REDUCING VEHICLE SPEEDS ON RESIDENTIAL STREETS: A SINGLE-HUMP EXPERIMENT

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1. INTRODUCTION

Speed humps have been known as one of the most effective devices to reduce vehicle speeds in order to ensure traffic safety. Several studies have evaluated the impact of speed humps on vehicle speeds. For example, Kojima et al (2011) studied the effectiveness of humps placed at different intervals ranged from 20 m to 100 m. The maximum speeds were recorded at each interval. The results showed that the longer intervals resulted to the higher speeds between humps and the interval of 60 m or less produced an average speed of less than 30 km/h. In the same study, the authors also pointed out that drivers tend to reaccelerate after passing the humps especially in case the long distances between humps are provided.

Previous studies only focused on vehicle speeds between humps with the interval length of less than 100 m. However, it is arguable that the drivers' speed choice behavior on the sections right before and right after the hump-setting zone may be different with those between humps. This paper aims to address this gap by investigating the effectiveness of single speed humps on vehicle speeds on residential streets. Different with previous studies that often used spot-speed data, in the current study, vehicle speeds were recorded continuously for each individual vehicle.

2. HUMP EXPERIMENT AND DATA COLLECTION

Two street sections were selected for this study both located on urban areas of Minami-Hatogaya, Kawaguchi city, Japan. These sections are one-way traffic with a speed limit of 30 km/h. On the traffic moving direction, these sections are adjacent to a river embankment with limited accesses on the right hand side and residential neighborhoods on the left.

Excessive speeds are very serious on the streets that may cause unsafe for residents nearby. To reduce vehicle speeds, two humps developed by a joint cooperation between the Laboratory of Design and Planning, Saitama University and Nippon liner Co.Ltd. in 2000 were installed on these streets, one hump for each street section. The details of the humps were provided in Kojima et al. (2011). Fig. 1 shows the sketch of the study street sections and the location of humps.

Speed profiles were recorded for individual vehicles by using STALKER ATS radar guns connected to a laptop on the field. Vehicle speeds were measured both before and during the humps experiment. At least 75 speed profiles were recorded for each situation.

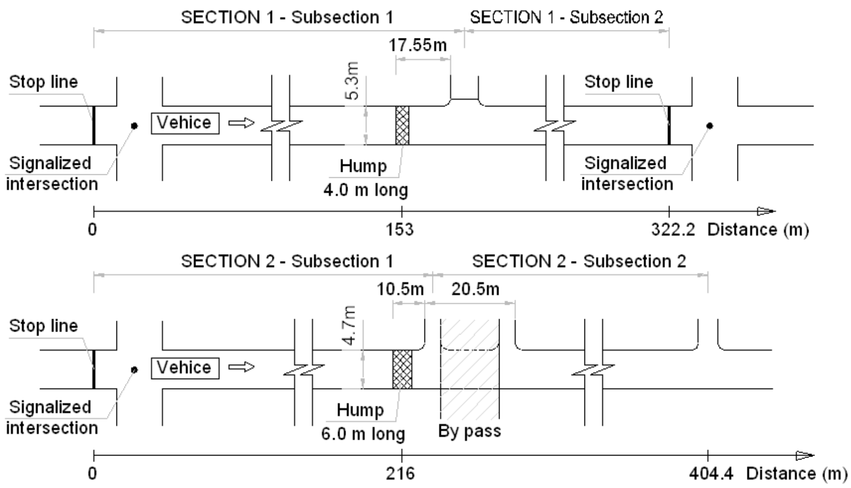

Fig. 1 Sketch of selected street sections

3. RESULTS

Fig. 2 presents the speed profiles for each street section while several speed indicators are shown on Table 1.

Table 1 Descriptive statistics of speed indicators

Indicators	Before experiment				During experiment				SR (km/h)	SR (%)
	Vmean	Vmax	Vmin	V85th	Vmean	Vmax	Vmin	V85th		
Section 1										
Maximum speed within subsection 1	44.63	59.20	31.80	50.33	42.60	58.77	32.15	47.07	2.03	4.56
Maximum speed within subsection 2	47.55	60.19	35.61	53.32	45.04	58.31	32.82	51.23	2.50	5.26
Speed at hump location	37.80	50.47	21.47	43.17	23.60	43.61	8.10	36.08	14.20	37.58
Section 2										
Maximum speed within subsection 1	49.65	64.10	36.51	55.83	42.93	56.38	30.88	47.59	6.72	13.54
Maximum speed within subsection 2	50.15	62.07	36.52	58.04	46.03	64.57	28.27	52.74	4.12	8.21
Speed at hump location	49.07	60.95	36.51	55.29	19.47	45.81	6.27	26.55	29.59	60.32

Note: SR – mean speed reduction. All speed indicators were measured by km/h.

Keyword: speed hump, profile speed, residential streets, 30 km/h speed limit.
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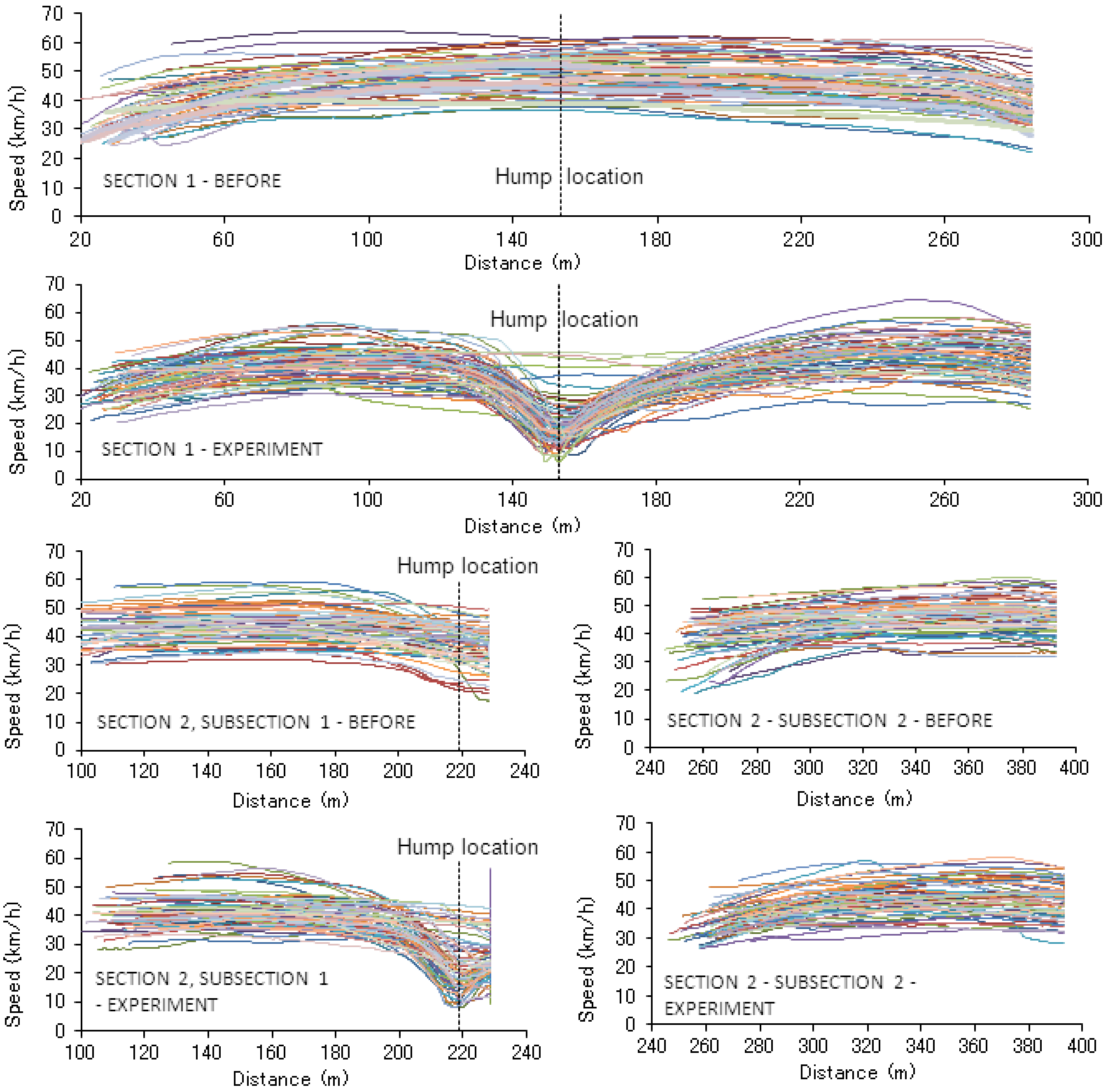

Fig.2 Speed profiles before and during humps experiment

4. FINDINGS AND CONCLUTIONS

The data showed that all mean speeds measured under the experiment are significantly lower than those measured before the experiment at the 95% level. Mean speeds at hump locations dropped rapidly after hump installation from 37.8 km/h to 23.6 km/h for Section 1 and from 49.07 km/h to 19.4 for Section 2. However, a part of drivers still exceeded 30 km/h when passing the humps. Mean speeds of the maximum individual speeds within the subsections before hump locations had a reduction of 2.03 km/h (4.56%) and 6.72 km/h (13.54%) for Section 1 and Section 2 respectively. The impact on the same mean speeds of the subsections after humps location seems to be smaller with only a decrease of 2.5 km/h (5.26%) for Section 1 and 4.12 km/h (8.21%) for Section 2 under the experiment. On average, drivers need a distance of about 30 m to decelerate from a speed of 40 km/h to the speeds at the hump location. Also, the acceleration rate after passing the hump is very high with only a necessary acceleration distance of less than 20 m to reach the speed of 30 km/h for Section 2.

The findings suggest that if the remaining length of the subsections before and after hump locations is large (more than 150 m as those under the current study), further measures should be considered to ensure the targeted speed reduction. Attention should be also paid at the high deceleration/acceleration rate occurred before/after hump location.

REFERENCES

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