



The value of self-report measures as indicators of driving behaviors among young drivers [☆]



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ABSTRACT

Although much of the knowledge in transportation psychology has been gained by means of self-report measures, there is still a dispute regarding the usefulness and validity of such instruments. This series of two studies employed multivariate statistical models to examine associations between self-report and objective measures in two samples of young drivers. Study 1 ($n = 151$) compared scores on the *Multidimensional Driving Style Inventory (MDSI)*, a self-report questionnaire tapping four broad driving styles, with the naturalistic driving recorded by an in-vehicle data recorder (IVDR). Study 2 ($n = 80$) compared responses to the *Reckless Driving Habits Scale*, assessing the frequency with which drivers commit a set of risky behaviors, with driving measures collected by a simulator. This study also examined the personality trait of sensation seeking, as well as gender and driving experience. In Study 1, the analysis revealed positive associations between high scores on the risky and hostile driving styles measured by the *MDSI* and risky behaviors measured by the IVDR, as well as inverse correlations between the latter and high *MDSI* scores on the anxious and careful driving styles. Similarly, in Study 2 associations were found between the self-reported frequency of reckless driving habits and several risky behaviors measured by the driving simulator. In addition, risky behaviors correlated with the sociodemographic variables and sensation seeking. The two studies therefore show that self-report measures are reliable tools for assessing driving behaviors for purposes of research, evaluation, and intervention.

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1. Introduction

Studies in transportation psychology have traditionally employed self-report measures to examine personality, motivations, cognitions, and perceptions on the one hand, and driving behavior, driving styles and skills, and involvement in traffic violations and crashes on the other. Nevertheless, the usefulness and validity of such instruments is often questioned, in particular when the aim is to capture risky driving behaviors (Boufous et al., 2010). Self-report measures have several advantages: (i) they are easy to administer to large samples and simple to complete; (ii) they constitute a standardized way of

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collecting data; and (iii) they are cheaper and allow for easier access to the data than objective options, such as driving simulators, in-vehicle data recorders (IVDRs), and instrumented cars (Helman & Reed, 2015). The weakness of these instruments, however, lies in the possibility of self-serving biases, recall biases, and shared residual variance with other self-report measures, leading to less than ideal and trustworthy reports on one's own driving behavior and crash involvement (Nesbit, Conger, & Conger, 2007; Schwebel, Severson, Ball, & Rizzo, 2006). In other words, the extent to which self-report measures represent real driving may sometimes be in doubt (af Wählberg, 2009; af Wählberg & Dorn, 2015; Evans, 2004; Helman & Reed, 2015).

In this paper, we reanalyze data from two studies that used different self-report measures, namely the *Multidimensional Driving Style Inventory (MDSI)* (Taubman – Ben-Ari, Mikulincer, & Gillath, 2004) and the *Reckless Driving Habits Scale* (Taubman – Ben-Ari, Mikulincer, & Iram, 2004), as well as different objective means for collecting behavioral data, i.e., risky driving events rate recorded by an IVDR in the first study, and risky driving measures scored by a driving simulator in the second. Both studies were previously used to investigate issues relating to young drivers, but did not address the specific question of the connection between self-report and objective measures (Eherenfreund – Hager, Taubman – Ben-Ari, Farah, & Toledo, submitted for publication; Farah et al., 2013; Farah et al., 2014; Taubman – Ben-Ari, Kaplan, Lotan, & Prato, 2015; Taubman – Ben-Ari, Kaplan, Lotan, & Prato, in press). Examining the associations between these measures will not only help to establish the validity of the *MDSI* and the *Reckless Driving Habits Scale* in particular, but, more importantly, will make it possible to determine the value of self-report measures of driving behavior in general.

The results of previous examinations of the associations between self-report and objective measures have been inconclusive, with some studies reporting positive correlations and others finding no significant associations. One group of studies found positive correlations between self-reports of road crashes and traffic offenses on the one hand, and official police records on the other (Begg, Langley, & Williams, 1999; Boufous et al., 2010; Marottoli, Cooney, & Tinetti, 1997; McGwin, Owsle, & Ball, 1998). Other studies looked at the associations between the self-report *Manchester Driver Behavior Questionnaire (DBQ)* (Parker, Reason, Manstead, & Stradling, 1995) and crash involvement, and found a robust correlation between the questionnaire's violations factor and crash rates, and weaker correlations between the errors and lapses factors and crash involvement (de Winter & Dodou, 2010; Parker et al., 1995). *DBQ* violations were also associated with a greater tendency to accept shorter gaps on turns across traffic in a driving simulator experiment (de Winter, Spek, de Groot, & Wieringa, 2009), as well as with higher speed as measured in a simulator (Helman & Reed, 2015; Schwebel et al., 2006). However, another study examining the associations between *DBQ* scores and simulated driving found only one significant correlation, showing that drivers with higher violations tended to brake less heavily (Stephens & Groeger, 2009).

Similarly, *MDSI* scores were found to correlate with performance measures collected in a driving simulator experiment (Farah, Bekhor, Polus, & Toledo, 2009; Farah, Polus, Bekhor, & Toledo, 2007). More specifically, participants with lower critical passing gaps scored higher on the *MDSI* angry and hostile driving style (Farah et al., 2009). Higher critical passing gaps were found for drivers scoring higher on the anxious and the patient and careful styles. In addition, speed and number of completed passing maneuvers, and to a lesser extent critical gaps, correlated significantly with higher scores on the reckless and careless driving style (Farah et al., 2007).

Studies have also examined associations between responses to self-report instruments and measures of actual driving. In a recent study, *DBQ* factor scores were found to correlate with various driving behaviors observed during real highway driving in an instrumented vehicle, which collected vehicle performance data, audio and video recordings of the driver and surrounding roadway, and physiological and eye-tracking information. It was found that drivers with high violations scores tended to drive somewhat faster, had more sudden unidirectional accelerations, had larger standard deviations of steering wheel angle, changed lanes more frequently, and spent more time in the left lane, while older drivers also had more hard braking events (Zhao et al., 2012). Another recent study, however, found correlations between *DBQ* violations and naturalistic driving speed only in daylight conditions, but not in night time, and no correlations with the other *DBQ* scales (Helman & Reed, 2015). Nor were any significant correlations found between *DBQ* scores and recorded on-road speed in an instrumented vehicle among novice drivers (Underwood, 2013).

The results of studies examining the associations between self-report scales and the objective IVDR measure of kinematic risky driving (using *The Naturalistic Teen Driving Study* data; Simons-Morton et al., 2013) have similarly been inconsistent. Although at various phases of one study (Simons-Morton, Hartos, Leaf, & Preusser, 2006), significant positive correlations were found between responses to both the *Checkpoints Risky Driving Scale (C-RDS)* and risky driving subscale of the *DULA Dangerous Driving Index (DDDI)* (Dula & Ballard, 2003) on the one hand, and the kinematic risky driving score on the other, no significant associations emerged in an auto-regressive cross-legged analysis. In another study (Richer & Bergeron, 2012), *DDDI* scores were related to maximum speed observed in a simulator, and to an aggregated score of simulated driving behaviors.

Two important points can be derived from the literature. First, more research is needed to determine the relations between self-report instruments assessing driving behavior and objective measures such as police records, simulated driving, and actual driving. Secondly, more sophisticated statistical analyses are needed to better establish the associations between the two modes of measurement.

Furthermore, a variety of psychological characteristics have been shown to correlate with measures of risky driving. For example, several studies have found *sensation seeking*, which involves searching for new and complex experiences and sensations and a tendency to take physical, social, legal, and financial risks in order to achieve such experiences (Zuckerman, 1994), to be related to reckless driving, including excessive speed, frequent overtaking, reckless lane changing, and driving

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