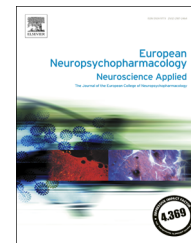




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REVIEW

Amphetamine-type stimulant use and the risk of injury or death as a result of a road-traffic accident: A systematic review of observational studies

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Abstract

Amphetamine-type substances are frequently detected among drivers injured or killed due to road-trauma. However, the role of this substance in crash causation remains equivocal. We performed a systematic review to evaluate existing evidence regarding the association between amphetamine use and the risk of injury or death due to road traffic accidents. A bibliographical search of PubMed, SafetyLit, Scopus, and Science Direct literature databases from 01 January 1980 until May 2015 was performed. The quality of included studies was assessed using the Newcastle-Ottawa Scale (NOS) (cut-off of ≥ 7 indicated high quality). Inter-rater reliability between three independent reviewers for the NOS was calculated using Cohens kappa (κ) statistic, and best-evidence synthesis was performed. A total of 182 articles were found. Nine studies met eligibility criteria for inclusion for review, and seven studies were included for best-evidence synthesis. Best-evidence synthesis demonstrated a conflicting level of evidence for associations between the use of amphetamine-type substances and the risk of sustaining an injury, and a moderate level of evidence between amphetamine use and the risk of death due to road trauma. This is the first review to synthesise evidence regarding the association between amphetamine-type substance use and the risk of injury or death due to a road traffic accident. More conclusive evidence of death due to road trauma among amphetamine users

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may reflect significant and global deficits in functioning associated with effective vehicular control under the influence of this substance. Additional high quality, sufficiently powered studies are required to elucidate the magnitude of these associations.

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1. Introduction

Driving under the influence of alcohol is known to result in a significantly increased risk for being severely injured or killed as a result of road traffic accident. Conversely, considerably less is known about the role of substances other than alcohol, particularly psychoactive substances such as amphetamines, and the relative risk of injury or death as a result of traffic accidents due to intoxication. Some limited and conflicting experimental studies have indicated that the consumption of amphetamine-type substances produce significant deficits in behavioural and cognitive domains associated with driving ability, translating to increased accident risk; however, other studies have observed no significant association (Brookhuis et al., 2004). Although a few systematic and narrative reviews exist which assess the relative role of illicit drugs in accident risk (Asbridge et al., 2012), there are currently no systematic evaluations explicitly assessing the role of amphetamine-type substances in attenuating this association.

Extant research has demonstrated that a linear, dose-response relationship exists between alcohol consumption and the relative risk of being involved in a road traffic accident. Substantial numbers of observational (Drummer et al., 2004; Movig et al., 2004), laboratory-based (Gawron and Ranney, 1988; Mets et al., 2011) and on road experimental (Ramaekers et al., 2000), review (Ogden and Moskowitz, 2004) and meta-analytic studies (Taylor et al., 2010) have described the strength of the association between alcohol consumption and the risk of sustaining severe or fatally injury as a result of a traffic incident. Conversely, substantially less is known about the relative risk of being involved in a road traffic accident as a direct result of illicit drugs. Although limited systematic review articles are available evaluating the role of some classes of illicit substances, such as barbiturates (Rapoport et al., 2009; Thomas, 1998) and cannabinoids (Asbridge et al., 2012; Li et al., 2012) and the risk of injury or death due to traffic accidents, inferences regarding the collective role of new-class psychoactive substances, such as amphetamines, and relative risk of injury or death as a result of a road traffic accident are currently equivocal.

Limited lab-based experimental simulation (Silber et al., 2005; Stough et al., 2012) and observational (Drummer et al., 2004; Gjerde et al., 2011) studies have indicated a significantly increased accident risk following the consumption of amphetamine-type substances, however, this finding is not universal, with some studies reporting no such association (Brookhuis et al., 2004; Silber et al., 2012). Although restricted observational research has suggested an increased risk of being involved in a vehicular accident due to amphetamine use, these findings are often impeded by

the concurrent detection of other psychoactive substances among injured or killed drivers, such as cocaine (Bogstrand et al., 2012; Sharwood et al., 2013), or by lack of distinction between illicit substances (Ramli et al., 2014). Thus it is difficult to draw conclusive arguments regarding the relative impact of amphetamine consumption alone. Indeed, there is paucity of systematic assessments collating and evaluating the magnitude of these reported associations in isolation, and thus it is problematic to reconcile whether the use of these substances represents a true independent risk factor for sustaining serious injury or being killed in a road traffic accident, particularly beyond a lab-based environment. Elvik (2013) reviewed observational studies that assessed the risk of accidents associated with the use of drugs whilst driving. Here it was reported that amphetamine use was associated with an increased risk of being injured or killed as a result of a traffic accident, or for incurring property damage as a result of the incident. When stratified by fatal-only studies as a function of study quality, although significant, a negative relationship was observed between study quality and accident risk. Despite these assertions, several areas of investigation remain. Inferences from available reviews regarding the extent of the reported associations are often impeded by inherent methodological flaws, such as small study numbers included for analyses and omission of evaluation of study quality, lack of distinction between the types of drugs assessed, and as the use of non-standardised subgroup analyses assessing peripheral crash indices.

Preliminary observational and experimental research, coupled with limited review articles and meta-analytic studies have indicated that the use of amphetamine-type substances is associated with an increased risk of being involved in a road-traffic accident (Brookhuis et al., 2004; Gawron and Ranney, 1988; Mets et al., 2011; Movig et al., 2004). Despite this, there is currently no research explicitly and systematically reconciling the observations provided from observational research, and thus it is unclear whether the magnitude of these associations are truly representative of an increased risk. Therefore, the aim of current study is to collate extant data regarding the use of amphetamine-type substances and the relative risk of being injured or killed as a result of a road-traffic accident. Such assessments have potential to inform both legislative and preventative approaches.

2. Experimental procedures

This systematic review adheres to the guidelines addressed in the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement 2009 (Moher et al., 2009)

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