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Trends in Stress and Traffic: An Analysis of the Projected Growth of Traffic and Implications for Stress, and Technologies and Rewards That Can Be Leveraged to Address the Issue

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Abstract

Should current trends continue, traffic congestion is expected to grow at an enormous rate. An increasing population, a recovering economy, and a continued preference on the part of Americans for private transportation will create a travel demand that future transportation capability cannot meet. In 2003, 39,500 lane-miles were considered severely congested. By 2030, this will have increased 51.1% to 59,700 lane-miles. The Travel Time Index (TTI) ratio for drivers in urban areas with a population greater than 3 million will be 1.76 (meaning that traffic time is 76% longer during peak hours than non-peak hours) in 2030 as opposed to 2006's 1.46. For urban areas of 1-3 million, it will be 1.88, or equal to Chicago traffic in 2006. Small population areas will see delay double. In terms of traffic density, by 2030, when compared to 2003 numbers, it will have increased by approximately 20% in areas with populations in excess of 1 million and by 30% in areas with a population between 50,000-251,000. In 2011, 5.5 billion hours of extra time was spent in traffic, with individual drivers experiencing an average of 38 extra hours. By 2020, this will be 8.4 billion and 45 respectively.

The correlation between stress and congestion has been well-established. Stress is known to be caused by constant exposure to daily hassles, such as traffic, which is found by many to be uncontrollable and undesirable. 50% of drivers in one study had reported experiencing negative reactions to driving on any given day. Two coping mechanisms of drivers that particularly dangerous are dislike for driving (characterized by anxiety, unhappiness, and lack of confidence) and aggression (characterized by irritation, impatience, and behavioral aggression). In addition to anxiety and aggression causing more stress rather than alleviating it, these two coping mechanisms can inadvertently cause more traffic. Anxious drivers focus on worry, emotions, and negative self-appraisal, which can distract them from the driving task at hand (cognitive interference). Aggression results in reckless behavior and, in extreme cases, violence, which can lead to accidents. Unfortunately, aggressive "coping" dramatically increases in areas of high congestion. With traffic congestion set to increase, it seems inevitable that so will stress.

The question, then, is how to deal with traffic-related stress. Several stress-measuring technologies can be employed to monitor stress levels of drivers, the most promising of which is a contact-free heart rate variability (HRV) sensor. HRV has become the focus of increased interest during the 2000s because of its accuracy in reflecting stress in various tasks, including driving. The development of the ability to read HRV via microwaves, rather than through electrodes and an ECG, makes the use of an HRV sensor even more attractive. Another promising trend is the fact that HRV sensing has emerged in popular society outside of the clinical world. The iThlete HRV app records and displays results taken from a heart monitor, while the Azumio Stress Check app allows the smart phone itself to read the HRV. However, in order to allow for data measuring and collection to be palatable, or to condition subjects to behave in a desired manner, various rewards can be offered. The reward programs now prolific in the business and shopping world can be adapted for these purposes. Of particular interest are reward programs that involve the provision of credit points (redeemable at various businesses) by third parties originally unaffiliated with the original service, such as the partnership between Shopkick and Visa or Foursquare and Amex. Of even greater interest is State Farm's Drive Safe & Save discount program, in which the in-Drive device monitors and collects data on a user's driving behavior. If data collected on braking, acceleration, turns, time of day, and speed of driving indicates safe driving, then users receive a deduction on their automobile insurance. This raises the possibility of using a similar system to make users receptive to stress data collection.

