International Co-operation on Theories and Concepts in Traffic Safety

Assessing the Impact of Telematics Based Feedback and Financial Incentives on Powered Two-Wheeler riding Behaviour

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Introduction

Powered Two-Wheelers (PTWs) riders have a higher risk of injury due to their lack of protection compared to passenger cars, which can lead to severe injuries in the event of crashes above a certain speed. As a result, in many developing countries, PTW accounts for the highest proportion of road crashes. In India, road crash reports highlighted that more than seventy-four thousand PTW riders lost their lives in 2.03 lakh reported PTW crashes. Road crashes are a complex occurrence with multiple causes, arising from the interplay of various factors. Among all factors, driving behaviour is the leading contributing factor in the majority of crashes, accounting for 93.5% of crashes. In the Indian context, road crash reports show that risky driving behaviour was the primary cause of 81.9% of road crashes. It is apparent from the statistics mentioned above that PTW safety has become a major problem for both developed and developing countries. However, existing literature related to PTW safety and riding behaviours is still not vast compared to other road users. This research addresses a gap in the existing literature by focusing on examining risky riding behaviours that may increase the probability of crashes among Indian PTW riders and exploring telematics data-based feedback system as a strategy to enhance PTW safety.

Research Methodology

The flow chart depicted in Figure 3.1 outlines a sequential framework for the proposed research. Initially, the focus is on reviewing existing literature to identify research gaps and subsequently addressing those gaps. The subsequent step involves the selection of various behavioural measures associated with crash risk in terms of telematics data, including speed, longitudinal acceleration, lateral

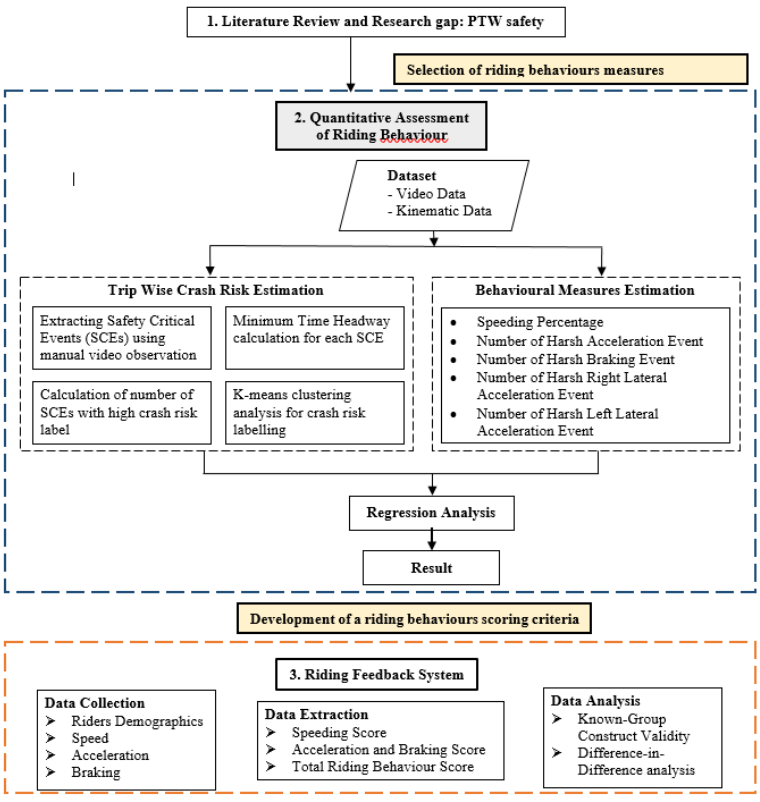

Figure 1: Study Methodology

acceleration, etc based on the literature.
The Naturalistic Riding Study (NRS) data were collected for 45 riders in two stages. In the first stage, fifteen participant's vehicles were equipped with a GPS data logger system called Video VBOX Pro 10 Hz which provides kinematic data at a frequency of 10 Hz along with synchronized videography data of front, rear, and left side views. Additionally, a laser distance sensor was attached to the data logger system for observing the distance between the study vehicle and the vehicle or object ahead on the road. Moving to the next step, the goal is to explore the relationship between telematics data-based behavioural measures and crash risk, leading to the development of riding behaviour scoring criteria using the first stage data. The final step involves examining the impact of feedback. For completing the final step, second-stage data have been collected. Thirty participant's vehicles were equipped with a GPS data logger device called VBox Sports, offering telematics data such as GPS coordinates, speed, longitudinal acceleration, lateral acceleration, radius of turn, etc., at a frequency of 10 Hz. The second stage of data collection was conducted in four phases: baseline phase, control phase, intervention phase I (feedback only), and intervention phase II (feedback with financial incentives). Riding behaviour feedback, presented in the form of a Riding Behaviour Score (RBS), was provided. Finally, the research concludes with a presentation of findings, and providing recommendations based on the analysis.

Results and Discussion
To explore the relationship between variables, the negative binomial regression technique was utilized in the analysis. Consistent with previous research on the relationship between behavioural measures and crash risk in naturalistic driving studies, the present study demonstrates statistically significant results indicating a positive association between riding behaviours and crash risk, as measured by telematics data collected during a short-term naturalistic riding study. Notably, the study identifies that a threshold value of 0.12g for acceleration is more suitable for defining harsh events (HAEs), as HAEs calculated using this threshold show a significant association with HCREs. Similarly, a threshold value of -0.14g is found to be more appropriate for defining HBEs. The regression analysis results further highlight that a one-unit increase in the speeding percentage per trip is associated with a 1.5% (95% CI: 1.4-1.7%) increase in the number of HCREs per trip. Similarly, a one-unit increase in the number of HAEs and HBEs per trip is associated with a one-unit increase in the number of HCREs per trip Further, a noteworthy finding from this study was the statistically significant effect of feedback with incentives on our composite score of risky riding behaviour (RBS). Conversely, the effects of feedback only on RBS outcomes were smaller in magnitude and did not reach statistical significance at conventional levels. This underscores the importance of consolidating various risky riding behaviour measures into a composite score, revealing potentially crucial risk reductions that are challenging to detect when evaluating changes in specific behaviours separately.

Conclusions
Overall the findings of this study hold the potential to refine the riding behaviour of PTW riders and will provide transportation agencies and policymakers with improved management and decision-making capabilities to implement effective interventions for enhancing PTW safety.