

# AN ANALYSIS ON CYCLING CHARACTERISTIC OF ELDERLY CYCLISTS RIDING ELECTRIC ASSISTED BICYCLES

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## 1 INTRODUCTION

Electric assisted bicycles have been sold since 1993. The possession number of electric assisted bicycles is more than 3 million, and the sales amount have increased.

Generally, the rate of accidents during cycling has increased in Japan. And accompanying to that, accidents during riding electric assisted bicycles also have increased. The fatalities in 2009 are more than 2.5 times than the ones in 2001 in Japan. And then, around 86% of fatalities are elderly (over 65 years old) riders.

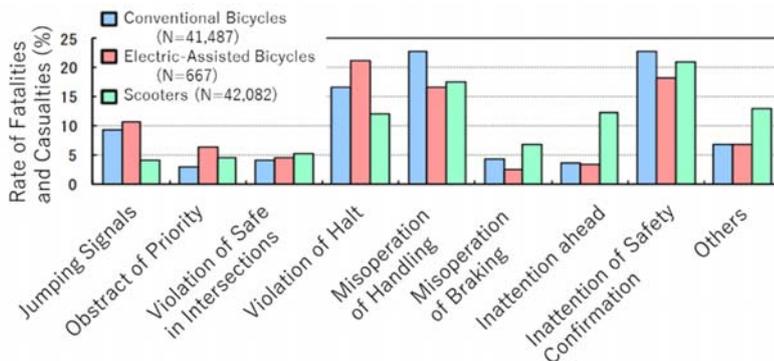


Figure 1: Rate of Fatalities and Casualties in Japan, 2008

The features of accidents types during riding electric assisted bicycles are that the cause of accidents tends to be jumping signals or violation of halt at intersections and it's different from the cause of the accidents during riding conventional bicycles (see Figure 1). It seems that the riders of electric assisted bicycles dislike stopping.

So in this study, we observed elderly's riding characteristic of electric assisted bicycles to know the feature of stopping behavior in the following 3 ways: 1) video observation at intersections, 2) GPS survey of daily cycling, and 3) questionnaire survey for cyclists.

## 2 PREVIOUS STUDIES

There are many previous studies about elderly cyclists of conventional bicycles, especially to know awareness during cycling, in Japan. However, there are little about the ones of electric assisted bicycles in Japan or the other countries. So in this study, to know comprehensively the cause of to ignore stopping by electric assisted bicycle riders in the aspect of behavior and awareness, we conducted the surveys in 3 ways.

### 3 METHODOLOGIES

We conducted 3 surveys as follows in comparison with riders of electric assisted bicycles and conventional bicycles in Tokyo, January, 2015:

- 1) Video observation at an intersection for waiting position and attitudes,
- 2) GPS observation of daily route choice during cycling, and
- 3) Questionnaire survey for preference of route choice, attitude for safe cycling or bicycle use.

### 4 RESULTS

#### 4.1 Video observation at intersection

As the results of video observation for 3 days, we collected 100 elderly cyclists waiting signals. Then we found that much elderly electric assisted bicycle riders waited signals on roadway more than elderly conventional bicycle riders (Figure 2). Moreover, elderly cyclists wait to put their feet on the pedals or start to pedal on total body weight. That's the easiest way to accelerate bicycles, especially for elders, but in the case of electric assisted bicycles, it may be a cause of speed up against their will.

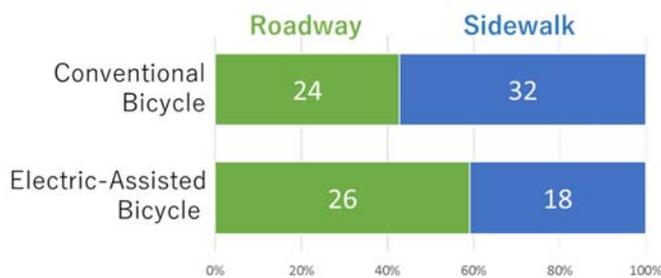


Figure 2: Waiting position of elderly cyclists at intersection, N=100

#### 4.2 GPS observation of daily route choice

As the results of GPS observation, we collected 82 cycling routes by 10 elderly's 3 days. Then we found that elderly electric assisted bicycle riders chose not only uphill but also downhill more than elderly conventional-bicycle riders. Of course, the electric power motivates elderly cyclists to go uphill. On the other hand, in downhill, electric assisted bicycle's heavier weight might be difficult to stop. However, it was revealed that the elderly electric assisted bicycle riders also chose downhill routes than elderly the conventional bicycle riders (Figure 3). It seems that the elderly cyclists not always to choose the same routes

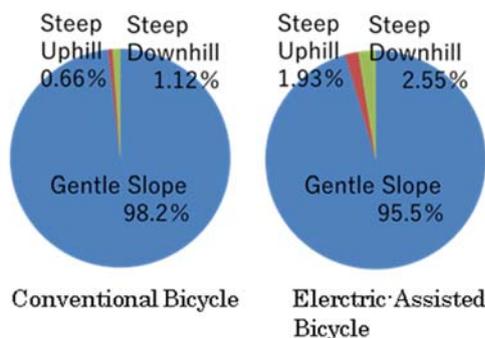


Figure 3: Rate of Fatalities and Causalities in Japan, 2008

### 4.3 Questionnaire Survey for Elderly Cyclists

As the results of a questionnaire survey of the same cyclists as the above GPS observation, we found that the elderly electric assisted bicycle riders think to choose the nearest routes and the elderly conventional bicycle riders think to choose the easiest routes without slopes or heavy traffic. Moreover, the elderly electric bicycle riders also tend not to want to stop at intersections. The reasons are “electric assisted bicycles are heavy to pedal and they avoid starting”, “they want to save waiting time”, or “they believe to be possible to pass fast and avoid vehicles at intersections”.

## 5 CONCLUSIONS

We conducted 3 surveys about elderly’s cycling with electric assisted bicycles. As the results, we found some features as follows:

- ◆ Elderly electric assisted bicycle cyclists tend not to stop where they must stop,
- ◆ They wait on roadways with attitude which they can pedal immediately
- ◆ They choose routes steeper uphill and downhill

That is, elderly electric assisted bicycle cyclists not seem to mind disadvantage or danger of them -need a longer distance to stop because of bicycle’s heavy weight and elderly cyclist’s weaker grip in braking, and start with high speed accidentally when putting their feet on pedal.

At the conclusion, on the aspect of infrastructure, the safer routes recommended for elderly cyclists should be developed, and on the aspect of education, the safety education or opportunities to know the characteristics of electric assisted bicycles for elderly cyclists is needed.

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