Effect of Colouring a Cycle Lane

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Abstract

This paper discusses the effects on colouring a cycle lane green. The position of both cars and cycles were measured on a road to give a measure of any change in behaviour of both drivers and cyclists of colouring a cycle lane green.

Cycle lanes in New Zealand are generally marked in accordance with MOTSAM, which is to provide a cycle lane using a painted edgeline and cycle symbols. Sometimes green surfacing is used to highlight particularly dangerous parts of a cycle lane, such as intersections or narrow points at kerb extensions.

Many European cities have coloured cycle lanes which are much more visible to a driver. Coloured surfacing is not specifically provided in the Traffic Devices Rule, however, the New Zealand Supplement to the Austroads Guide to Traffic Engineering Practice Part 14: Bicycles, states that "*coloured road surfacing should be used in areas where the presence of cycle lanes needs to be highlighted to other road users…. Typical locations for providing surface colour are cycle lanes near intersections and advance stop boxes*."

A trial was undertaken in Palmerston North City to determine the effect of colouring a cycle lane on the behaviour of cyclists and cars. It showed that the clearance between cyclists and cars was increased by an average of 250mm.

1. Project Aim

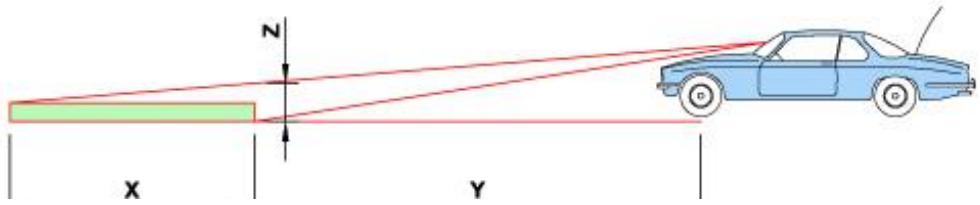
The primary aim of the research was to assess weather a cyclist was likely to be safer on a coloured cycle lane than a standard cycle lane. It has been assumed that when adjacent vehicles travel closer to a cyclist there was more chance of injury to the cyclists.

2. Background

The draft Auckland Regional Cycle Standards for Markings, colouring and Signage recommends that cycle symbols are painted on a 5m length of green pavement every 100m along the cycle lane. The authors of the Standard considered that this was too little, but many of the Local Authorities said that they could not afford additional greening of cycle lanes.

The safe stopping distance for a vehicle doing 60 kph is 55m. The diagram below shows that a 5m length of green paint is similar to having a green object on the road that is 95 mm in height.

Figure 1: Driver Viewpoint



This is more clearly shown in the photograph below, which shows a 5 m length of coloured bus lane at a distance of 55 m.

Figure 2: Coloured Surface at 55 m

The green surfacing is barely visible and is highlighted with an arrow.

3. Research Methodology

The research was undertaken on College Street, in Palmerston North, which is used by many children to cycle to school. College Street is a two-lane a collector road with an annual daily traffic flow of around 6,500 vehicles per day. Two schools are located on College Street in the vicinity of the study.

The site was chosen as it was already in Council's programme of works to install a cycle lane on College Street. The surveys were undertaken on westbound direction of traffic, just west of Milverton Avenue.

Parking is permitted on the street prior to the installation of a cycle lane, and was included in the cycle lane markings. The cycle lane was painted between 2.0 m and 3.6 m from the kerb.

Surveys were undertaken to assess the vehicle and cycle position at the survey site under three different scenarios; no cycle lane, cycle lane and coloured cycle lane. In order to record vehicle and cycle positions, spray-paint marks were made across a section of road at 0.5 m intervals. These marks were made to be as inconspicuous as possible to avoid influencing driver behaviour, but still needed to be seen when taking photos. The marks were covered during the final survey on the cycle lane section of the road. Cars were the only motorised vehicle to be surveyed due to the low volume of heavy vehicles.

Figures 3, 4 and 5 shows the layout of the street in the three surveyed scenarios.

Figure 3: College Street – No Cycle Lane

Figure 4: College Street – With Cycle Lane

Figure 5: College Street – With Coloured Cycle Lane

Photos were taken of each scenario. The photos were printed and lines drawn to show the location of the outer most point of the tyres on the road. The distance from the kerb was estimated to the nearest 0.1 metre based on the paint markings on the road. When there were two or more cyclist abreast, the distance was taken as the cycle closest to the moving traffic (furthest from the kerb).

Figure 6: Methodology

The photos were undertaken on the following days:

- No cycle lane - 20 December 2006
- Cycle Lane – 6 and 18 September 2007
- Coloured Cycle Lane – 21 and 24 September 2007

A total of 450 photos were taken. Table 1 summarises the distribution of the samples:

Table 1 Survey Sample Size

	Car Only	Car +1 Cycle	Car +2 cycle	Cycle Only	2+ cycle	Total
No Cycle Lane	73	15	4	39	9	140
Cycle Markings Only	92	14	3	29	4	142
Coloured Cycle Lane	187	6	1	11	3	208

Due to the limited number of sample sites available, no accident analysis could be undertaken that would show if there had been a change in cycle accidents and still be statistically significant.

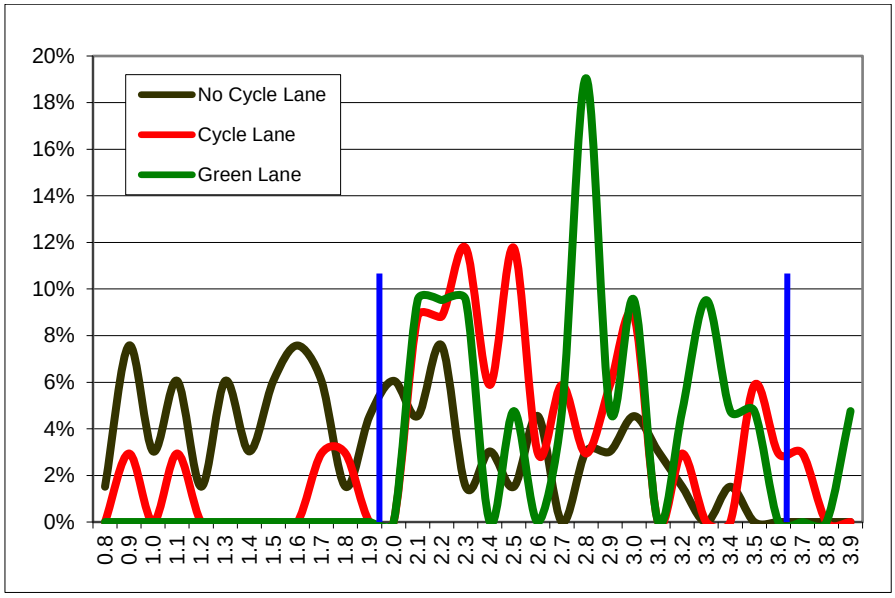
4. Survey Results

4.1 Distance between Cycle and Kerb

When there was no cycle lane marked, there was a great distribution of the location a cyclist would cycle. Even though a vehicle was parked beside the kerb in all the before photos, many cyclists were observed to be very close to the kerb, and were weaving in out of parked cars. Others were cycling in the middle of the traffic lane, forcing cars to cross the centre-line to avoid a collision.

The distances cyclists were cycling from the kerb for each scenario are graphed below. The location of the cycle lane has been superimposed on the graph.

Figure 6: Distance Between Cycle and Kerb



The graph shows that cyclists were cycling close to the kerb without the cycle lane and also with the uncoloured cycle lane. When the cycle lane was coloured the cyclists tended to cycle in the middle of the lane.

The average distance between the kerb and cycle lane for each scenario is tabulated below:

Table 2 Distance Between Cycle and Kerb

No Cycle Lane	1.90
Cycle Markings Only	2.49
Coloured Cycle Lane	2.81

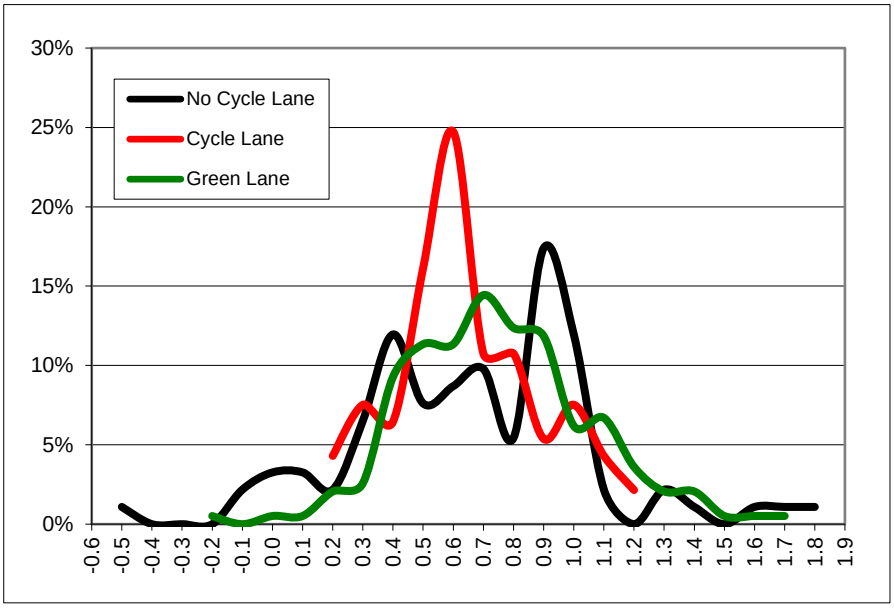
When the cycle lane was marked, the average cyclist rode 1/3 of the way into the cycle lane. However when it was coloured green, the average cyclist rode in the centre of the cycle lane.

It appears that cyclists feel safer on a coloured cycle lane. By cycling further away from the kerb, they are at less risk from drivers opening a car door onto them, but they are closer to the traffic lane.

4.2 Distance between Cars and Cycle Lane

The distances cyclists were cycling from the cycle lane for each scenario are graphed below.

Figure 7: Distance Between Cars and Cycle Lane



The detailed analysis of the distance between a car and a kerb was separated into two groups. One for when there were cars only, and one for when there were cars and cyclists.

Table 3 Distance Between Cars and Cycle Lane

	Car Only	Car with Cycle	Shift with Cycle
No Cycle Lane	0.60	0.88	0.28
Cycle Markings Only	0.63	0.74	0.11
Coloured Cycle Lane	0.72	1.12	0.40

When there were no cyclists present, car drivers drove on average 9 cm further away from the cycle lane. This distance increased to 38 cm when a cyclist was present.

The third column in the table shows the amount an average driver has moved when a cyclist is present. When there is no cycle lane, the average car path is 28 cm further from the kerb. This reduces to only 11 cm when there is a cycle lane marked. However, when the cycle lane is coloured, the average vehicle moves 40 cm.

Drivers appear to be more aware of cyclists on a cycle lane when the cycle lane is coloured.

4.3 Distance between Cars and Cyclists

There has been a shift in both cars and cyclists away from the kerb when a cycle lane is coloured. Ultimately, it is the distance between cars and cyclists that is important when assessing cycle safety.

Table 4 Distance Between Cars and Cyclists

No Cycle Lane	2.46
Cycle Markings Only	1.74
Coloured Cycle Lane	2.01

The results show that the distance between cars and cyclists reduce when a cycle lane is installed. This is probably due to the reduced carriageway width with the introduction of a cycle lane. However, the results show that a coloured cycle lane increases the distance between cars and cyclists on a cycle lane by 25 cm. This is an increase of nearly 15%

4.4 Statistical Tests

The data has been assessed using statistical analysis software that determines weather the differences between two means are statistically significant, or could be due to random error.

The individual data points have been assessed and the level of significance is shown below:

- Distance between cyclist and kerb 5% significant
- Distance between cars and cycle lane 5% significant
- Distance between cars and cyclists 15% significant

In other words, the results have a 5% possibility that they are occurring due to randomness.

5. Discussion

Results from the positioning survey indicated that both cars and cyclists moved further from the kerb with the installation of cycle lanes and that this distance increased further when the cycle lane was coloured. The distance between cars and cyclists reduced when a cycle lane was installed. The distance between cars and cyclists increased when the cycle lane was coloured, however it was still less than when there was no cycle lane.

The positioning of cyclists was much more uniform with the introduction of a cycle lane and motorists were therefore better able to predict their movements, thus making a cyclist safer on the road.

The increased separation distance between a cyclist and the edge of the cycle lane will result in the distance between cyclists and parked cars increasing, and making it less probable that a vehicle occupant will open a car door in front of a cyclist.

Cyclists ride closer to the centre of a cycle lane if it is coloured. They appear to feel more comfortable cycling closer to moving traffic when the cycle lane is coloured. It appears that they perceive they are safer on a coloured cycleway, thereby increasing the cyclist's level of service.

Cars made a bigger shift away from cyclists when the cycle lane was coloured. It appears that drivers are more aware of cyclists on a coloured cycle lane as the cycle lane is more visible.

6. Acknowledgements

We would like to thank Palmerston North City Council for colouring the cycle lane and allowing the staging of the survey.