Cycling in pedestrian areas - facts and guidelines

Ing. Hans Godefrooij, DTV Consultants

DTV Consultants
Postbus 3559
4800 DN Breda

Email address: h.godefrooij@dtvconsultants.nl

Abstract

In 2004, The Dutch Centre of Expertise on Cycling Policy (Fietsberaad) asked consultancy firm BRO to investigate at which point the use of shared space by both cyclists and pedestrians starts causing problems. The immediate reason for this research was the diversity of solutions in The Netherlands, due to different (political) choices and assumptions. There were no guidelines at the time, making it impossible to substantiate those choices. Commissioned by Fietsberaad, 182 locations in 15 cities have been examined to see if lessons can be learned from daily practice. The results are evident.

Discomfort

Pedestrians generally experience little discomfort from cyclists. In pedestrian areas, the cyclist adapts to the surrounding pedestrians. Mixing cyclists with pedestrians is generally possible when the number of pedestrians per hour, divided by the width of the street in meters, is 100 or less. At most examined locations, both the number of cyclists and the number of pedestrians are relatively low. Even more important: locations with a high number of cyclists and a high number of pedestrians do not appear in the data set. Cyclists tend to choose other, more attractive routes when the number of pedestrians in a certain area is (too) high, whether this is due to certain prohibitions in, or due to stimulating cycling facilities outside of the pedestrian area.

Separating pedestrians and cyclists

When the number of pedestrians per meter of street width exceeds 100, separating pedestrians from cyclists is advisable. When the number of pedestrians is between 100 and 160, using a deviant colour or type of paving can be sufficient. When the number of pedestrians is even higher (up to 200 per hour), a height difference is preferred. When the number of pedestrians exceeds 200 per hour per meter of street width, it is advisable to close the street to cyclists altogether: separating pedestrians and cyclists in the street is no longer a solution.

Alternatives for cyclists

Cycling is prohibited in a large number of (streets in) pedestrian areas in The Netherlands. However, cycling is often possible in those streets. If cyclists find the street attractive, they will use it. It is therefore pointless to ban cyclists, unless they have a good alternative and cycling is impossible because of the large number of pedestrians. The cyclist will then decide that choosing the alternative route is the best option. Appropriate cycling policy (such as creating bicycle parking spaces near the edges of the pedestrian area) can help to support this.

Brief biography of the author

DTV Consultants is an ambitious and innovative research- and consultancy firm in the field of traffic and transport. Hans Godefrooij is Senior Consultant at DTV Consultants, working on projects in the areas of cycling and walking and road safety. Previously, as an employee of consultancy firm BRO, Hans investigated when (and when not) cyclists and pedestrians can be mixed in pedestrian areas.

Cycling in pedestrian areas - facts and guidelines

Ing. Hans Godefrooij, DTV Consultants

DTV Consultants
Postbus 3559
4800 DN Breda

Email address: h.godefrooij@dtvconsultants.nl

When can pedestrians and cyclists (no longer) be mixed?

In many municipalities in The Netherlands the focus on the residential quality of the central area increased in recent years and accessibility of pedestrian areas for cyclists is reconsidered. In many municipalities this had led to real political issues and, eventually, to a diversity of solutions (figure 1).

Figure 1 Examples of traffic signs, used in pedestrian areas in The Netherlands

Guidelines for the theme of cyclists in pedestrian areas were not available, giving politicians little or no data to support their decisions on. Fietsberaad, The Dutch Centre of Expertise on Cycling Policy, asked consultancy firm BRO to hit the streets to see if lessons could be learned from daily practice. With the key question: when can pedestrians and cyclists (no longer) be mixed?

Research

Goal of pedestrian areas is primarily to keep out cars, not to ward cyclists. Therefore, the questions to be answered in the study are:

1. Under what circumstances do cyclists and pedestrians encounter so much nuisance of each other that absence of cyclists is required or that separation of cyclists and pedestrians within the street section is necessary?
2. If separation of cyclists and pedestrians is desired, how should the street be designed?
3. If the absence of cyclists is required, how can the disadvantages for bicycle traffic be minimized, and to what extent it is necessary and possible to introduce prohibitions?

The study

Initially, several municipalities with a pedestrian area have been approached and asked whether they wanted to cooperate with the investigation. Several municipalities directly confirmed the relevance of the research. In many municipalities a debate was (or was earlier) going on about whether or not to allow cyclists to have access to pedestrian areas. Finally, in fifteen urban centers, a total of 91 locations in pedestrian areas, the practical situation was identified: is cycling legal or not, what are the numbers of pedestrians and cyclists on a workday afternoon and at late opening, how does the street's profile appear and what conflicts occur between pedestrians and cyclists. In the aggregate a dataset of 182 cases was collected (91 sites times two surveys).

Based on these data sets, the factors affecting the desirability of whether or not allowing cyclists in pedestrian areas were determined. Next, a guideline was developed to enable municipalities to decide for themselves at what locations access for cyclists can be allowed or not and what conditions must be met.

Pedestrian density

For each of the 182 cases was determined whether the combination of cyclists and pedestrians was possible. In order to assess each situation, the observer made an overall picture of the situation (number of pedestrians and cyclists, conflicts, street layout, etc.). On that basis, the observer concluded that the combination of cyclists and pedestrians is properly possible or not. Three conclusions are possible:

1. Yes, cyclists and pedestrians experience little or no discomfort of each other, cycling is possible
2. Cyclists and pedestrians experience discomfort of each other, but with difficulty cycling is possible
3. No, cyclists and pedestrians experience too much discomfort of each other, cycling is reasonably impossible

These conclusions are put into a graph, and compared with the pedestrian density, the number of pedestrians per hour, divided by the width of the street in meters (figure 2).

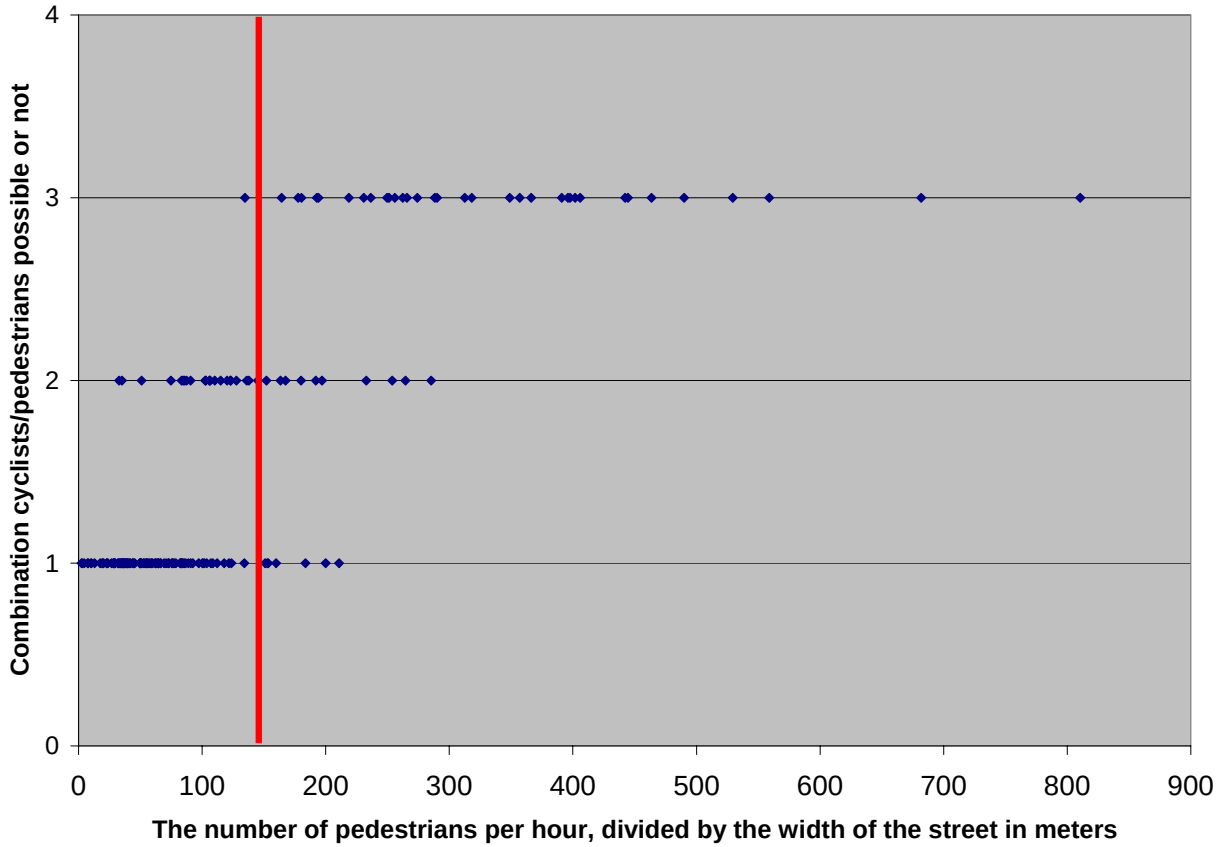

Figure 2 Combination of cyclists and pedestrians possible or not

Figure 2 shows a clear pattern. In the vast majority of the locations, the density of pedestrians is limited, and de combination of cyclists and pedestrians is possible. In the top row is the opposite: there are high pedestrian densities and (therefore) a combination with cyclists is not possible.

Schubert

In 1984, the German Hellmut Schubert conducted a study of cyclists in pedestrian areas (Hellmut Schubert, 1984, *Radfahren im Fussgängerbereich*, Strassenverkehrstechnik No. 6). The study concluded that with a pedestrian density greater than 0.07 pedestrians per square meter, cycling is no longer possible. It is obviously interesting to check whether this value is still (and also in the Netherlands) applicable. Therefore the number of 0.07 pedestrians per m^2 is converted to the number of pedestrians per hour, divided by the width of the street in meters. In shopping areas, the average velocity of pedestrians is 2 km/hour (= 0.56 m/s). At that speed 0.07 pedestrians per m^2 is equivalent to 141.1 pedestrians/h/m. This value is the red line shown in Figure 2. What is clear, is that the value that Schubert applied, is still relevant. The line lies exactly in the area where you would expect it to be. Thus the number of pedestrians per hour, divided by the width of the street in meters is an important factor that affects the (im)possibility of the combination cyclists/pedestrians.

Influences of street layout

Factors other than the pedestrian density also play a role in determining whether mixing cyclists and pedestrians is possible. Surely, in graph of Figure 1 there is an area where the same number of pedestrians per hour per, have different conclusions on “combination cyclists/pedestrians possible”. These differences must be explained by other factors. The street layout seems to give the most important explanation (Figure 3). All situations where the combination cyclists/pedestrian is possible (bottom row) at more than 141.1 pedestrians/h/m, have a driving strip, with deviant colour of pavement. The three points most right, also have height differences (side walk) in the street. A driving strip and especially height differences create separated domains for pedestrians and cyclist, so that they are not affected by each other.

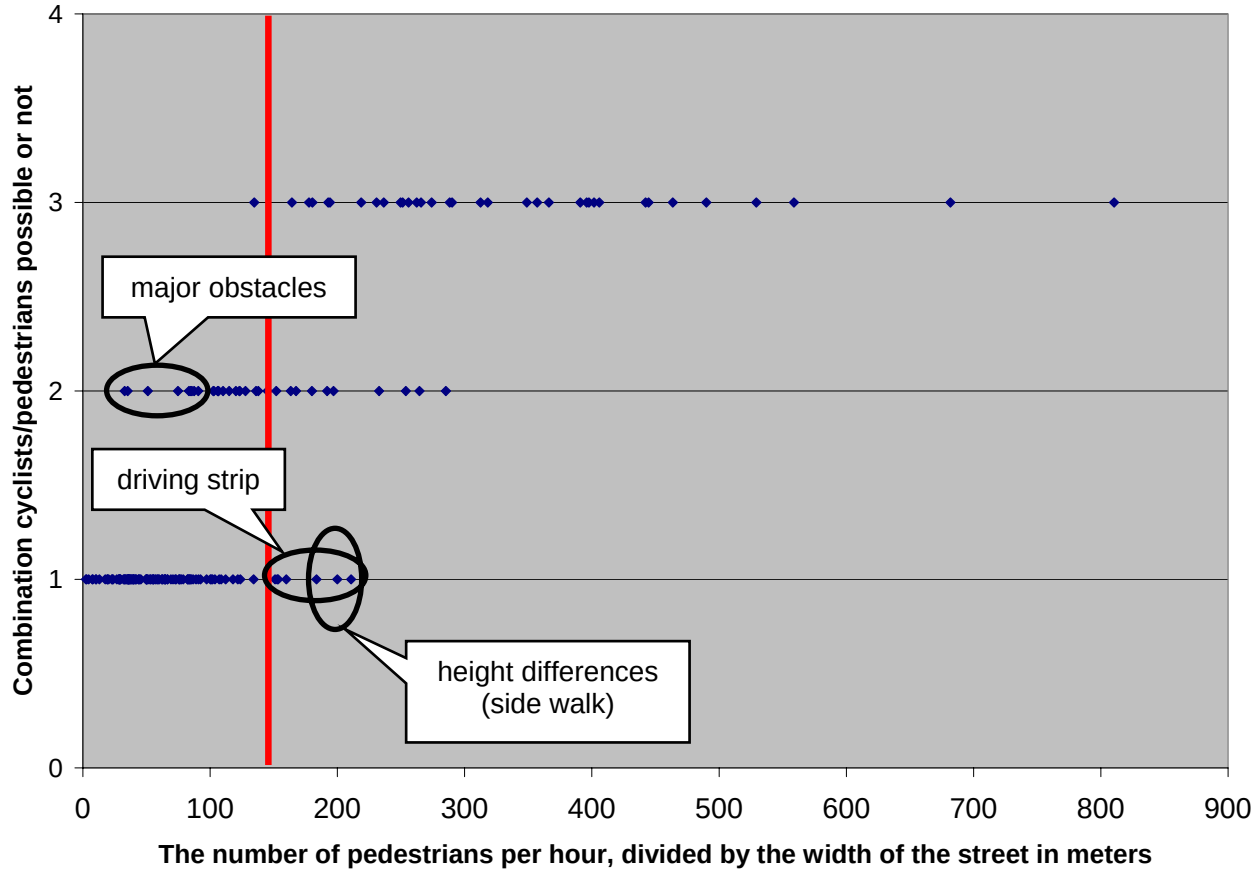

Figure 3 Combination of cyclists and pedestrians possible or not (with street layout explanation)

The eight points located most left in the doubtful “with difficulty” category (middle row) all have major obstacles (such as terraces, bicycle racks, etc.) in the street. So the available width of the street is substantially smaller than the total width. The number of pedestrians per available meter will therefore be significantly higher (more closely to or even at the right of the red line).

Conclusion on combinations

The empirical analysis makes it possible to draw firm conclusions about when cyclists and pedestrians can be mixed in pedestrian areas:

- At pedestrian densities up to 100 pedestrians per hour per meter mixing cyclists and pedestrians is easily possible. No additional measures are necessary.

Figure 4/5 Shared pavement for both cyclists and pedestrians

- At pedestrian densities over 100 pedestrians per hour per meter, the separation of pedestrians and cyclists within the street layout is desirable. At densities of up to 160 pedestrians/h/m a driving strip, with deviant colour of pavement, will suffice.

Figure 6/7 Driving strip, deviant colour of pavement

- At high pedestrian densities (up to over 200 pedestrians/h/m) a height difference (side walk) is a solution.

Figure 8/9 Height difference to separate pedestrians from cyclists

- If the density of pedestrians rises over 200 pedestrians/h/m, mixing cyclists and pedestrians is no longer possible.

Self-regulation and prohibitions

Pedestrians generally experience little discomfort from cyclists. In pedestrian areas, the cyclist adapts to the surrounding pedestrians. Cyclists give way, or dismount their bike and continue to walk, guiding the bike by the hand. Moreover, at most examined locations, both the number of cyclists and the number of pedestrians are relatively low. Even more important: locations with a high number of cyclists and a high number of pedestrians do not appear in the data set. Cyclists are always looking for the best route to get from A to B. The most attractive route for cyclists is determined by several factors such as length of the route, the ease or speed at the route, conflicts with other traffic, etc. The width of the road profile in pedestrian zones in itself plays no role the attraction for the cyclist. When the number of pedestrians in a certain area is (too) high, cyclists tend to choose other, more attractive routes.

Simultaneously, the research shows that bans are ineffective. In almost 50% of the cases where mixing cyclists and pedestrians is possible, cycling is actually prohibited, either 24/7 or only during (part of) the opening hours of shops. And often there were nevertheless cyclists in the street.

Cyclists apparently do not take prohibitions seriously. At the same time, there is much self-regulation. In many pedestrian areas cycling is prohibited, while the combination cyclists/pedestrians would be possible. If the combination is possible, and cyclists find the route attractive, there will be cyclists. If the combination cyclists/pedestrians is not possible, there are hardly any cyclists, especially if there is a good alternative route. And this is almost independent of existing prohibitions. Appropriate cycling policy, such as creating bicycle parking spaces near the edges of the pedestrian area, and creating attractive cycling routes around the pedestrian area is more convenient and effective.

More information

- Fietsberaad, 2005, *Fietsers in voetgangersgebieden, Feiten en richtlijnen*, Fietsberaad publicatie 8
- www.fietsberaad.nl