CRASH EFFECTS OF HARD SHOULDER RUNNINGS IN FREEWAYS

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Abstract
This paper presents the result of a research project carried out to investigate the safety effect of the hard shoulder running in freeway facilities. Traffic congestion is increasing in urban freeways and freeway operation authorities in many countries are applying a variety of traffic control devices to increase vehicle carrying capacity at peak times. The hard shoulder running is one of the efficient devices applied to deal with traffic congestion in freeways and it creates an extra lane, relatively cheaply, at fixed times where there are known bottlenecks. Despite the popular use in South Korean freeway facilities, the hard shoulder running became a research subject recently, because many crashes start to occur within its surrounding areas. Both the total crash number and the injury crash number in the hard shoulder running have significantly increased. Transportation engineers are wondering whether this crash increase is casual or correlated with the application of the hard shoulder running. If proved that the hard shoulder running carries undesirable results, its application in freeway facilities will be no longer justifiable. We have applied the Empirical Bayes Method to investigate this question and analyzed a set of freeway vehicle crash data obtained from the authority of freeway operations in South Korea. In addition, relevant information about the before and after conditions of the hard shoulder running was acquired by our own field studies which included occasional visits to the police office. These study activities were made for 7 freeway corridors with 15 separate route sections covering 130.3 km in length. Although several studies have been conducted in S Korea to examine the factors associated with vehicle crashes in general freeway facilities, little research has been conducted to examine the differences in the factors associated with the hard shoulder running, its geometric characteristics including entrances and exits, and the speed pattern of motorists in the regular lane and the hard shoulder running.

This study finds that there were increased numbers of traffic crashes in the freeway hard shoulder running and an average 4.1 crashes per our study section was the crash difference from applying the hard shoulder running. It also finds that the site involved in the highest crash difference showed a 46.4% growth, while the one involving in the lowest crash showed a 2.1% crash reduction. In detail, the average daily traffic volume had the most significant correlation with vehicle crashes in the hard shoulder running. Other significant variables included the percentage of trucks, the number of exit and entrance ramps, the presence of highway curves, and the width of the shoulder lane.

Hence, transportation engineers responsible for the operation of freeways should consider the result of this study when they are required to provide the justification of the hard shoulder running and to improve the crash risk levels associated with traffic control devices.

Key words: Vehicle Crash, Hard Shoulder Running, Freeway, Empirical Bayes Method