Original Article

How triathletes hold-ride the bike through boxes during the first transition. A proposal of classification

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Abstract:

A proposal is submitted for the classification referring to the way in which triathletes carry their bicycles into the boxes during the first transition (T1). This area must be covered on foot carrying the bicycle next to you. The demonstration was made up by the participants of three Spanish Championships and age groups of different distances and types (407 triathletes). They were recorded on film from the time they took their bikes down and moved through the boxes. This study is only going to concentrate on what happens in the last part of T1. It's the moment in which, having everything necessary to peddle, the triathlete picks up their bike, and travels through the transition area carrying the bike next to them as fast as possible. The purpose is to determine how the binomial triathlete-bicycle was moved into the transition area, (hold-riding), in other words, in which part of the bike they put their hands. It was concluded that there were four habitual types of hold-riding bikes in the transition area.

Key words: Guiding the bike to the transition exit, swimming - cycling transition, T1.

Introduction

The international Triathlon Union (ITU), defines triathlon in the ITU Competition Rules (ITU, 2015), as a combined and endurance sport, in which the athlete performs three different sporting disciplines, in three segments. These are: swimming, cycling and running. The order is marked and the timer doesn't stop at all throughout the competition.

Curiously in this definition the between halfway "phases" aren't included in these three disciplines, known as "transitions". However, for the purpose of classifications, in article 2.11 (Timing and Results), paragraph "b" of the international regulation, it does include the phases called transitions and states that the time splits to be included are: 1) Swim or first segment; 2) Transition 1; 3) Bike or second segment; 4) Transition 2; 5) Run or third segment; 6) Overall finish time.

In this case, the governing body responsible for this sport understands the same, as result or sum of these 5 partial times. Curiously, the ITU limits the definitions of the transitions to a concept of space, this being "the place that defines the transition area" (T1 and T2). However, researchers have studied other aspects of transition, going beyond the mere space limits that are set by the rules. These issues are specified in representative studies including: quick transition (Cejuela et al., 2008, 2011, 2013); the effects of drafting during swimming on subsequent cycling performance (Bentley et al., 2007; Ortega, 2013); physiological and biomechanical adaptations to the cycle to run transition (Taylor et al., 2011); strategy swimming pace (Delextrat et al., 2003; Commotto et al., 2011; Rivas Feal, 2011); effect of swimming intensity (Peeling et al., 2005); analysis of performance factors (Cejuela et al., 2007); analysis of transition time (Cejuela et al., 2008); the lost time in T1 &/or T2 (Paton and Hopkins, 2005; Cejuela et al., 2011, 2013); change in neuromuscular control, running kinematics, muscle recruitment or motor coordination after cycling (Chapman et al., 2008; Chapman et al., 2009; Cala et al., 2009; Bonacci et al., 2010a, 2010b) Bonacci et al., 2011a; Bonacci et al., 2011b)...

This study is focused only on the last part of T1. It is the moment in which, with every necessary thing for pedalling, the triathlete takes down his bike and moves through the box zone on foot (where all the bikes are hanging), next to the bike, taking it as fast as possible (normally running) with it at their side so as not to lose the group which could be formed, and can be more comfortable in the cyclic sector.

Despite being an essential characteristic aspect for the transitions, no publications have been found with the same purpose of this study. The aim is to determine how the bikes are carried through the boxes without yet riding them.

Material and method

The object of the study was “to know the different ways to carry the bicycle in transitions areas (boxes) and what was being looked for was the greater number of single recordings (T1) as possible, regardless of age, sex or, the standard of the triathletes.

There weren't any exclusion criteria because all possible types of triathletes were recorded. In these triathlon competitions were the Spanish national elite even with, some triathletes who are usually in World Championships or European Championships.

Participants

The sample was composed by 407 Spanish triathletes, participants of three Spanish championship triathlons in 2013: medium-distance Spanish championship (elite and age groups, 99 participants: 61 men and 38 women), short distance Spanish championship (elite, 147 participants: 99 men and 48 women) and triathlon-cross Spanish championship (elite and age group, 161 participants: 98 men and 63 women).

Procedure

In the different official championships such Spanish ones, the boxes access are closed to the public and this hampers the display of the triathletes in the start of the T1 or the arrival to the T2, because of the large amount of people who watch the event, the existence of fences and other decorative or advertising elements which impede to get closer to have a good view. To solve this problem, the Spanish and the Andalusian Triathlon Federation, and the corresponding chief of press from the different Spanish Championship were asked for their authorization to take images (right of the image). Once these consents were obtained, they had to seek the best position of the cameras in order to obtain the best images for the subsequent analysis.

Equipment

There were two video cameras used, the model was Panasonic SDR-H40 with a tripod.

Design

Previous attempts in minor events were made. It was decided to place two cameras recording at the same time, from different positions or points of view. It was better because there were various test made with only one, but the problem of using just one camera was that, when large groups leave at the same time, triathletes who lead the race cover the athletes behind them, meaning it was not possible to see them passing through the boxes. Placing two cameras helped to alleviate this flaw. Cameras 1 and 2 (figure 1) were placed diagonally from each other, to get the image of the same triathlete both from the front and from the rear.

Basically what was wanted to know is *the way that the triathlete carries the bike with their hands and in which part of the bike they put them*. This action was called “hold-riding” by the authors of the present study.

The specific position of each one of the cameras depended on three aspects:

1st. The transition area's location relative to the sun.

2nd. Real available space. According to the length and width of the transition area, zooms on the cameras were modified.

3rd. Other elements. Amount of judges, motorcyclists, TV cameras which were inside at this time and could distort the shots (generally they are gathered at the end of the transition areas and impede, sometimes, a good frontal shot).

Fig. 1. The Camera's position to obtain crossed images of displacement in boxes

Recording time started when the Chief Judge indicated the imminent arrival of the first triathletes exiting the water. Cameras remain recording until the entrance or arrival to the transition area of the last triathlete. Recordings were carried out by two of the principal authors of this study who knew very well which images they wanted to get.

Results

The results let them design a hold-riding classification of bikes in the transition area.

Classification

There are four ways in which triathletes place their hands on the bicycle to carry it, through the transition area until the judge line. Conduction of bicycles through the transition area is characterized, by these 4 kinds of holding:

1. Hold-riding of the bicycle “by the saddle”; with one hand on it and holding the saddle; HBbySADDLE.

1.1. Hold-riding with one hand on the saddle occasionally leaning the other hand (free hand) on the handlebar; HBbySADDLE/HANDLEBAR.

2. Hold-riding of the bicycle “by the handlebar”; with both hands on the handlebar; HBbyHAND.

2.1. Initial hold-riding with both hands on the handlebar and finally, with one hand on the handlebar and the other on the saddle (HB2H to HAND/SADDLE).

3. Hold-riding of the bicycle, always, “by the front/rear”; with one hand on the handlebar and the other on the saddle or the top tube; HBbyFRONT-REAR.

4. Hold-riding of the bicycle “by the stem” with only one hand on the stem; HBbySTEM.

Explanation of the four categories or types of hold-riding of the bicycles in the transition area

1st Category. Hold-riding of the bicycle *by the saddle*; with one hand on it and holding the saddle.

It must be noted that, in all modes of hold-riding, the triathlete always ends just before boarding, placing both hands on the handlebars to ride it.

Description.

The triathlete handles the bicycle exclusively with only one hand over the saddle (figure II). The hand leans gently over the saddle without applying too much pressure.

- Right handed riders generally hold or grab the seat with the right hand, hence running on the left side of the bicycle, leaving it on the right side.

- Left handed riders tend to hold the saddle with the left hand, hence running on the right side of the bicycle, leaving it on the left side.

The videos show this handling method, the triathlete is in a very vertical position, with facilitates running next to, or parallel with the bicycle. In that case, it facilitates a fast race with good frequency and stride of legs. Subsequently, when arriving to the riding line, the triathlete chooses this way, changing the position of the hands. In the last moment of the T1, just before mounting, the free hand (the hand furthest away from the bicycle) leans over the closest part of the handlebar and, the hand which is on the saddle (the hand closest to the bicycle) moves forwards to lean itself on the side furthest away of the handlebar. Now having both hands on the handlebar, you hardly have to modify the speed since this does not drop much. Thus, this way the binomial body-bike form a “stable or balanced system” to mount the saddle “without jumping or jumping” in a safe way when at speed so you can start pedaling.

Fig. 2. Detail 1st category.

Use. The observations shown on video indicate that, if there is enough space in the transition area and you can run fast with the bicycle in parallel, this method is the most effective. The high running speed, means that the direction of the bike, and the front wheel don't move to the sides, (the stem y handlebar remain stable and straight).

Observations. This method of holding the saddle can be seen as facilitated-disfavored because:

1) External facilitators;

- The transition area aisle is wide.

- In the transition area aisle there are few triathletes.

- When the aisle is wide and there a few triathletes.

2) Internal facilitators (in relation to the bicycle).

- If the handlebar stem is relatively large, it gives headset stability and the handlebar manages to stay straight even though the speed that they run next to the bicycle is a bit lower.

3) No facilitators:

3.1 The opposite to the ones shown in external facilitators;

- The transition area aisle is narrow.

- When there are many triathletes in narrow or small transition areas.

- When the aisle is narrow and there are too many triathletes.

3.2 The short stems, are more “edgy” and they tend to go sideways with more ease, which occasionally makes the triathlete straighten the handlebar with the free hand, because if not, it can completely turn around itself. This method will be difficult to perform whilst moving since the bicycle direction would not maintain itself straight.

Variation. 1st Category.

1.1 Hold-riding with one hand on the saddle occasionally leaning the other hand (free hand) on the handlebar. This maneuver (holding momentarily the stem with the other hand or the free hand furthest away from the bicycle) is performed when:

- A large group of triathletes are going to leave the transition area making it difficult to lead the bicycle by holding the saddle. The triathletes have to dodge each other because they are so many.

- There are triathletes who are in the middle of the transition area aisle and have to dodge each other.

- There are triathletes who are unhanging the bicycles.

- There are triathletes, in the way, still getting changed; helmets...

In all these situations, even though a triathlete starts holding the bicycle with only one hand on the saddle, normally you have to “redirect” the bicycle helped by the free hand (the one furthest away from the bicycle) until you pass the zone.

2nd Category. Hold-riding of the bicycle by the handlebar; with both hands on the handlebar.

Pointing out that in all methods of hold-riding, the triathlete ends up holding the handlebar with both hands. The difference is, the triathlete who chooses this second method has both hands on the handlebar through the whole aisle of the transition area hence you don’t have to change them when arriving to the judges line. They are already in their place!

Description. The chosen side depends on whether a person is right-handed or left-handed. The triathlete hold-rides the bicycle with both hands on the handlebar. One hand on each side (figure III). Both hands are on the shifters or on the padded tape or the frontal side of the handlebar. As mentioned previously, the side of the bicycle in which you run and leave the bicycle depends if you are right or left handed, or, the side that the triathlete usually gets on the bicycle.

When mounting the triathlete, chooses this method and, by having both hands on the handlebar, the triathlete hardly needs to modify the speed. The speed decreases lightly but, doesn’t usually stops the bicycle. The only thing the triathlete has to do is “to jump” on the saddle.

Fig.3. Detail 2nd category

Use. The analysis of the videos has shown that this type of hold is nearly, exclusively used by those triathletes who subsequently mount the bicycle “from a jump”. It would be “impossible” to jump on the bicycle if both hands are not holding the handlebar.

Observations. This method seems slower (speed of displacement bicycle binomial triathlete-bicycle) than the first (hold-riding by the saddle) and forces the athlete to displace the center of gravity to the limit of

their support base. The dynamic balance is possible because the triathlete is leaning his weight over the handlebar. As for the internal and external facilitators, and no facilitators, is the same as those from the first classification.

Variation. 2nd Category. Some triathletes, when arriving to the line of ascent, they don't mount by jumping with this method, which supposes a big waste of time. Is a matter of "being scared from getting hurt and or a lack of control technique". This gives place to the following variant:

2.1. Initial hold-riding with both hands on the handlebar and finally with one hand on the handlebar and the other on the saddle (HB2H to 1BAR/1 SADDLE).

The triathlete moves through the transition area with both hands on the handlebar, but when the moment of mounting the bicycle at the line of ascent arrives, the hand from the arm closest to the handlebar withdraws to lean itself on the saddle or, the crossbar to mount passing the leg over the saddle instead of jumping. Generally this action comes with "inclining or leaning" the bicycle towards us, to facilitate the passing of the leg. This totally stops the speed that was taking place (in the case that the athlete was not walking). That is to say there is a "total stop" of the bicycle to be able to do this maneuver.

3rd Category Hold-riding of the bicycle by the front/rear; with one hand on the handlebar and the other on the saddle or the top tube.

Description. The side chosen will depend on whether a person is right-handed or left-handed. The triathlete hold-rides the bicycle, performing a hold, with the hand furthest away from the closest part of the handlebar. The other hand, the one from the arm closest to the bicycle is placed on the saddle or crossbar of the bicycle (figure IV). This description coincides with the final position of the classification variant 2.1. The difference is that in that case it is only used at the end of the transition area, just before mounting the bicycle and in this case, the triathlete exits directly with this hold. It is always leaded like that until just the moment before mounting. In that moment, of ascent, the triathlete who chooses this method and, by having both hands on opposite sides, there is no option but to perform a semi-stop or stop completely to mount the bicycle. This is when the hand closest to the bicycle, the one that goes on saddle or crossbar, is placed forwards on the furthest part of the handlebar to enable, to pass the leg over the saddle to mount or jump on top of it.

Fig.4. Detail 3rd category

Use. As seen in the video recordings, this method is not used very often by the triathletes who first arrive to the transition areas. That is to say, it seems that it could have more correlation with middle or low level athletes or beginners, than the ones with middle or high level.

Observations. This method seems slower than the first or second; the race is less dynamic and more difficult to carry out. As for the internal and external facilitators, and no facilitators, they are also the same as those from the first classification.

4th Category. Hold-riding of the bicycle by the stem with only one hand on the stem.

Description: The triathlete hold-rides the bicycle, with just one hand on the handlebar stem; the one from the arm closest to the bicycle (figure V). The chosen side, like in the previous methods, depends if you are right or left handed.

In this category, like in the 1st one, the triathlete is in a very vertical position. This makes easier to run in parallel to the bicycle. It facilitates a faster race but as well as the 1st method. The image analysis points out that the triathlete "swings the arms" with the free arm to improve the whole coordination-balance movement. Just before mounting, the triathlete, places the hand that is on the stem (the arm closest to the bicycle), on the furthest away to the part of the handlebar and the hand from the free arm (the one from the arm furthest away from the bicycle) swinging beside the body, on the closest part of the handlebar.

Fig.5. Detail 4th category.

Use. Along with method 3, it seems to be the least used one.

Observations. If the body's position is vertical, a simple analysis of this type seems not being able to go as fast as in category 1.

- Eventhough the triathlete is in parallel with the bicycle, they go just behind the handlebar. This forces them to nearly "drag" the bicycle. The only thing in front of the triathlete, is part of the front wheel. This forces the triathlete to apply more force carrying the bicycle. However in method 1, the triathlete pushes the bicycle from behind (saddle) having most of the bicycle in front of the body.

- In this hold-ride situation (by the saddle – method 1), the pushing levers are more effective.

- In this situation (method 4), the pushing and leading of the bicycle becomes slower and more complicated.

Discussion

It is the first time that a classification has been made regarding this concrete aspect of T1 triathlon. The triathlon sport needs, after 40 years of history, to start making studies on its "logical or internal operation" (Parlebas, 1984; Hernández Moreno, 1994). The recording reveals various situations that we must take into consideration: Type 1: The observations shown on video indicate that, if there is enough space in the transition area and you can run fast with the bicycle in parallel, this method could be the most effective. The high running speed, means that the direction of the bike, and the front wheel don't move to the sides, (the stem y handlebar remain stable and straight). Type 2: The analysis of the videos has shown that this type of hold is nearly, exclusively used by those triathletes who subsequently mount the bicycle "from a jump". Type 3: As seen in the video recordings, this method is not used very often by the triathletes who first arrive to the transition areas. That is to say, it seems that it could have more correlation with middle or low level athletes or beginners, than the ones with middle or high level. Type 4: Along with method 3, it seems to be the least used one. A simple analysis of this type seems not being able to go as fast as in category 1. In future studies we could:

- Measure the time that is employed in each chosen method, in one of the given transition areas and in similar conditions

- Carry out a statistical study which correlates the triathlon modality (distance Sprint, Short, Medium, Long, Cross....) or level, age and gender with the hold-ride method.

Conclusions

The triathletes, independent of their age and level, should know well and know how to carry out adequately each one of the four categories of types of hold-riding of the bicycle presented in table I. It is interesting that these four methods of leading a bicycle through the transition areas are taught in Triathlon schools, amateur, elite or professional teams. Knowing how to do this is important like technical and functional background of the different types of transition areas (width, length, distance between the rows of bikes, number of triathletes...).

Table I. Summary of types of hold-riding and variants

1. Hold-riding of the bicycle <i>by the saddle</i> ; with one hand on it, and holding the saddle: HBbySADDLE .
1.1 Hold-riding with one hand on the saddle occasionally leaning the other hand (free hand) on the handlebar: HBbySADDLE/HANDLEBAR .
2. Hold-riding of the bicycle <i>by the handlebar</i> ; with both hands on the handlebar: HBbyHAND .
2.1. Initial holding-driving with both hands on the handlebar and, finally with one hand on the handlebar and the other on the saddle: (HB2H to 1BAR/1 SADDLE) .
3. Hold-riding of the bicycle, always, “ <i>by the front/rear</i> ”; with one hand on the handlebar and the other on the saddle or the top tube. HBbyFRONT-REAR .
4. Hold-riding of the bicycle <i>by the stem</i> with only one hand on the stem: HBbySTEM .

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