



# Patterns of use, knowledge, and perceived effects of sedating medication on driving: A questionnaire survey of Japanese drivers who use sedating medication



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## ABSTRACT

**Objective:** This study was designed to investigate patterns of medication use among drivers using pharmaceutical drugs, the subjective impact of medication use on driving, and knowledge about the effects of medication use on driving.

**Methods:** An online survey was administered to a sample of Japanese drivers ( $n = 1424$ , age range 21–79 years) to investigate the use pattern of major sedating medications such as cold/sinus drugs, anxiolytics, hypnotics, and antidepressants. The strength of association between variables pertaining to the use of sedating medications and self-reported at-fault crash involvement was explored using a series of multivariate logistic regression models.

**Results:** On average, respondents reported using 2.7 sedating medications over the past two years (standard deviation = 1.8; range = 0–11). The pattern of psychotropic medication use was diverse, and the use of multiple psychotropic medications was common. Respondents could be grouped into four subgroups in terms of multiple medication use. Irrespective of the type of medication taken, respondents noticed few adverse side effects of medication on driving and generally did not adhere to driving-related product warnings; some respondents were unaware of important facts such as the exacerbation of the effects of medication effects when combining medications. Multivariate logistic regression analyses showed that the presence of a higher number of sedating agents in the medication taken was positively associated with reporting an at-fault crash in the last two years, having longer driving distance, being a commercial driver, receiving more traffic tickets, and having a higher tendency for rules violations.

**Conclusions:** The present study showed that medication use by drivers is diverse and complex, that most drivers are not sufficiently informed of the potentially impairing effects of medication, and that poly-medication use appeared prevalent among those who use psychotropic medications. In line with previous studies, the current study reveals a need for better communication between health experts and patients and for education of all stakeholders. The results also highlighted the need for systematic investigation into cause of crash in light of potential contribution of sedating medication used by the driver, given the low autopsy rate for fatally injured drivers in Japan.

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## 1. Introduction

### 1.1. Prevalence of CNS medication use and its crash risk

The consumption of medications that affect the central nervous system (CNS) is increasing in Japan, and this trend is predicted to continue in the future (Nakagawa A., 2011). It is estimated that about 3% of the Japanese population has been prescribed antidepressants in the last three months; that figure is 5% for hypnotics (sleeping pills) and anxiolytics (anti-anxiety medicines), a level similar to that in Europe (Nakagawa, 2011).

There is growing evidence that certain CNS medications—mostly of sedating nature—can impair driving performance and increase crash risk (Rudisill, Zhu, Kelly, Pilkerton, & Rudisill, 2016; Schulze, Schumacher, Urmeew, & Auerbach, 2012) by causing drowsiness, dizziness, sleepiness, or blurred vision (Fierro, Gómez-Talegón, & Alvarez, 2013). Examples include benzodiazepines (BZD), opioid analgesics, antidepressants, and sedating antihistamines (Rudisill et al., 2016; Smyth, Sheehan, Siskind, Mercier-Guyon, & Mallaret, 2013a). Most epidemiological studies investigating the association between medication use and crash risk take into account some confounding variables, such as age, gender, driving distance, drug dose, or alcohol use (Elvik, 2013; Ravera, van Rein, de Gier, & de Jong-van den Berg, 2011). Adjusted odds ratios (OR) of crash involvement for medication users versus non-users are significantly higher than 1, ranging from 1 to 2. This indicates that the use of certain medication may increase the likelihood of car crashes; however, the impact of medication use on general road safety may not be as high as that of alcohol (Schulze et al., 2012), and not all sedating medications have been found to increase crash risk (Elvik, 2013; Rudisill et al., 2016).

### 1.2. Poly-medication use and potential impact on crash risk

Assessing the impact of medication use on driving is complex. Risk varies across drug classes and can vary within classes and even by individual product, depending on dosage, duration of therapy, and underlying driver characteristics (Kelley-Baker, Waehrer, & Pollini, 2017). Furthermore, combined use of medications or combining medications with alcohol may result in higher risk of car crashes (Elayeh et al., 2016; Orriols et al., 2010; Schulze et al., 2012). As the population ages, the number of people consuming more than one medication rises; however, little attention has been paid to the potential adverse outcomes associated with concurrent use of several medications, such as those attributed to drug interactions (Kelly, Darke, & Ross, 2004; Monárrez-Espino, Laflamme, Elling, & Möller, 2014).

Using a case-control study design in which subjects were matched by sex, age, and place of residence, Monárrez-Espino et al. (2014) found a positive association between the number of medications taken and older drivers' likelihood of involvement in a car crash: those who had received medication prior to a crash had a higher likelihood of crash involvement. Furthermore, crash risk increased with higher numbers of medications. A large-scale case-crossover study combining police crash data and a prescription database in France showed similar causal relationship between crash involvement and the number of medications used per patient, as well as the medication type classified by level of impairment (Orriols et al., 2010). Poly-medication use is a particular concern in Japan, as prescriptions for multiple medications may be more prevalent than in western countries (Doi, 2002). Therefore, the number of sedating medications may merit special attention in relation to driver impairment.

### 1.3. Knowledge of and attitudes towards medication use among drivers

From a public health perspective, the advantages of taking medications generally outweigh the disadvantages of not taking them. Untreated medical conditions can be more risky in road traffic than when treated with medication appropriately. Previous research examines risk of medication use vs. non-use and risk of illness vs. absence of illness separately as reviewed by Vaa (2003), and information about the interaction or trade-off between various medical conditions and medication use is scarce. From a traffic safety perspective, the potential impairing effects of medication need to be clearly addressed. Previous studies have indicated a lack of awareness and knowledge about medications' adverse effects on driving among the general driving population. Many drivers may not be aware of the potentially negative impact of medications on their driving performance (Elayeh et al., 2016). For example, package warning labels seem to have little impact on patients' decisions about whether to drive a car, suggesting a need for explicit rules regarding driving while under the influence of psychotropic medications (Smyth et al., 2013a; Veldhuijzen et al., 2006). On the other hand, there is evidence that explicit pictogram-based labelling systems enhance safer attitudes among drivers (Fierro et al., 2013). To the best of our knowledge, there have been few previous studies, aside from those mentioned above, investigating driver attitudes towards medication use.

The interaction of medication-related driver impairment with fatigue and stress is another concern that may be particularly relevant for commercial drivers, who may be more likely to use both medications and illicit drugs while driving (Ingsathit et al., 2009). Commercial drivers also exhibit particular forms of unsafe driving behaviour to cope with workload and time pressure (Newnam, Greenslade, Newton, & Watson, 2011). These work-related conditions likely increase commercial drivers' risk of crash involvement. Furthermore, there seem to be no previous studies examining unsafe driving behaviours such as speeding, rules violations, or driver distraction, in relation to medication use. Use of illicit drugs while driving has been associated with unsafe driving behaviour, previous traffic offence convictions, and various socio-demographic factors (Dols et al., 2010). However, to our knowledge, no such investigation has been conducted for the use of licit medications.

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