhD

Like other endurance athletes, competitive cyclists have exceptionally high maximal oxygen consumption values. But the author feels $\dot{V}O_2$ max shouldn't stand alone as a predictor of success.

Dr. Burke is in the department of medicine, cardiovascular division, at the University of Iowa Hospitals in Iowa City. He is chairman of the sports physiology and medical committee of the US Cycling Federation and a fellow of the American College of Sports Medicine.



Few sports are as varied and physiologically challenging as competitive cycling. The races range from a 200-meter match sprint that lasts approximately ten seconds, to the grueling Tour de France, which lasts 23 days and covers 5,000 km. It combines racing over high passes in the Alps with the possibility of sprints at the end of each stage.

Recent publications have described the physiological profiles of successful athletes.[1-4] However, since Zuntz[5] originally measured the oxygen consumption in relation to speed of riding on a 200-meter track, little physiological information has been published about the competitive cyclist.

The goals of this four-year study were to evaluate the metabolic and body composition characteristics of national and international male and female competitive cyclists and determine if a significant difference in oxygen consumption exists among the Senior Men's National Team, the Junior Men's National Team, and the category 1 cyclists. All of these cyclists were actively engaged in endurance training and competition.

The top 15 to 20 men over age 18 are the senior men's team. They represent the United States in international competition, including world cycling championships and Olympic Games. Seniors who have been successful but have failed to qualify for the national teams are category 1 cyclists. The top 15 to 20 men ages 17 and 18 are the junior men's team. The top women cyclists who represent the United States in international competition are the Women's National Team.

Methods

Cardiovascular fitness was determined by having the athlete pedal to exhaustion on a Monark ergometer, specially adapted with toe clips, racing saddle, and dropped handlebars. After a warm-up at 2.5 kiloponds (kp) at 80 rpm for three to five minutes, the work load was increased 0.5 kp every minute. The test was terminated when the athlete's pedal revolutions dropped below 75 rpm or when the $\dot{V}O_2$ leveled off or declined. Oxygen consumption was recorded continuously using the semiautomated system as described by Wilmore[6] or by the Erich Jaeger metabolic cart. Heart rate was monitored electrocardiographically during all tests.

Hydrostatic weighing was conducted, and the two weights were averaged and used in the calculation of percent body fat.[7] Residual volume was calculated by multiplying the vital capacity by 0.24 for males and 0.28 for the females.[8]

One-way analysis of variance was used to determine if mean maximal oxygen consumption varied among classifications. The results were interpreted at the $p < .05$ level of significance.

Results and Discussion

Physical Characteristics. Anthropometric data for the subjects appear in table 1. These cyclists are taller and heavier than distance runners,[1,9] but similar to canoeists, ice hockey players, speed skaters, soccer players, etc.[10] They are similar to the 40 road cyclists at the 1969 World Championships,[11] who had a mean height of 175 cm and a mean weight of 70 kg.

No recorded vital data are available on female competitive cyclists, but they are similar to other well-trained female athletes in height and weight.[3]

The average height and weight for the juniors is comparable to the ten junior cyclists studied by Placheta.[12] His cyclists were 17 and 18 years old and had a mean height of 180.4 cm and a mean weight of 72.1 kg.

Body Composition. Extensive studies of male athletes have shown the following mean percent body fat: college wrestlers, 9%; distance runners, 4%; college runners, 8%; elite heavyweight crew, 11%; and lightweight crew, 8.5%.[13] The senior men have similar values. Vank[11] reported 7.1% for road cyclists using skinfold measurements.

While the mean of 10.3% body fat may seem high for the junior team, the average age for the group was only 17 years, and some may not have reached full body maturity. These juniors are several percentage points lower than the average population of similar age.[14]

The Women's National Team averaged 15.4% body fat. In studies of other female athletes, the following values were reported: basketball, 20.8%; gymnastics, 15.5%; a group of unidentified varsity athletes, 20.6%;[3] and elite distance runners, 15.2%.[14]

From these results, the following recommendations can be given for percent body fat for competitive cyclists: seniors, 5% to 9%; juniors, 9% to 12%; and women, 12% to 15%. These figures depend on event, time of the season, and body build.

Metabolic Data. Like many other trained endurance athletes,[2,4] road cyclists possess exceptionally high $\dot{V}O_2$ max values. Table 2 compares the maximal oxygen consumption values for cyclists reported by several investigators.

While the mean group $\dot{V}O_2$ max is not quite as high as other elite athletes,[4] several factors may be involved. $\dot{V}O_2$ max recorded on a bicycle ergometer has been reported to be 5% to 8% lower when compared to running on the treadmill.[4,15] However, Stromme[16] and associates demonstrated that athletes reached higher levels of maximal oxygen uptake when tested in natural working conditions. For example, cyclists in his study rode their own bicycles on a treadmill. Speed was kept constant at 29.8 km/hour and uphill inclination was individually changed from 2.5° to 4.5° in order to maintain a suitable pedaling frequency during the test. He also had them run to exhaustion at a 3% grade on a treadmill. The entire group of bicyclists, all national performers, reached higher levels of $\dot{V}O_2$ max during bicycling. The mean difference was 5.6%, or 0.31 liters. Trained cyclists report feeling better on an ergometer when it is equipped with narrow seat, dropped handlebars, adjustable stem, and toe clips.

Table 3 reports the values for maximal oxygen consumption for individual cyclists as recorded in the literature. Cyclists 1 and 2 were professionals in Europe. The other cyclists were world-class amateurs. It is apparent that well-trained cyclists have the metabolic characteristics of high-caliber endurance-trained athletes. Over a three-year period, the $\dot{V}O_2$ max of the third cyclist was 79.6, 82.8, and 82.2 $ml \cdot kg^{-1} \cdot min^{-1}$, and his maximal heart rate was 187, 189, and 189 $beats \cdot min^{-1}$.

The mean value for $\dot{V}O_2$ max in the women's team is considerably higher than that found for the average woman (table 2). When compared to values for other women athletes, the present values are also high. Hermansen reported a mean value of 3.65 $liters \cdot min^{-1}$ for six Norwegian women orienteers, reportedly the best orienteers in Norway at the time, which is comparable to the 3.58 $liters \cdot min^{-1}$ for the six women tested in this study. Cross-country skiers have demonstrated consistently higher mean $\dot{V}O_2$ max values than any other sport.[17]

The values reported for the juniors (4.45 $liters \cdot min^{-1}$) are higher than those reported by Placheta[12] for trained 17- to 18-year-old male cyclists (3.79 $liters \cdot min^{-1}$).

Analyses of variance for maximal oxygen consumption showed a significant difference only between the men's and junior national teams (table 2).

It is interesting to note the small metabolic differences between the men's national team and category I cyclists. Factors such as anaerobic threshold and efficiency may play an important role in cycling, as has been shown for other athletes.[9] On the other hand, a difference of only 3.4 $ml \cdot kg^{-1} \cdot min^{-1}$ for maximal oxygen consumption, while far from significant, may represent an advantage in high-level competition.

Foster and Daniels[18] studied 16 competitive cyclists representing different senior categories and found a direct relationship between performance ability and mean aerobic power. This suggests that the general level of performance by competitive cyclists largely depends on aerobic power. Muscle fiber composition and enzyme activity, however, do not seem to influence success in competitive cycling. Burke et al[19] found no significant difference between classifications of trained senior cyclists, although they found differences in $\dot{V}O_2$ max.

The mean values for the junior national team, while significantly different from the senior team, are commensurate to the values reported for category I men in table 2. This characteristic profile of the juniors and seniors can be seen in actual head-to-head

competition, in which the juniors compete to acquire skill and experience. They have no problem placing well among the category I men, but only a few can challenge the senior men's team.

Although certain trends exist in the data for competitive cyclists, some overlapping of values found among many of the cyclists make interpretation complex. Multivariate analysis may elicit more definitive results and make it possible to predict success in well-trained cyclists.

Summary

This report investigated selected physical performance characteristics of male and female national- and international-class competitive cyclists. Measurements of body composition and maximal oxygen consumption compared favorably with those of other highly trained athletes.

$\dot{V}O_2$ max may be an indicator of success in competitive cycling, but it is always difficult to separate cause from effect. Is the successful athlete successful because he or she possesses a specific oxygen consumption or is oxygen consumption a result of training for the sport? Unless combined with other criteria, $\dot{V}O_2$ max may be most useful only for making relatively gross separations of talent. Still, a high $\dot{V}O_2$ max is one of the characteristics of a competitive cyclist.

Furthermore, in an effort to open channels of communication among athlete, coach, and sports scientist, a model of cooperation has been established. The results of the tests have helped some of the cyclists determine their physiological strengths, weaknesses, and limitations, and helped the national coaches plan individual training programs.

Further research with more subjects is being conducted on submaximal work (efficiency), anaerobic threshold, and biomechanical studies. These data, along with the objective and subjective data obtained by coaches, could provide the criteria for selection of future national teams.

Acknowledgments

The author wishes to thank the cyclists, coaches, and administrators of the US Cycling Federation for their cooperation and extends special gratitude to the testing personnel.

Table 1. Physical Characteristics of Competitive Cyclists (Mean ±SD)

Group	No. of Subjects	Height (cm)	Weight (kg)	Body Fat (%)
Men's national team	12	180.3±5.7	67.1±7.7	8.8±2.0
Category 1 men	8	180.6±6.0	70.8±6.8	8.4±3.3
Junior national team	25	178.0±5.2	68.6±6.4	10.3±3.4
Women's national team	7	167.7±10.7	61.3±8.5	15.4±4.7

Table 2. Team $\dot{V}O_2$ Max Data (Mean ±SD)

Study	No. of Subjects	$\dot{V}O_2$ Max ($ml \cdot kg^{-1} \cdot min^{-1}$)	Notes
Saltin[4]	6	74.0	1966 Swedish national team
Hermansen[17]	16	73.0	Norwegian national team
Burke[19]	11	67.1	National-class road and track cyclists
Stromme[16]	5	69.1	1975 Swedish national team
Present study			
Men's national team	23	74.0±8.3	
Category 1 men	8	70.6±9.5	
Junior national team	15	64.8±5.5	
Women's national team	6	57.4±6.6	

Table 3. Individual $\dot{V}O_2$ Max Values

Study	Cyclist	$\dot{V}O_2$ Max ($ml \cdot kg^{-1} \cdot min^{-1}$)	Notes
Stromme[16]	1	77.0	5-time winner of Tour de France
Saltin[4]	2	80.0	1970 winner of Tour of Italy
Burke[19]	3	82.7	1975, 1979 Pan-American road team 1976 Olympic road team
Burke[19]	4	79.8	1972, 1976 Olympic road team 1976, 1977 National road champion

References

1. Costill DL, Daniels J, Evans W, et al: Skeletal muscle enzymes and fiber composition in male and female track athletes. J Appl Physiol 40:149-154, February 1976
2. Daniels J: Physiological characteristics of champion male athletes. Res Q 45:342-348, December 1974
3. Wilmore JH, Brown CH: Physiological profiles of women distance runners. Med Sci Sports 6:178-181, Fall 1974
4. Saltin B, Astrand PO: Maximal oxygen uptake in athletes. J Appl Physiol 23:353-358, September 1967
5. Zuntz L: Untersuchungen uber den Gaswechel und Energie umsatz des Padfahrers. Berlin, August Hirschwald Press, 1899
6. Wilmore JH, Costill DL: Semiautomated systems approach to the assessment of oxygen uptake during exercise. J Appl Physiol 36:618-620, May 1974
7. Brozek J, Keys A: The evaluation of leanness-fatness in man: norms and interrelationship. J Appl Physiol 5:194-206, 1951
8. Wilmore JH: The use of actual, predicted, and constant residual volumes in the assessment of body composition by underwater weighing. Med Sci Sports 1:87-90, 1969
9. Costill DL, Branam G, Eddy D, et al: Determinants of marathon running success. Int Z Angew Physiol 29:249-254, 1971
10. Rusko H, Havu M, Karvinen E: Aerobic performance capacity in athletes. Eur J Appl Physiol 38:151-159, March 20, 1978
11. Vank L: Somatometric investigations of top cyclists at the World Championships 1969, in Cycling and Health: Proceedings of Functional and Somatometric Examinations of Top Cyclists Taking Part in the World Championships 1969. 1973, pp 185-203
12. Placheta Z, Drazil V: Application of long-term medical examination results to the training system of cyclists. J Sports Med Phys Fitness 11:52-58, March 1971
13. Burke ER: Too fat? Testing the top US riders gives guide. Velo News, December 1977, p 8
14. Wilmore JH, Brown CH, Davis JA: Body physique and composition of female distance runners, in Milvy P (Ed): The Marathon: Physiological, Medical, Epidemiological, and Psychological Studies. New York City, New York Academy of Sciences, 1977, pp 764-776
15. Glassford RG, Baycroft GH, Sedgwick AW, et al: Comparison of maximal oxygen uptake values determined by predicted and actual methods. J Appl Physiol 20:509-513, May 1965
16. Stromme SB, Ingjer F, Meen HD: Assessment of maximal aerobic power in specifically trained athletes. J Appl Physiol 42:833-837, June 1977
17. Hermansen L: Oxygen transport during exercise in human subjects. Acta Physiol Scand (Suppl) 399:1-104, 1973
18. Foster C, Daniels J: Aerobic power of competitive cyclists. Aust J Sports Med 7:111-112, 1975
19. Burke ER, Cerny F, Costill DL, et al: Characteristics of skeletal muscle in competitive cyclists. Med Sci Sports 9:109-112, Summer 1977

Address correspondence to Edmund R. Burke, PhD, Department of Medicine, Cardiovascular Division, University of Iowa Hospitals, Iowa City 52242.