CASE REPORT

Giro, Tour, and Vuelta in the same season

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The exercise volume and intensity are reported of a male professional cyclist (age 30; $V_{O_2}MAX$ 75.0 ml/kg/min) who successfully completed the 2001 Giro d'Italia (May), Tour de France (July), and Vuelta a España (September). The total exercise time during the Giro, Tour, and Vuelta was 90 hours 44 minutes (5444 minutes), 88 hours 23 minutes (5303 minutes), and 72 hours 59 minutes (4379 minutes) respectively. Heart rate telemetry during the races allowed the exercise intensity to be classified into three phases: I, below the first ventilatory threshold (VT1); II, between VT1 and the second ventilatory threshold (VT2); III, above VT2. Compared with the Giro and Tour, the lower exercise volume of the Vuelta (about 20% less total time) was compensated for by a considerably lower and higher contribution of phases I and III respectively. As a result, the total load (volume × intensity) in the three races was comparable.

The most remarkable racing events in professional cycling, which make this sport so special compared with other endurance sports, are the three week tour races: the Tour de France, Giro d'Italia, and Vuelta a España. The recovery time between each daily stage is about 18 hours, with only one to two days of rest allowed over the three week period. Since the 1990s, most riders in the "peleton" wear a heart rate (HR) telemeter during competitions, which allows researchers to describe the exercise intensity of tour races.[1–5] Exercise intensity can be divided into three phases according to the reference HR values obtained during a previous ramp cycle ergometer test: I, "light intensity", < first ventilatory threshold or < about 70% $V_{O_2}MAX$; II, "moderate intensity", between the first and second ventilatory threshold or about 70–90% $V_{O_2}MAX$; III, "high intensity", > second ventilatory threshold or > about 90% $V_{O_2}MAX$.[2] These races are extremely demanding, as suggested by a recent report which showed a state of hormonal exhaustion—for example, decrease in testosterone and cortisol—in some riders by the end of the Vuelta.[6] In fact, it is widely accepted that a professional cyclist should not participate in more than two three week races per season, and, in the last decade, only 10 riders have been able to participate in all tours in one season.

CASE REPORT

We report data on the exercise intensity and total load of the only cyclist (age, 30 years; height, 181 cm; $V_{O_2}MAX$, 75.0 ml/kg/min; six years of experience as a professional) who completed the Giro (May), Tour (July), and Vuelta (September) during the 2001 season. He had previously completed the Tour and Vuelta three and four times respectively.

Written informed consent was obtained from the subject in accordance with the regulations of the Universidad Complutense, Madrid. He was in good health as established by a previous physical examination (including electrocardiographic and echocardiographic evaluation). One month before the Giro, he performed a ramp protocol on a cycle ergometer.[2] From this test, we determined reference HR values at the first and second ventilatory thresholds for the three tour races, during which he wore an HR telemeter (Polar S710; Polar Electro, Oy, Finland).[3] Previous research has shown that these reference HR values remain stable throughout the season.[7]

In the three races, the subject was assigned the same team role as a "domestique"—that is, not required to seek for stage victories nor to achieve a good overall classification, but rather to work hard for the team leader during flat and mountain stages (especially during the first two thirds of each stage). He was not expected to perform maximally—that is, phase III—at the end of mountain stages or during individual time trials. Normal nutritional intake, hydration, and timing of food intake, typical of professional cycling, were maintained throughout the races.[8] Mean daily food intake during three week tour races is standardised for most professional cycling teams and averages about 840 g carbohydrate (about 12 g/kg body mass/day), 200 g protein (about 3 g/kg body mass/day), and 160 g fat, corresponding to about 23.5 MJ.[8] This high total carbohydrate intake and the combination of carbohydrate and protein ingestion within the first six hours after each stage (1.1 and 0.35 g/kg body mass/h respectively) is expected to replenish glycogen stores within 18 hours (from the end of each daily stage, at about 1700, to the beginning of the next one, at about 1200).[8] During the recovery weeks between the three week tour races, carbohydrate intake on training days averaged 500–600 g/day. Previous research has shown that during training periods the nutritional habits of professional cyclists are sufficient to match their energy requirements.[9] During the five month period, the subject took concentrated vitamin/mineral supplements orally (every day) and vitamin supplements by intravenous injection (after hard stages). Vitamin/mineral supplementation (orally or by injection) is common practice during professional tour races, which ensures a daily micronutrient intake considerably higher than the recommended daily allowance, especially for iron and vitamin B_{12}.[10]

No banned substances were detected in the subject before the start of each event. He showed no major signs of overtraining during the three races—for example, his sleeping pattern was normal (about nine hours a day) and he had no infectious diseases. His pre-exercise (about 0900) body mass and percentage body fat[11] at the start and end of each tour race respectively was: 72.5 kg and 9.0%, and 68.2 kg and 8.5% (Giro); 69.9 kg and 8.7%, and 68.8 kg and 8.4% (Tour); and 68.0 kg and 8.4%, and 67.9 kg and 8.3% (Vuelta). Resting HR over the days (measured at about 0900, under basal conditions) was similar in the Giro and the Tour (mean (SD) 47 (3) and 47 (2) beats/min respectively) but was decreased in the Vuelta (37 (2) beats/min). Mean maximal HR during the stages and mean basal (measured at about 0900) systolic/diastolic blood pressure remained similar in the three races (Giro, 179 (10) beats/min and 99 (4)/51 (4) mm Hg; Tour, 179 (7) beats/min and 98 (5)/51 (5) mm Hg; Vuelta, 182 (7) beats/min and 106 (5)/52 (5) mm Hg). An endocrine evaluation (one blood sample collection at about 0900, under basal conditions) was carried out before the start of the Vuelta. Concentrations of follicle stimulating hormone (6.3 IU/l),

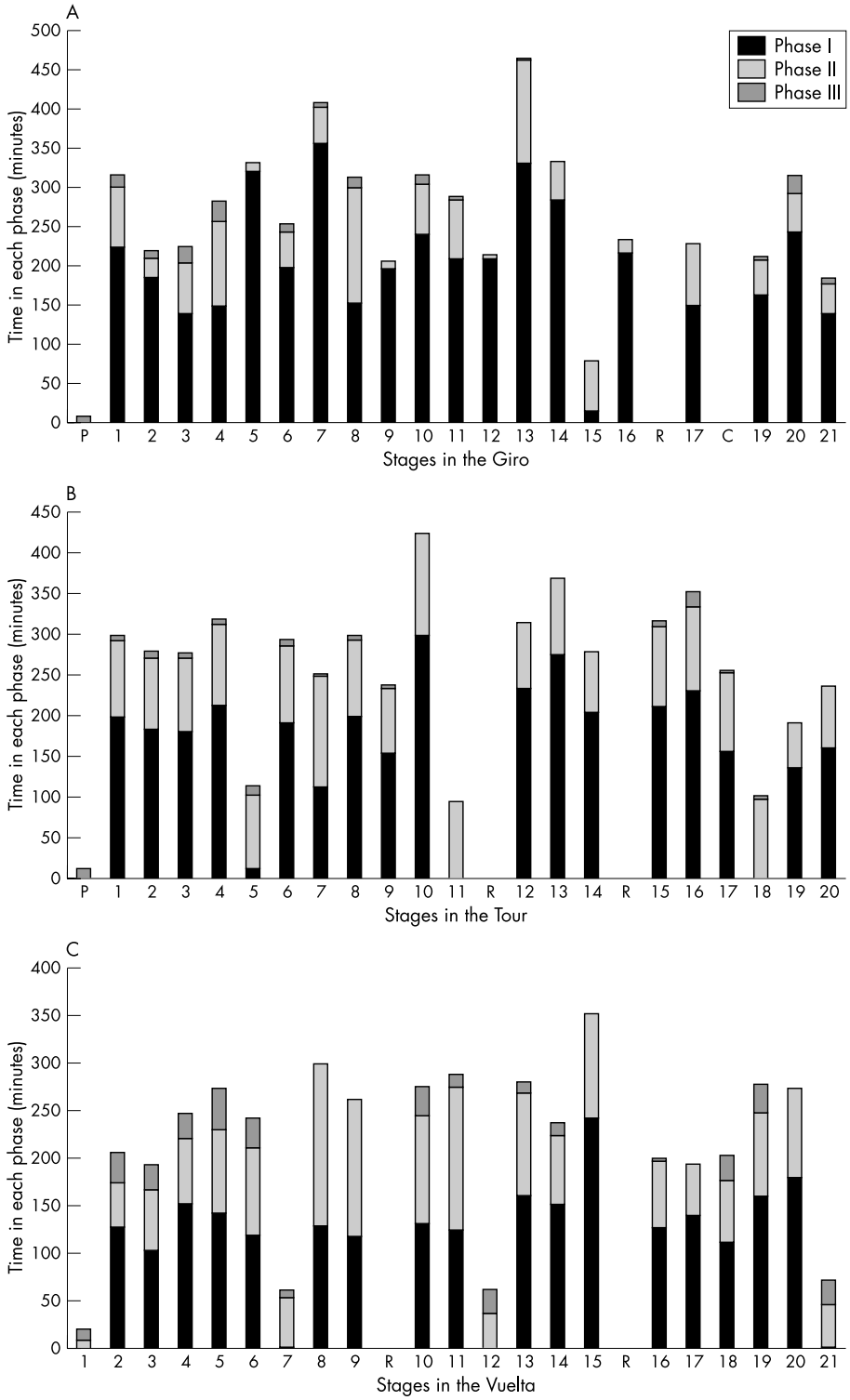

Figure 1 Day to day results of time spent in each intensity phase during the Giro (A), Tour (B), and Vuelta (C). Phase I, "light intensity", < first ventilatory threshold or < 73% V_{O_2MAX}; phase II, "moderate intensity", between the first and second ventilatory threshold or 73–90% V_{O_2MAX}; phase III, "high intensity", > second ventilatory threshold or > 90% V_{O_2MAX}. All the bars of considerably lower height—for example, P in the Tour and the Vuelta—correspond to time trials. C, Cancelled stage; P, prologue; R, "active" rest day (no stage), consisting of two to three hours of easy training (phase I).

luteinising hormone (2.1 IU/l), testosterone (6.2 ng/ml), cortisol (187.9 ng/ml), prolactin (9.2 ng/ml), 3,5,3′-triiodothyronine (1.4 ng/ml), thyroxine (5.4 µg/dl), and thyroid stimulating hormone (2.1 µIU/ml) were all within normal limits.

Before the Giro, the subject had covered a total of 17 competition days. He participated in one day race between the Giro and the Tour, and in one five week tour race and two one day races between the Tour and the Vuelta. Daily training sessions in these two periods were mainly easy ones (three to four hours in phase I).

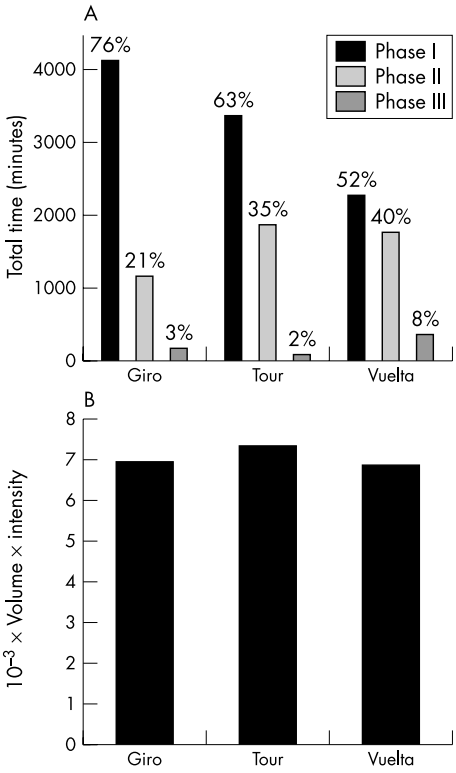

Figure 2 (A) Total exercise time during the Giro, Tour, and Vuelta in the three intensity phases. Percentage time in the three phases is shown at the top of each bar. (B) Variable integrating exercise volume (total exercise time in minutes) and intensity (total time spent in each of the three phases) in the three events. The score for each phase was computed by multiplying the accumulated duration in this phase by a multiplier for this particular phase—for example, one minute in phase I was given a score of 1 (1 × 1), one minute in phase II was given a score of 2 (1 × 2), and one minute in phase III was given a score of 3 (1 × 3).[12] The total score was obtained by adding together the results of the three phases.

The subject's total exercise time during the Giro, Tour, and Vuelta was 90 hours 44 minutes (5444 minutes), 88 hours 23 minutes (5303 minutes), and 72 hours 59 minutes (4379 minutes) respectively. Figures 1 and 2 show the distribution of exercise intensity in the three races. A variable integrating exercise volume (total exercise time in minutes) and intensity (total time spent in each of the three phases) was applied as reported elsewhere.[12] Compared with the Giro and the Tour, the lower exercise volume of the Vuelta (about 20% decrease in total time) was compensated for by a considerably lower and higher contribution of phases I and III respectively. As a result, the total load (volume × intensity) of the three races was overall comparable.

Take home message

It seems that an experienced professional cyclist with a team role as a "domestique" can complete the Giro d'Italia, the Tour de France, and the Vuelta a España within one season (over a five month period).

DISCUSSION

This is the first report of the loads of the Giro, Tour, and Vuelta over a five month period. It seems that a cyclist with a predominant team role as a domestique and substantial experience as a professional (especially in tour races) is able to cope with the high requirements of the three races. It must be emphasised, however, that the total contribution of near maximal exercise (phase III) in this case was low. In contrast, team leaders must maintain near maximal intensities during long periods (> 30 minutes) in several stages, which possibly precludes them remaining competitive in the three tour races within the same season.

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