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Analyzing a bike race

In order to understand a race result, you must understand the component parts of the race. Each race has three main components; the start, the body of the race and the finish. The Individual Pursuit is an intense and difficult event that requires not only excellent conditioning, but solid focus and discipline. Like all races it can be taken apart and analyzed a piece at a time. Because it is run the same way every time and always done on a velodrome, it is easy to dissect. It is even easier if you have races on video tape. Trying to plan out a race like the individual pursuit can be greatly simplified with the use of video tapes. In fact it is one of the best sources of information because you can get your resources from the greatest cyclists in the world. For the sake of this discussion we will enlist the help of one of America's greatest female athletes to ever race a bicycle; Rebecca Twigg. We will take a good look at her world record performance in the 1995 World Track Championship Women's 3,000 meter Individual Pursuit.

Saying we have Rebecca Twigg's help in this may seem like a stretch of the imagination, but her race was made available on video tape from World Cycling Productions. If you watch the tape you will see Antonella Bellutti and Rebecca Twigg waiting at the start. Paul Sherwen narrates the course of the race and less than four minutes later it is all over. However there is a wealth of information on the video for the smart observer to collect. It simply requires a stopwatch, paper and pencil and a remote control for the video cassette player. By paying attention to the information available on the video tape, you will be able to determine Rebecca's cadence, gearing, speed, control of effort, tactics, consistency and bike handling skills.

On closer inspection, one of the first things you will see is that the athletes begin their race waiting in Tissot timing stands. Rebecca Twigg is in the home straight of the Bogota, Columbia velodrome and is in the shade. This may not seem like a big factor, but upon closer inspection it is to be noted that both athletes are wearing rubberized skinsuits. The afternoon sun at the velodrome will definitely make Bellutti overheat ahead of Rebecca Twigg. A point to be remembered if you ever wear a skinsuit like that.

Rebecca Twigg's GT track has had a different fork put on because of a mechanical problem. It also draws attention to the fact that her bike has a lower frontal profile than her opponent from Italy. As the race starts, it is immediately obvious that Rebecca Twigg has chosen a much smaller gear than Antonella Bellutti, because we clock Rebecca Twigg's cadence at over 95 rpm by the time she sits down just before turn three.

As the race progresses and Bellutti seems to be taking the lead, but the large gearing choice she made begins to work against her. After several laps, Twigg begins to wind out her gearing at a cadence of about 120 rpm. Her position on the bike never changes and she keeps her upper body completely still.

Bellutti on the other hand has begun to thrust her torso in an effort to keep turning the big gear she is now mashing.

On the last lap, Rebecca has increases her cadence to almost 135 rpm and has the Italian in plain sight ahead of her on the home straight. She crosses the finish line without ever losing her rhythm or position on the bike. Her world record breaking time of 3:36.081 gives her an average speed of 49.981 kph. Closer inspection of the split times shows how she not only paced her performance, but eroded her opponent's confidence at the same time.

Starting at the beginning of the race again, we can see step by step how Rebecca got that Gold Medal. The race seems to start fairly even. No split time is given for the first lap, but by the end of the second lap Bellutti is clocked with an elapsed time of 50.573 seconds and a lead of .596 seconds over Twigg. As the third lap ends, Bellutti has an elapsed time of 1:14.237 with a lead of .664 seconds over her American rival. Now although nothing appears different in Rebecca Twigg's ride, by the end of the fourth lap we see that Bellutti's time of 1:38.223 holds only a .038 second advantage over Twigg. It is at this point that the crowd cheering begins to change. The Italian coaches become more animated and Bellutti begins to thrash on her bike. She is now cracking.

By the end of the next lap, Rebecca clocks a time of 2:01.462 and has taken the lead by 1.385 seconds. That is a jump of over one second in one lap. Lap six shows Twigg's time at 2:25.188 and an increased lead of 2.665 seconds which is nearly double the previous gap. Bellutti has now completely cracked not only physically, but mentally. The gap increases by 4.496 seconds on the seventh lap. At this point the video tape no longer shows Bellutti's split times because Rebecca Twigg is now on the same stretch of the track and if the race were to have lasted another 200 meters Bellutti would have been caught.

Although Rebecca Twigg began the race at a slower pace, she was able to increase her speed gradually over the course of the race. Her choice of gearing permitted her to keep an even pace until her opponent was bogging down and then gradually increase her cadence continuously for the rest of the race. This not only allowed her to pace herself as she wished, but the effect of her gradually upping her speed demoralized her rival.

Again, this information was gathered simply by reviewing the video tape and using a stopwatch. It says a lot about how Rebecca Twigg races the individual pursuit. We can also use this information to determine what size gearing was on either bike. An athlete planning on competing in the individual pursuit could save a lot of experimentation by using this technique for determining their own choice of gearing. The method is really very simple.

We can analyze the final race in the Women's 3,000 meter Individual Pursuit at the 1995 World Track Championships by looking Rebecca Twigg's World Record performance consisted of riding 3 kilometers in 3:36.081.

She went 3 kilometers = 3,000 meters.

She covered this distance in 3:36.081 = 216.081 seconds.

$3,000\text{m} / 216.081\text{ sec} = 13.884\text{ meters per second.}$

By taking the time of the race (216.081 seconds) and dividing by the average cadence as determined from the video tape (120 rpm+/-) we can determine Rebecca turned the pedals about 432 times during the race. We divide the distance of 3,000 meters by 432 pedal strokes to get a development

of about 6.944 meters +/- per pedal stroke. Looking at a gear chart that shows development, we can find three combinations that come very close to this calculation.

A chainring with 48 teeth and a cog with 15 teeth produces a development of 6.78 meters.

A chainring with 47 teeth and a cog with 15 teeth produces a development of 6.64 meters.

A chainring with 46 teeth and a cog with 14 teeth produces a development of 6.97 meters.

Any one of these could produce the result Rebecca Twigg delivered at the 1995 World Championships in Columbia. So if you were trying to choose a gear combination for riding the individual pursuit, a similar chainring matched to a 14 or 15 tooth cog would be a sound choice for a starting point. Since every athlete is different, you might need to modify that selection slightly to fit your own personal needs.

An important idea to consider during preparation is the breaking apart of a given race. That is, looking at all the independent components that make up the race. Athletes seldom think of a race as being a collection of pieces, but in truth that is what it is. Since we have been carefully looking at the individual pursuit, let's pick apart the process an athlete faces in competition. This is not an absolute listing of every single component of the individual pursuit, but it gives a hint as to how a race can be broken down.

Step 1. Pre-race stretching - The athlete should always begin any training or racing session by stretching properly and completely. This is the time to relax and loosen up the body, while keeping the mental distractions at bay. In shorter duration events, this becomes more important because the athlete will not be able to relax once they are on the bike.

Step 2. Pre-race visualization - The pre-race stretching in step one is linked to this step. Stretching and relaxing is also a good time to visualize what will be taking place during the race. The athlete reviews how they want the race to unfold and how they want to see themselves actually perform on the bike. It is important that the athlete not let any negative performances from the past influence this process.

Step 3. Pre-race warm-up - In order to perform properly, the athlete needs to do a complete warm-up routine. The duration and intensity will be different for each athlete, but they should warm-up thoroughly. During the warm-up, the athlete should focus on how they feel, what they plan to do and continue the visualization process. The warm-up must be timed to coincide with the start of the race. Ideally warm-up should end about five minutes before the race.

Step 4. Post warm-up stretching - When the athlete is finished warming up, they should again stretch completely and then proceed to the start line. Any last minute race review or thoughts from the athlete's coach should be taken care of now. It is important that the last verbal communication be positive.

Step 5. Waiting for the start - In the case of the individual pursuit, this would be the time when the athlete walks to the ready area to await having their bike placed on the starting line. There are often chairs or benches in this area and the athlete should take a water bottle and try to relax as much as possible in this area.

Step 6. Placing the bike on the start line - Once the bike is placed on the track, the athlete should make sure they are comfortable with the crank position, and level of the bike. At this point the athlete must feel everything is ready to go and working optimally. Some tracks use mechanical bike holders and if the

athlete has not started with one before, they should practice ahead of time to become familiar with the procedure.

Step 7. Getting on the bike - The point where the athlete actually gets their feet onto the pedals, should be the cue for their total focus on the upcoming effort. Many athletes still use toe clips and straps for track events and the athlete should take as much time as necessary to ensure they have their feet comfortably attached to the pedals. They should also use this moment to again focus on what they are about to do.

Step 8. Sitting on the bike - In many championship events, the official at the start line assumes the athlete is ready to compete when they actually sit down on the bike. The countdown clock will begin at this point. Be sure that you are finally ready to race when you at last sit down. The set position for the athlete will be when they are seated on their bike.

Step 9. Grabbing the handle bars - This again seems like an over simplification of the race process, but part of the focus process should be how you grab the handlebars as you prepare to start. Do not grip the handlebars as if you were clinging to a ladder. Hold them firmly, but easy so as not to create undo stress or tension in your arms and shoulders. Taking hold of the handlebars is a clear indication to the athlete and officials that the athlete is race ready.

Step 10. Looking down the track - As the clock begins the final countdown; the athlete should be looking down the straight and visualizing how they will actually ride that part of the track.

Step 11. Looking at the finish - As the clock continues the countdown; the athlete should be imagining how they will be finishing the race. They should attempt to see themselves doing the race as they have planned.

Step 12. Preparing to start - As the final 20 seconds begin to pass, the athlete should bring their breathing under control and focus on the effort they will need to bring the bike up to speed in the first lap.

Step 13. Waiting for the gun - As the last 5 seconds pass, the athlete should have their breathing under control and be standing up on the pedals in the last 2 seconds. The final moment before the start should be one of anticipation of release from the start line, not one of struggle to begin.

Step 14. Starting the race - As the clock starts and the athlete begins their race, their total focus should be on getting the bike up to speed as quickly as possible, without going into too high of a heartrate range. Careful attention should be paid to keeping the bike in as straight a line as possible so as to avoid wasting energy. The athlete should be looking to the end of the straight along the black line at the bottom of the track.

Step 15. Moving into the first turn - As the athlete enters the first turn, they should adjust their viewpoint to watch the black line in the turn about 10 meters ahead. Many athletes interfere with their own performance by not maintaining control of their speed and direction in the turns.

Step 16. Going through the turn - As the athlete proceeds through the turn, they should be mentally preparing to bring the bike onto the straight with as much speed and control as possible.

Step 17. Coming out of the turn - As the athlete enters the straight, they should again adjust their viewpoint to focus on the end of the straight ahead of them.

Step 18. Sitting down - By the time the athlete reaches the opponent's start line on the straight, they should make the transition from standing to being seated. Care should be taken during practices that this transition takes place as smoothly as possible. Too abrupt a motion can actually slow the bike.

Step 19. Grasping the aerobars - Once the athlete is seated they should make the change from the upright position on the handlebars, to the aerodynamic position. This should take place before entering the turn so as to ensure control of the bike during the turn.

Step 20. Going into the turn - As the athlete begins the turn, they should be relaxed on the handlebars and as close to the black line as possible. Care should be taken to keep the pace from bogging down during the initial part of the turn. The normal tendency is to try and steer the bike through the turn. It is better let the bike flow into the turn and allow the banking of the track to help steer the bike through the turn. The process of actually turning on pavement of any kind slows the bike down. A slight increase in effort allows the athlete to maintain speed and pace during the turning process.

Step 21. Hitting the rhythm - As the athlete proceeds around the track, they should attempt to hit their stride as quickly as possible. Once they have established a rhythm in their mind and body, it is easier to pace themselves to the race. Attention should then be paid to keeping the rhythm going as perfectly as possible.

Step 22. Attacking your opponent's focus - One area that athletes often fail to protect is their mental focus on their effort. Most athletes will have a coach working with them during the individual pursuit. The coach will use a stop watch to track the athlete's time and progress, but they also watch the opponent's progress. The athlete can often lose the mental focus and their race when they try to do the coach's job. In practice sessions leading up to the race, the coach and athlete should develop very strong non-verbal communication skills. This will allow the coach to signal the athlete during competition. It is necessary for the coach to relate the athlete's progress to them without disrupting their focus. On the other hand, part of the coach's job is to use the athlete's progress to disrupt their opponent's progress. Gradual changes in pace and lap time can create panic in an opponent. This in turn will begin to undermine their focus and can lead to a poorer performance.

Step 23. Keeping your focus - As the race unfolds, there will be reactions from the people present at the track. Spectators will voice their approval. Other athletes waiting their turn will begin talking and the coach of the opposing athlete will be trying to encourage them to go faster. The athlete cannot allow these things to disrupt their focus as the race continues. Part of the coach's job at this point will be to keep the athlete focused. This includes keeping the athlete from looking for their opponent.

Step 24. Closing the race - When there is one lap to go, the officials will ring the bell to notify the athletes. As the bell lap approaches, the athlete should begin increasing their effort. By the time the athlete crosses the finish line, they should have no real energy left.

Step 25. Finishing the race - Because events like the individual pursuit are often decided by fractions of a second, the athlete must not stop their efforts until after they have crossed the finish line. Only then, when the race is over, should they take the time to look at the clock or their opponent.

All of this race dissection may seem to be too much, but it may be necessary for the athlete to develop the skills needed. It is much simpler to understand a procedure if it is addressed a piece at a time. It also makes it easier to identify what the athlete's needs are. No two athletes are the same. What works for one may not be helpful for another. Choice of gearing, cadence, bike adjustments and even whether to use clipless pedals or toe clips and straps are all based on the athlete's personal needs.

Good Luck!