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Pre-Employment Screening Best Practices in the Commercial Motor Vehicle Industry

J. Erin Mabry • Jeffrey S. Hickman • T. Laurel Glenn

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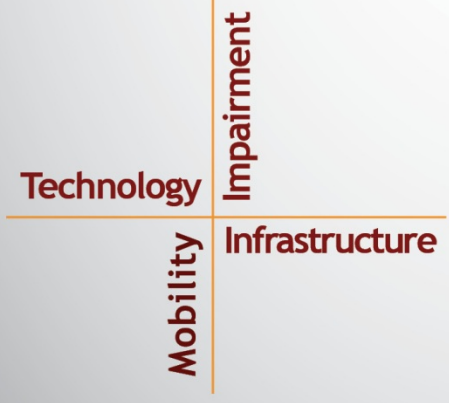

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EXECUTIVE SUMMARY

Safety-conscious commercial motor vehicle (CMV) carriers understand that starting with the right people is critical to obtaining a safe driver workforce. Unfortunately, it is not always easy to identify these drivers. Although most CMV drivers are reliable and safe, a small percentage (10% to 15%) are over-involved in crashes and violations (Knipling et al., 2011). Pre-employment screening practices attempt to identify safe drivers to mitigate crashes and moving violations. However, pre-employment screening practices can also increase driver retention, lower costs (through reduced crashes, turnover, and training), and increase the company's reputation as a safe carrier.

The extant literature supports the influence of driver factors and environmental or workplace factors on driving performance and CMV safety. Driver factors, such as younger male drivers (Blower et al., 1996; Cantor et al., 2010; Chen et al., 2016; de Almeida et al., 2013; Duke et al., 2010), life events, such as recent divorce or separation (Kposowa et al., 2009), alcohol and/or other legal and illegal substances (Compton & Berning, 2015), performing risky driving behaviors (e.g., speeding, not wearing a seat belt, following too close, etc.; Bunn et al., 2005; Olson et al., 2009), and a history of prior violations and crashes (Lueck & Murray, 2011) have all been shown to increase crash risk. Drivers' physical health has also been associated with greater crash risk, including obesity (Mabry et al., 2016), cardiovascular disease (Thiese et al., 2015), diabetes (Laberge-Nadeau et al., 2000), obstructive sleep apnea (Burks et al., 2016), and musculoskeletal conditions (Thiese et al., 2015). Lastly, workplace factors, such as driver turnover (Corsi & Fanara, 1988; Suzuki et al., 2009), driving inexperience (American Trucking Research Institute, 2008; Federal Motor Carrier Safety Administration, 2017), low compensation rates (Braver, 1992a, 1992b), weak training and scheduling practices (ATRI, 2008; McCartt et al., 1996), and safety culture (Corsi & Barnard, 2003) increase crash risk. Although these factors help identify what types of driver characteristics to avoid (or, conversely, possess), carriers need to ensure that any prescreening criteria are legal and meet the criteria established by federal regulations to prevent discrimination. With so much information to digest on how to hire safe drivers, CMV fleets are left with many questions. How can CMV fleets attract safe drivers? What methods can CMV fleets successfully use to identify safe versus risky drivers? What is the cost and effort associated with these strategies and techniques? What techniques and strategies are CMV fleets using to hire safe drivers and have these techniques been effective?

The objective of this study was to document innovative and successful practices for pre-employment screening in the CMV industry and assess the prevalence and effectiveness of these pre-employment screening practices in a sample of CMV operations. The practical delivery from this project can assist CMV organizations and federal agencies to develop practical and cost-effective pre-employment screening practices and guidelines to reduce the risk of injury from crashes.

A Web-based survey assessed participating carriers' (i) use of various pre-employment screening practices, (ii) effectiveness of pre-employment screening practices, (iii) reasons why pre-employment screening practices are used or unused, and (iv) descriptive data on the participating carrier (fleet size, operation type, etc.). The 47-item online survey was administered via Qualtrics. The initial contacts were survey respondents who responded to prior Virginia Tech Transportation Institute surveys. They can be characterized as safety-conscious managers from

many types of CMV transport operations (e.g., truckload, less-than-truckload, private). Additional safety managers were identified based on collected information and through industry contacts (i.e., National Private Truck Council, American Bus Association, Truckload Carriers Association, United Motorcoach Association, and Owner-Operator Independent Drivers Association). Although our 40 survey respondents included carriers of different sizes and operation types, it should be viewed as a convenience sample and not reflective of the overall CMV population. Thus, discussion of the results in the context of the overall CMV population is not appropriate.

EFFECTIVE PRE-EMPLOYMENT TECHNIQUES

The pre-employment screening techniques are listed in order of their effectiveness ratings from survey respondents.

Performance or Skills Testing

Placing job applicants in a situation in which they are required to perform the duties of the job provides direct evidence of their ability or skill. Respondents in the current study viewed the Department of Transportation road test as the most effective pre-employment screening technique to identify safe drivers. Respondents thought there was no substitute for the "real thing": a driving simulator and written test were not viewed as effective as the on-road test or range/yard/lot maneuvering test.

Background Checks

Background checks can include prior crash and moving violation history, employment history, criminal background checks, Social Security Number, education verification, credit history, financial reports, and military discharge records. By far, a driver's license check to verify a driver's motor vehicle report is an effective way to identify a safe driver. Respondents in the current study agreed that drivers' motor vehicle reports were the second most-effective pre-employment screening technique to identify safe drivers. Most respondents obtained these records from either the state where the driver obtained his/her license or the Federal Motor Carrier Safety Administration's Pre-employment Screening Program. Other types of background checks were generally viewed as ineffective (and rarely used) at identifying safe drivers.

Drug Screening

Although alcohol and illicit drug usage increases the likelihood of crashes, the link between drug testing for pre-employment screening and lower crash rates is unsupported (Christian, 2011; Feinauer & Havlovic, 1993). However, random drug testing (vs. pre-employment testing) has been found to reduce crash rates (Pidd & Roche, 2014). Respondents viewed pre-employment drug testing as the third most-effective pre-employment screening technique.

Personality Testing

Finding a good fit for a position can save a company money via increased productivity, improved retention, and fewer crashes (Clarke & Robertson, 2005; Johns, 2011; Retzlaff, King, & Callister, 1995). Personal interviews and personality testing are techniques used by employers to

identify desirable personality traits. A meta-analysis on the Big Five personality factors (extraversion, neuroticism, conscientiousness, agreeableness, and openness) found a relationship between personality (i.e., low in conscientiousness and low agreeableness) and increased crash risk (Clarke & Robertson, 2005). A few respondents used other assessment techniques and ranked them as slightly effective; thus, it appears this is an area where more resources could be expended in educating CMV management on the usefulness of these assessments.

Medical Examination

Certain medical conditions increase crash risk. Respondents viewed the Commercial Driver Medical Exam (CDME) as the fifth most-effective pre-employment screening technique to identify safe drivers. Most respondents accepted a valid CDME; however, a few carriers also required all potential hires to complete a CDME with their in-house personnel.

Physical Ability Testing

Truck drivers often do more than drive and loading or unloading are included as part of their daily job duties. More than half of respondents performed additional health and fitness testing beyond the CDME prior to hire. However, these tests were only viewed as slightly effective in identifying safe drivers. Respondents indicated that these tests were not implemented for safety, but to identify drivers who could perform the physical abilities necessary to load and unload the truck. Thus, the purpose of this test was not related to crash risk but for the safety of the driver by reducing the likelihood of a musculoskeletal injury from loading and unloading.

Social Media Screening

Although social media screening allows employers to gauge person-organization fit and identify undesirable characteristics, none of the respondents used this approach in pre-employment screening. Even though none of the respondent used this screening, they rated this screening as an ineffective technique in identifying safe drivers based on their personal experience with hiring. Respondents indicated it was too time-consuming, and, regardless of time, viewed it as an invasion of the driver’s privacy.

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LIST OF ABBREVIATIONS AND SYMBOLS

ATRI	American Transportation Research Institute
BMI	Body Mass Index
CI	confidence interval
CDL	Commercial Driver's License
CDLIS	Commercial Driver's License Information System
CDME	Commercial Driver Medical Exam
CMV	commercial motor vehicle
DOT	Department of Transportation
DSI	Driver Stress Inventory
EEOC	Equal Employment Opportunity Commission
FMCSA	Federal Motor Carrier Safety Administration
FMCSR	Federal Motor Carrier Safety Regulations
IIHS	Insurance Institute for Highway Safety
LTCCS	Large Truck Crash Causation Study
MCMIS	Motor Carrier Management Information System
NHTSA	National Highway Traffic Safety Administration
NTSB	National Transportation Safety Board
OOS	out of service
OR	odds ratio
OSA	obstructive sleep apnea
PSP	Pre-Employment Screening Program

CHAPTER 1. BACKGROUND

The goal of employers when hiring commercial motor vehicle (CMV) drivers is to obtain quality drivers who prioritize safety. Obviously, starting with the right people is critical to ensuring a safe driver workforce. However, which people are the "safest" is not always easy to identify. Research indicates that most CMV drivers are reliable and safe and that only a relatively small percentage (10% to 15%) are overinvolved in crashes and violations (Knipling et al., 2011). This phenomenon is termed differential driver risk, with research revealing significant individual differences in crash risk among CMV drivers (Knipling et al., 2004). A large naturalistic truck driving study conducted by Hickman et al. (2005) determined that a subset of CMV drivers with just 19% of driving exposure was involved in 53% of all observed at-fault driving events and that drivers with 81% of exposure were responsible for only 47% of at-fault events.

Principal correlates of differential driver risk include many individual factors that remain persistent despite changes in experience or driving styles (Lancaster & Ward, 2002). Personality factors, including sensation-seeking, anger or hostility, impulsivity, intensity, agreeableness, and conscientiousness can influence differential driver risk. Individual attitudes about risk reflect personality and can affect safety-related behaviors and outcomes. Mental and physical abilities impact driver risk and CMV safety (Burks et al., 2009) as do sensorimotor abilities, such as dynamic vision, information processing proficiency, and reaction time. Medical conditions, including cardiovascular disease, sleep disorders, diabetes, and obesity are also associated with driver risk. Past behavioral data, driving-related behavior (crashes and moving violations), and non-driving behavior (criminal record), are highly predictive of future driver risk (Knipling et al., 2004; Murray et al., 2005). Using data from the Motor Carrier Management Information System (MCMIS) and Commercial Driver's License Information System (CDLIS), Murray et al. (2005) determined that CMV drivers with prior crash involvement were 87% more likely to be involved in a future crash, and drivers cited for reckless driving and improper turn violations were 325% and 105% more likely to be involved in future crashes, respectively.

A literature review conducted by Howarth et al. (2007) identified driver characteristics and motor carrier practices as they relate to safety outcomes. Howarth et al. (2007) identified a possible indirect association between decreased safety performance and high driver turnover, the selection of unqualified drivers, inexperienced drivers, and compensation. Specific practices for improved safe driver hiring recommended in *SafeReturns* included completing in-person applications, conducting personal interviews, screening for stable employment history, gaining knowledge of prior crash involvement history, having a maximum point limits for moving violations, having a minimum years of experience requirement, conducting driving tests, requiring a physical examination, and reviewing the past financial performance (e.g., credit rating) of owner-operators (American Trucking Associations Foundation [ATA, 1999a). Combining multiple screening practices and tools are likely to have the greatest combined benefit when they assess different driver traits and personality dimensions related to risk. These results highlight the importance of successful recruitment, selection, and retention of qualified drivers.

Research highlights the need for valid driver selection procedures that are feasible for carriers to use when hiring CMV drivers and that go above the general requirements established by the Federal Motor Carrier Safety Administration (FMCSA) (Federal Motor Carrier Safety

Regulation [FMCSR] 391.11): In order to operate a CMV in interstate commerce, drivers must (i) be physically qualified to drive a CMV; (ii) be at least 21 years of age; (iii) speak and read English; (iv) safely operate the vehicle and transport passengers and/or cargo safely; (v) hold one current valid Commercial Driver's License (CDL); (vi) pass a road test or equivalent; and (vii) not be disqualified from driving a CMV.

These additional procedures assess individual driver differences that are relevant to driver safety and productivity and would ideally include subjective and objective measures to assess beneficial traits that identify high- and low-risk drivers. Additionally, assessment should be validated against job performance criteria such as crash, violation, and incident rates while meeting Equal Employment Opportunity Commission (EEOC) standards. Knipling et al. (2011) identified 15 specific practices consistently reported as effective for improving driver selection from a safety perspective. These practices include (i) using multiple assessments to capture a variety of safety-relevant characteristics, (ii) updating driver medical conditions regularly, (iii) conducting standardized interviews designed to assess key driver-safety-related traits, (iv) checking criminal background history, (v) selecting for retention as well as for safety, and (vi) using the FMCSA Pre-Employment Screening Program (PSP) service. The PSP assists carriers in making informed hiring decisions by providing secure, electronic access to a commercial driver's 5-year crash and 3-year inspection history from MCMIS. FMCSA (2013) found that carriers who used PSP to screen new hires subsequently lowered their crash rates by 8% and driver out-of-service rates by 17%.

The opportunity for improving the quality of drivers is strongest when the economic climate is favorable, and carriers can afford to be more selective in their hiring. However, the CMV industry is experiencing a shortage of quality drivers and the high turnover inherent in the industry puts tremendous pressure on human resources to find quality drivers (American Trucking Associations, 2013). This is also a cost-intensive process to account for the constant cycle of hiring, training, and turnover. Howarth et al. (2007) concluded that employee turnover and subsequent hiring needs are responsible for substantial costs to the carrier and are exacerbated when considering costs for human-resource efforts (i.e., recruiting, training, and insurance). Furthermore, new and inexperienced drivers are associated with decrements in safety performance and operational inefficiencies (Griffin et al., 2000).

Carriers benefit from emphasizing driver selection and hiring practices in order to achieve a stable workforce that prioritizes safety performance. Selection methods must assess driver characteristics known to impact risk, such as driver demographics; driver knowledge, skills, and abilities; personality; risk perception and attitudes; psychomotor skills; medical conditions; behavioral history; and mental abilities. Successful recruitment and pre-employment screening strategies attract many highly qualified applicants and have a high selection accuracy using tests and measurements that assess driver characteristics relevant to safety (Cascio, 2004). With so much information to digest on how to hire safe drivers, CMV fleets are left with many questions. How can CMV fleets attract safe drivers? What methods can CMV fleets successfully use to identify safe versus risky drivers? What is the cost and effort associated with these strategies and techniques? What techniques and strategies are CMV fleets using to hire safe drivers and have these techniques been effective?

The current study documented the literature on (i) individual factors associated with job safety; (ii) the goals of pre-employment screening practices; (iii) existing pre-employment screening practices and their efficacy, practicality of implementation, and limitations; and (iv) a summary of future research needs and next steps for implementing effective pre-employment screening practices in fleet operations. The literature review informed the development of a Web-based survey to assess (i) participating carriers' use of various pre-employment screening practices, (ii) the effectiveness of pre-employment screening practices, and (iii) reasons why pre-employment screening practices were or were not used. The Web survey also collected descriptive data on the participating carriers, such as fleet size and operation type. The outputs of the current study provide information to assist CMV operations and regulatory agencies in developing practical and cost-effective pre-employment screening practices and guidelines to reduce the risk of crashes and their associated fatalities and injuries.

RESEARCH OBJECTIVES

As stated in *SafeReturns* (American Trucking Associations, 1999a), "starting with the right people is key to overall safety performance." However, the CMV industry is experiencing a shortage of quality drivers, and when these drivers are found, they are unlikely to stay with the carrier for longer than 1 year. Not only does this put tremendous pressure on the human resources department to find quality drivers, it also makes hiring an expensive process. The objective of this study was to document innovative and successful practices for pre-employment screening in the CMV industry, and assess the prevalence and effectiveness of these pre-employment screening practices in a sample of CMV operations (see Chapter 3). The practical delivery from this project is information that can assist CMV organizations and federal agencies to develop practical and cost-effective pre-employment screening practices and guidelines to reduce the risk of unintentional injury from crashes.

INDIVIDUAL FACTORS ASSOCIATED WITH CMV SAFETY

The extant literature supports the influence of driver factors and environmental or workplace factors on driving performance and CMV safety. The Large Truck Crash Causation Study (LTCCS) was a three-year data collection project conducted by the FMCSA and the National Highway Traffic Safety Administration (NHTSA) to examine the reasons for serious crashes involving large trucks (FMCSA, 2006). The LTCCS database included driver attribute data for 1,123 CMV drivers and concluded that 87.2% of all truck crashes are caused by driver-related factors (FMCSA, 2006). Relationships between individual driver factors, including demographic, personality, and behavioral factors, have been shown to influence CMV safety and usually remain persistent despite the influence of outside factors, such as experience or driving styles (Lancaster & Ward, 2002). Workplace factors also impact driving performance and safety yet can be highly variable and adaptive.

Demographic Factors

Age

Driver age impacts crash risk and is magnified by the general aging of the workforce. Duke et al. (2010) reviewed the literature on age-related safety and other factors that contribute to heavy

vehicle crashes, finding that CMV drivers younger than 27 years demonstrated higher rates of crashes and fatality involvement. The authors observed that crash and fatality rates decline after age 27 and plateau until age 63, where rates again increase. Using FMCSA's Driver Information Resource database to develop a driver-focused truck crash prediction model, Cantor et al. (2010) concluded that drivers younger than 25 years have a greater likelihood of future crash involvement than older drivers. Chen and Zang (2016) found that young male CMV drivers with less experience were at high risk for being involved in a fatigue-related crash. Sullman et al. (2002) reported that younger CMV drivers accumulate more annual miles, were more likely to travel above the posted speed limit, and were convicted of more aggressive driving violations than older drivers. Similarly, Blower et al. (1996) reported that younger CMV drivers were 50% more likely to be charged with a violation in a crash compared to middle-age drivers. The insurance industry reported similar conclusions. The Insurance Institute for Highway Safety (IIHS, 2016) cites that drivers between 18 and 24 years of age had the highest crash rates across all age groups, with male drivers younger than 25 years paying the highest insurance premiums of any group.

Gender

Compared to females, males are disproportionally linked to a higher crash risk, which has implications for the trucking industry, a predominately male profession. Chen et al. (2016) conducted a case control study to explore risk factors for fatigue crashes involving truck drivers in China. In addition to age and experience, the driver's gender was significantly associated with fatigue-related truck crashes. Using a driver-focused truck crash prediction model, Cantor et al. (2010) concluded that male drivers have a greater likelihood of future crash involvement than female drivers. Harb et al. (2008) found that male passenger car drivers were 1.3 times more likely to be involved in a work zone crash compared to female passenger car drivers. Zhu et al. (2006) reported that male drivers have a higher crash rate and fatality rate compared to females. In a non-concurrent cohort study of 118,830 passenger car crashes in Brazil over a 5-year period, de Almeida et al. (2013) investigated the risk factors contributing to fatal crashes. They found that male gender was a main contributing factor for involvement in a fatal crash (odds ratio [OR] = 2.5, 95% confidence interval [CI] = 1.9 to 3.3). Examining workplace injuries not specific to CMV drivers, Berdah et al. (2008) found that males had a greater risk of workplace injuries compared to females. Engagement in risky behaviors or practices may contribute to this increased risk observed in males. Not using seatbelts, driving while impaired with alcohol or drugs, and speeding are behaviors performed more often by males compared to female drivers according to IIHS (2008).

Marital Status

The influence of marital status on crashes is thought to be largely influenced by associated characteristics, including responsibility and carefulness. De Almeida et al. (2013) investigated the risk factors contributing to fatal passenger crashes in a large cohort study, finding that being single was a main contributing factor for involvement in a fatal crash (OR = 6.6, 95% CI 4.1 to 10.73). The authors suggest that individuals who are single may expose themselves more to risk factors, which has been supported in other studies (Hersch, 1996; Morelock et al., 1985; West et al., 1996). Whitlock et al. (2004) found similar results in a large cohort study (n = 10,525) to investigate the association of marital status with risk of driver injury. They found that light

vehicle drivers who were never married had twice the risk of driver injury compared to married participants after adjusting for age, gender, alcohol use, driving exposure, locality, Body Mass Index (BMI), and occupational status. These findings also apply to the CMV driver population. Rodriguez et al. (2014) examined the driver demographic and occupational factors in truck crash occurrence and frequency using a proprietary dataset from a large for-hire U.S. trucking firm. Twenty-six months of safety data from over 11,000 long-haul CMV drivers were collected. Among other demographic variables associated with crash risk, the authors found that married individuals were 7% less likely to have no crashes compared to non-married drivers.

Kposowa and Breault (2009) investigated the influence of marital status on mortality from motor vehicle crashes, finding that divorced and separated people were over 62% more likely to die from a motor vehicle crash compared to their married counterparts. Furthermore, men were nearly 2.6 times as likely to die from crashes as women. They suggested that a stressful life event such as divorce may impair some individuals' ability to drive safely. Romano et al. (2014) conducted a case-control study to investigate how factors, including driver demographics, influence the likelihood of a driver being in a crash, while also investigating alcohol-related crashes. They found that drivers who were separated, divorced, or widowed were 1.5 to 1.9 times more likely to drive while impaired or to be involved in crashes involving alcohol than married drivers. These findings further support the notion that unmarried individuals may be more likely to engage in risky driving behavior.

Substance Abuse

The risks posed by alcohol on driving impairment have been well known for decades. Although it is apparent that a wide variety of illegal substances and medications can impair skills imperative for driving performance, the nature and scope of the drug-impaired driving problem has been difficult to define. This is further complicated by the fact that individual drugs or drug combinations produce different effects that are likely to increase crash risk in various ways. For example, some substances may result in poor judgement or lead to inattention, while others increase risk-taking behavior or reduce visual scanning (Compton & Berning, 2015; Houwing et al., 2013). Girotto et al. (2013) published a systematic review summarizing psychoactive substance use among truck drivers. They found the prevalence of substance use varied greatly and was higher in studies that self-reported use compared to studies with results from biological samples. The average frequency of self-reported alcohol consumption was 54%, amphetamine intake was 30%, marijuana was 19%, and cocaine was 3% (Girotto et al., 2013). The authors also concluded that substance use was mainly associated with indicators of poor working conditions, including unappealing work hours, low pay, and poor road conditions.

Second to alcohol, marijuana is the most frequently detected drug in drivers involved in a crash (Lacey et al., 2009; Walsh et al., 2005). Studies show that marijuana use can impair psychomotor skills, attention, lane tracking, and cognitive function (Hartman and Huestis, 2013; Moskowitz, 1985). The contribution of marijuana to crash risk, however, is less clear. Epidemiological, observational, and experimental studies have reported contradictory results on the impact of marijuana use on crash risk. The recent legalization of marijuana in some states has exacerbated concern over the potential risks of driving impaired by marijuana (Compton et al., 2015).

A large-scale case control crash risk study supported by NHTSA and the National Institute on Alcohol Abuse and Alcoholism estimated the risk associated with alcohol- and drug-positive driving among light-vehicle drivers (Compton et al., 2015). Data were collected from more than 3,000 crash drivers and 6,000 non-crash (control) drivers over 20 months. Researchers found a significant increase in unadjusted crash risk for drivers who tested positive for use of illegal drugs (1.21 times) and 1.25 times for tetrahydrocannabinol (THC), a psychotropic cannabinoid; however, there was no increase in crash risk after adjusting for age, gender, ethnicity, and alcohol use. These findings indicated high correlations between these other demographic variables and drug use, which accounted for much of the increased risk associated with use of illegal drugs and THC. Alcohol use was associated with an increase in crash risk before and after controlling for demographic factors. The risk of a crash increased exponentially with increases in blood alcohol levels. Low levels of blood alcohol increased risk by 20%, while high blood alcohol levels increased risk over 23 times higher compared to sober drivers.

Medication and drug use while driving is an important risk factor for large truck crashes. Operating a CMV while under the influence of alcohol and controlled substances, including amphetamines and narcotic drugs, is a disqualifying offense, as regulated by the FMCSA (49 Code of Federal Regulations [CFR] 383.51 Subpart D), though CMV drivers may use stimulants to combat fatigue and keep themselves awake during long work schedules (Wesensten et al., 2015). Licit and illicit drugs can impair driving ability through effects on functions of the central nervous system, including cognitive and psychomotor functions. The LTCCS demonstrated that prescription and over-the-counter drug use were in the top 10 factors associated with crashes. Relative risk analysis showed that alcohol, over-the-counter drug use, and illegal drugs were associated with significant relative crash risks of 5.3, 1.8, and 1.3, respectively (FMCSA, 2007; Starnes, 2006).

Risky Driving Behaviors

Associations between risky driving behaviors and crash involvement are strongly supported in the literature. Brodie et al. (2009) conducted a descriptive study of a population of heavy vehicle drivers killed in crashes while driving a CMV for work purposes. Researchers collected and analyzed information about the crash, environment, driver, vehicle, and occupational factors from 61 eligible cases between 1999 and 2007. The presence of stimulants or cannabis was detected in more than 15% of the fatally injured drivers. Thirty-six percent of drivers were speeding and nearly 60% of the drivers were not wearing a seatbelt. A retrospective population-based case-control study was conducted by Bunn et al. (2005) to examine factors associated with fatal crashes among CMV drivers. In this study, CMV drivers who died from a crash (cases: n = 68) were matched at a 1:4 ratio with control drivers (n = 271). The study found that lack of safety belt usage increased the likelihood of a fatal crash (OR = 8.22, 95% CI = 3.51 to 19.21) and use of a shoulder belt, lap belt, or both was protective against a fatal crash. A study conducted by Oz et al. (2010) indicated that aggression, dislike of driving, and the hazard monitoring dimensions of the Driver Stress Inventory (DSI) were associated with crash involvement. They also determined that dislike of driving and the thrill-seeking dimensions of the DSI were related to speeding. These results support the findings of earlier studies indicating that professional groups differ from nonprofessional driver groups regarding their risky driving behaviors and stress reactions. Oz et al. (2010) concluded that nonprofessional drivers drove faster on rural and highway roads compared to professional drivers, who in general drive at lower speeds due to the

nature of their job. The authors also determined that professional drivers were more aggressive in traffic than nonprofessional drivers, likely reflected by the difficulties and stress caused by traffic. Chen et al. (2016) concluded that speeding behavior was significantly associated with fatigue-related truck crashes among other factors previously mentioned.

With the rise of in-vehicle technologies like cell phones, inattention has become increasingly common and linked to crash risk. In the case-control study led by Bunn et al. (2005), inattentive drivers were 3 times more likely to be involved in a fatal crash compared to drivers involved in crashes with other human factors listed as a cause of the collision. A naturalistic driving data collection effort that analyzed distraction events from a dataset of 203 CMV drivers found that text messaging on a cell phone was the riskiest behavior identified, with a significant OR of 23.2. Other distracting tasks, such as interacting with a dispatching device and dialing a cell phone, were also associated with significantly higher risk in being involved in a safety-critical event (Olson et al., 2009).

Physical Health

Driver health is a crucial factor that contributes to safety performance. For this reason, federal regulations require physical fitness and function in order to qualify to drive a CMV and obtain a CDL. Up to 90% of CMV drivers are either overweight or obese (Mabry et al., 2016; Sieber et al., 2014; Thiese et al., 2015), which has been associated with adverse driving performance and crash risk. Stoohs et al. (1994) found that obese drivers had a twofold higher crash rate than non-obese drivers, which was also associated with daytime sleepiness. Wiegand et al. (2009) supported these findings, demonstrating that obese CMV drivers were at 1.37 times greater risk for involvement in a safety-critical driving event than non-obese drivers. Anderson et al. prospectively examined the risk of truck crashes as a function of BMI among new-hire professional drivers from a large nationwide trucking firm, finding that drivers with Class II and III obesity had significantly higher crash rates (risk ratio = 1.55; 95% CI 1.24 to 1.94) compared to drivers with a normal BMI.

In addition to obesity, several chronic health conditions, including cardiovascular disease (Ronna et al., 2016; Thiese et al., 2015), diabetes (Laberge-Nadeau et al., 2000), obstructive sleep apnea (OSA; Burks et al., 2016; Stoohs et al., 1995), and musculoskeletal conditions (Thiese et al., 2015) have been shown in the literature to have an impact on crash risk. A large cross-sectional study of nearly 800 CMV drivers found that drivers in the highest cardiovascular disease risk groups, based on the Framingham cardiovascular disease risk score, had more than a twofold higher likelihood of crash (Ronna et al., 2016). Thiese et al. (2015) performed a cross-sectional study of CMV drivers to examine associations between health factors and crash risk, finding that CMV drivers with diagnosed heart disease and cardiovascular risk factors were at least twice as likely to have been involved in a lifetime crash. Laberge-Nadeau and colleagues (2000) examined the relationship between diabetes and crash risk among CMV drivers, finding that non-insulin dependent diabetic drivers without complications were 1.68 to 1.76 times more likely to have been involved in a crash. Stoohs et al. (1995) assessed the effect of diagnosed OSA on crashes in 193 long-haul CMV drivers and found that CMV drivers with sleep-disordered breathing, including OSA, had a twofold higher crash rate per mile than CMV drivers without sleep-disordered breathing.

Burks et al. (2016) evaluated data from the first large-scale, employer-mandated OSA program for CMV drivers to quantify the safety effect of the program on the risk of involvement in a Department of Transportation (DOT)–reportable and preventable truck crash. The researchers determined that CMV drivers who were diagnosed with OSA but not adherent to treatment had a crash rate nearly fivefold greater than matched control drivers without or unlikely to have OSA. However, CMV drivers with OSA that were fully adherent with positive airway pressure treatment had crash rates similar to controls, demonstrating the effectiveness of positive airway pressure treatment in terms of safety. Thiese et al. (2015) conducted a cross-sectional study with nearly 800 CMV drivers to assess factors associated with self-reported lifetime crashes. A history of recent low back pain was common among the CMV driver sample (31% of CMV drivers) and was significantly associated with an increased risk of a self-reported crashes. The authors suggested that back pain may distract drivers and limit range of motion, thereby influencing driving performance and crash risk.

Workplace Factors

Job Longevity and Turnover

For the trucking industry to operate at such a large capacity, it is imperative for carriers to recruit and retain qualified drivers. Unfortunately, a severe driver shortage exists in the trucking industry due to a variety of factors, including growth in business, drivers who retire or leave the profession, and fewer young people choosing CMV driving as a career (American Trucking Associations, 2019; Short et al., 2007). High rates of driver turnover are associated with the driver shortage, as drivers leave one company for another, often seeking higher pay or a change in schedule. This results in the same pool of qualified drivers circulating among carriers, in addition to high operating and labor costs that decrease operational efficiency, making it more difficult for carriers to keep trucks moving and meet customers' service expectations. In a literature review highlighting the determinants of driver turnover, Suzuki et al. (2009) found that driver turnover behavior is influenced by age, education, union status, job category, prior driving experience, past income, pay rate, miles driven, home time, empty (dead haul) miles, job strain, job security, and job advancement opportunity within the company.

Although the industry is susceptible to fluctuations in driver turnover rates, rates have been steadily declining, reaching a 5-year low at the end of 2016 (Heavy Duty Trucking, 2016). In 2016, turnover at large and small fleets dropped to 81% and 80%, respectively. The ATA attributes ongoing softness in the freight economy to this drop in turnover; however, despite the falling turnover rate, carriers continue to report difficulty finding well-qualified drivers and this problem will persist as the freight economy improves (Heavy Duty Trucking, 2016).

Although there are substantial recruitment, training, and other costs associated with driver turnover, the greatest impact of driver turnover is arguably safety. Corsi and Fanara (1988) conducted an analysis of audit data from almost 2,000 motor carriers, finding that carriers with higher driver turnover had significantly higher crash rates. Staplin et al. (2002) sought to expand on these general findings by estimating the extent to which crash risk increased as a function of turnover. Using the MCMIS database to develop estimates of the increased risk of crash involvement experienced by CMV drivers who change jobs frequently, they concluded that crash risk begins to rise when a driver averaged more than two jobs with different employers each year

for 2 years or longer. Furthermore, the odds of being involved in multiple crashes more than doubles for drivers with three or more jobs per year for at least 2 years.

Driving Experience

The LTCCS examined associations between professional truck driving experience and the critical reasons assigned to a driver in a crash. A subset of the database from 943 drivers who were all involved in a fatal or injury crash of varying severity was included in the analyses (FMCSA, 2017). The research team compared the risk of the critical reason for a crash being assigned to the drive for groups of drivers with varying years of experience. They found that the risk of being assigned the critical reason in the crash was 17% higher for drivers with less than 5 years of truck driving experience compared to drivers with more years of experience. After 5 years of driving experience, the risk ratios markedly declined and the risk of being assigned the critical reason for the crash was 14% lower for drivers with 10 or more years of driving experience. Even short-term experience has been shown to be associated with safety performance. The American Transportation Research Institute (ATRI, 2008) found that new entrant drivers' length of employment was positively correlated with safety incidents, including DOT-reportable crashes, traffic violation convictions, and property damage crashes.

Prior Safety Performance

A driver's past safety performance and crash involvement are important predictors of future safety performance (Mejza et al., 2003). In a study supported by ATRI, Murray et al. (2005) sought to identify specific truck driver behaviors, including violations, convictions, and crashes, that were most predictive of future crash involvement. Three years of data, including from MCMIS and CDLIS, was gathered and analyzed on 540,750 CMV drivers. The authors found that having a past crash increased the likelihood of a future crash by 87%. Having past convictions and violations, especially serious violations, also increased a driver's likelihood of a future crash. Reckless driving increased the likelihood of a future crash by 325%, while improper turn violations increased future crash likelihood by 105%. The likelihood of a future crash increased by 91% to 100% for drivers convicted of an improper or erratic lane change, failure to yield, improper turn, or failure to maintain the proper lane.

A 2011 update to the Murray et al. (2005) study was conducted to identify specific types of driver behaviors that are most highly correlated with future crash involvement (Lueck & Murray, 2011). Data from 587,772 drivers over a 2-year time frame between 2008 and 2009 were analyzed to determine the future crash predictability of crashes, violations, and convictions. Some behaviors demonstrated similar patterns compared to the 2005 analysis, whereas other behaviors demonstrated different trends. Like the 2005 results, drivers with a prior crash had an 88% increase in the likelihood of a future crash. Improper passing violations had the strongest associations with crash involvement, and failure to use/improper signal, improper passing, improper turn, and improper or erratic lane change increased crash likelihood 80% to 96%. The smaller proportion of drivers who were issued violations compared to 2005 suggests that drivers with a roadside inspection had safer records in the 2011 study; this may have contributed to the differences seen between the 2005 and 2011 analyses (Lueck & Murray, 2011).

Compensation

It is widely believed that in a competitive market, higher compensation would allow trucking firms to attract and retain quality drivers, leading to improved safety. The literature has demonstrated associations between better driver pay and increased safety outcomes (such as violations of hours of service rules; Braver, 1992a, 1992b; National Transportation Safety Board [NTSB], 1991; NTSB, 1995). However, few researchers have examined crash risk. Rodriguez et al. (2014) examined the socioeconomic and driver occupational factors on truck crash occurrence and frequency using a proprietary dataset from a large for-hire U.S. trucking firm. Twenty-six months of safety data for over 11,000 long-haul CMV drivers were collected. Among other demographic variables associated with crash risk, higher pay rates and pay raises contributed to an improvement in the overall crash record of drivers. A penny per mile pay increase was related to a 2.22% lower probability of observing one or more crashes, and for every percentage point increase in pay, drivers had a 0.23% lower expected crash frequency. These findings suggest a motivational component related to pay increase that led to drivers having better safety records (Rodriguez et al., 2014).

Training

Little research has assessed the efficacy of various training program elements or overall training curriculums on driver safety outcomes. An analysis by ATRI (2008) examined the relationship between driver training and driver safety performance. The primary research objective was to examine the relative safety impact of (i) duration of new driver training, (ii) instructional environment, and (iii) curriculum topics on the safety performance of new entrant drivers. Participating carriers provided information on the training programs new drivers attended, including company-owned or sponsored programs, private training programs, and training offered through public education institutions. Safety data were analyzed using three key safety metrics, including DOT-reportable crashes, traffic violation convictions, and property-damage-only crashes. Safety data for 17,004 new entrant drivers and training data for 98% of the drivers were included in the analyses. Interestingly, little variation among driver safety performance was explained by duration of training, which ranged from 88 to 272 hours. Only one training variable, post-accident procedure instruction duration, significantly influenced the probability that a driver did not have a safety event.

The LTCCS study identified 15 driver factors that have been associated with large truck crashes and assigned as critical factors (FMCSA, 2007). Among these factors, half reflected driving mistakes and should be addressed with driver training according to the authors. These factors included traveling too fast for conditions, inadequate surveillance, illegal maneuvers, inattention, external and internal distraction, and following too closely.

Scheduling

Irregular and unpredictable operating schedules and long workdays contribute to driver fatigue. The NTSB reported that more than 30% of fatal-to-the-driver truck crashes are fatigue related (NTSB, 1999). In a study that interviewed nearly 600 long-haul CMV drivers, McCartt et al. (2000) reported that 47% of drivers reported falling asleep at the wheel at some time and 25% had fallen asleep at the wheel in the past year. Factors related to scheduling, including arduous

schedules, more work hours and fewer hours off-duty, and short/poor sleep on the road, were predictive of self-reported falling asleep at the wheel (McCartt et al., 2000). Studies of the general driving population and shift workers have demonstrated a link between fatigued driving and rotating shifts or night shifts (Lauber & Kayten, 1988; Marcus & Loughlin, 1996; McCartt et al., 1996). Mackie and Miller (1978) conducted an experiment with CMV drivers to evaluate the influence of scheduling on driving performance. The authors found that drivers operating on an irregular schedule experienced greater subjective fatigue, physiological stress, and degraded driving performance compared to drivers working a similar number of hours on a regular schedule.

Driver fatigue has been recognized in the literature as a probable cause and risk factor for crashes involving heavy trucks and commercial buses (Jones & Stein, 1989; Massie et al., 1998; NTSB, 1990; NTSB, 1995; NTSB, 1999; Sweedler, 1990). According to results from the LTCCS, fatigue was among the top 10 reasons for large truck crashes in the U.S., and 13% of CMV drivers were considered to have been fatigued at the time of their crash (FMCSA, 2006). Duke et al. (2010) reviewed the literature on age-related safety and other factors that contribute to heavy vehicle crashes, finding that working long hours, sleepiness, and fatigue contributed to heavy vehicle crashes. Bunn et al. (2005) determined that CMV drivers who were fatigued or fell asleep were 21 times more likely to be involved in a fatal crash. An analysis of carrier crash data for 1,564 CMV drivers to assess hours-of-service regulations on crash risk found that driving time was a significant predictor of crash risk, with crash odds increasing as driving time increased, beginning at hour 5 through hour 11 (Jovanis et al., 2011). The study also found that driving breaks reduced crash risk.

Strategies for coping with schedule-related fatigue have been evaluated and show promise for improving driving performance and mitigating crash risk. Napping and scheduling breaks have been shown to improve alertness and performance of over-the-road CMV drivers. A naturalistic driving study involving 97 CMV drivers looked at the impact of driving and non-driving work and rest breaks on driving performance in CMV operations (Blanco et al., 2011). The researchers found that when non-driving activities were introduced during the driver's shift, these breaks significantly reduced the risk of safety-critical events for the first hour after the break.

Safety Culture

The norms, attitudes, values, and beliefs of organizations define the culture of an organization and are expressed in the behaviors of its agents. Within an organization, culture will not only influence individuals, but individuals will in turn define the culture. Safety culture is highly qualitative and rarely standardized within the trucking industry (Short et al., 2007). Safety culture requires a safety management base that includes a multilevel and comprehensive series of safety programs and procedures. Such programs target bad behaviors empirically linked with crash risk. Isolating these behaviors results in greater levels of safety, thereby linking safety culture with safety performance results.

Research studies have shown that carriers with excellent safety records have comprehensive safety programs, and therefore, strong safety cultures. A 1999 publication by the American Trucking Associations Foundation (1999a), cites a series of tools for successful safety programs that reduce crashes, their costs, and their overall risk. Hiring, training, and retention programs,

bonuses and awards, and continuing safety education, meetings, and communications were among the tools listed. Another publication by the American Trucking Associations Foundation (1999b) documents best practices of safe carriers, including recruitment and selection practice and effective methods of measuring drivers' safety performance. Corsi and Barnard (2003) conducted a survey about safety management practices among the safest motor carriers, highlighting driver hiring practices, including safety risk assessment, as a key safety practice. Other best practices for safety training included encouragement and enforcement of safe driving behaviors, driver management and monitoring, and vehicle maintenance management. All of these enhance a motor carrier's safety culture, focusing on eliminating crashes before the crash happens through preemptive measures that target driver history and the potential for future crashes. Conversely, motor carriers without a strong safety culture may be riskier in terms of safety. Duke et al. (2010) reviewed the literature on factors that contribute to heavy vehicle crashes, finding that employer safety culture was correlated with heavy vehicle crashes.

In a joint effort to reduce motor-vehicle-related deaths and injuries in the workforce, the Occupational Safety and Health Administration, Network of Employers for Traffic Safety, and NHTSA published a white paper, "Guidelines for Employers to Reduce Motor Vehicle Crashes" (OSHA, n.d.). These guidelines outline steps for organizations of any size to develop and incorporate successful driver safety programs, fostering a focused safety culture in the workplace. A key feature of these guidelines are real-life examples of company programs and their safety outcomes. An example program highlighted in the report was Pike Industries, an asphalt paving company in Vermont that operates approximately 280 fleet vehicles, including pickups, tractor-trailers, and dump trucks. Following the initiation of their fleet safety program, which included classroom training, veteran mentors, and weekly talks to discuss fleet safety topics, the company reported significant reductions in workers' compensation claims for vehicle crashes and vehicle property damage losses.

GOALS OF PRE-EMPLOYMENT SCREENING

Safety

The primary goal of employing pre-employment screening practices in CMV operations is safety, as driving a commercial truck or bus presents a far greater safety challenge than driving a passenger vehicle. Mileage exposure and time behind the wheel are considerably higher for commercial drivers compared to noncommercial drivers (Knipling et al., 2004). Moreover, severe vehicle damage and occupant injuries can result from CMV crashes, with non-CMV occupants as the predominant victims given the weight of the CMV. Even with these safety disadvantages, CMV drivers generally have good safety records. CMV drivers are involved in fewer crashes per mile than light vehicles and a much smaller percentage of their crashes is determined to be "at fault" (Craft et al., 2000; Wang et al., 1999). CMV drivers also are less likely to engage in risky driving behaviors, including speeding, compared to non-CMV drivers (NHTSA, 1991). However, safety remains a primary priority due the high mileage exposure of CMV drivers and the potential severity and consequences of the crash (Wang et al., 1999). In 2015, transportation and material moving occupations accounted for over one-fourth of all fatal work injuries, with CMV drivers incurring the most fatal work injuries of any occupation (Bureau of Labor Statistics, n.d.).

A synthesis sponsored by the FMCSA detailed effective commercial truck and bus safety management techniques, including the problems faced by fleet managers and the methods they use to confront and address these problems (Knipling et al., 2003). Surveys were conducted with 139 fleet managers representing fleets of all sizes to identify the most important safety problems cited by safety managers. These included high-risk drivers and risky driving behaviors, driver health and wellness, lack of defensive driving skills, delays with loading and unloading, driver fatigue and drowsiness, and aggressive driving. To address these safety issues, 90% of fleet managers indicated that they employed hiring practices based on criteria related to driver crash, violation, or incident history; managers rated these practices as highly effective in improving safety.

Pre-employment screening practices can be useful in identifying drivers that tend to engage in risky or aggressive driving behaviors. Behaviors including speeding, improper following distance, lateral encroachment, failure to yield, and general disobedience of road rules represent major safety concerns, especially if they become frequent and a pattern of behavior (Craft et al., 2000; Knipling et al., 2003). Risky and aggressive driving behaviors are ranked as a top high-priority safety issue by the FMCSA (2016), as well as the safety managers and other CMV experts polled in the synthesis survey by Knipling et al. (2003). Hanowski et al. (2001) also identified risky driver behaviors that were the causes of at-fault critical incidents in local/short-haul operations. Overconfidence, distraction (e.g., cell phone use), improper lane changes, improper roadway entrances and turning, and late braking for stopped or stopping traffic were among the at-risk behaviors identified.

The PSP established by FMCSA in 2010 provides past information on driver safety performance to CMV carriers to assist in determining if a driver applicant should be hired (Johnsen et al., 2013). This voluntary program provides 5 years of crash data and 3 years of inspection data. Employers must receive driver permission and pay a $10 fee to obtain a driver's record. To determine the safety effectiveness of the PSP, FMCSA provided the PSP (at no cost) to six carriers and compared crash and driver out-of-service violations to the general carrier population during a 12-month time period prior to and after the start of the PSP. Carriers using the PSP reduced their crash and out-of-service violation rates over the general carrier population. Carriers using the PSP reported liking the system and using it for every newly hired driver (Johnsen et al., 2013).

Employee Quality and Driver Retention

Another goal of pre-employment screening is to hire and retain safe and courteous drivers. High importance is placed on examining driver behavior and identifying low-risk drivers for hiring. Although significant individual differences exist among CMV drivers regarding safety, much of the variance in risk is related to long-term characteristics or traits (Knipling et al., 2004). Improving driver selection and hiring practices to eliminate high-risk drivers from joining a company is an ideal way to improve safety. The best carrier driver recruitment and selection systems are those that attract many highly qualified applicants and have the highest and most accurate standards for selection (Knipling et al., 2011). Accuracy of selection requires the use of valid selection tests and other procedures to assess driver traits that are relevant to safety (Cascio, 2004). Unfortunately, selectivity is difficult for most carriers due to driver shortages and

suboptimal wages and working conditions. However, systematic processes can be incorporated into hiring practices to improve the pool of safe CMV applicants (Knipling et al., 2004).

A synthesis led by Knipling et al. (2004) focused on identifying the "high-risk' CMV driver found that checking drivers' motor vehicle records, contacting past employers, alcohol and drug testing, and on-road driving tests are all federally required protocols that were rated highly effective by fleet managers. Less frequent pre-employment screening practices used by fleets included criminal record and credit history checks and using selection tests. A driver's motor vehicle record, including violations, convictions, and crash involvement, is an important predictor of future safety performance and should be evaluated early in the pre-employment screening process (Mejza et al., 2003; Murray et al., 2005). Structured personal interviews can also be a valuable pre-hire tool to convey more information about the applicant and gauge the rapport between applicant and employer (Knipling et al., 2004). Conducting the CMV road test near the end of the hiring process, usually during fleet orientation, can be used to assess driver attitudes in addition to basic driving skills and knowledge. Although employed less frequently in CMV operations, performing background checks of criminal history and/or credit history/rating may be a valuable pre-employment screening tool, as these factors may be related to fleet and cargo security in addition to safety (Knipling et al., 2004). Furthermore, drivers with a criminal record or poor credit may indicate irresponsibility or socially deviant behavior. Selection tests are intended to provide objective and predictive measures of personality traits and performance capabilities; however, CMV carriers may be hesitant to use selection testing, as federal regulations require the tests meet certain criteria to prevent discrimination (Knipling et al., 2004). Only a small percentage of carriers (26%) surveyed by Knipling et al. (2004) indicated that they use selection tests in hiring, and those that did rated their effectiveness as poor. The authors highlight several selection tests that are marketed for use by CMV carriers and may have value for identifying "high-risk" drivers; however, the authors did not evaluate the efficacy of these tests as part of the synthesis.

Once hired, driver retention is important for streamlining fleet operations, maximizing efficiency, and ultimately meeting customer service expectations (Knipling et al., 2003). Annual driver turnover rates are between 75% and 100% in many CMV operations. Often, carriers bear significant recruitment and hiring costs associated with high turnover rates. Costs associated with recruiting, selecting, hiring, and training a new driver can exceed $6,000 according to Staplin et al. (2002). Drivers who change jobs frequently are also more likely to be involved in a crash. More specifically, Staplin et al. (2002) found that drivers who average three or more jobs with different CMV carriers per year are more than twice as likely to be involved in an at-fault crash compared to drivers that do not change jobs as frequently.

Assessing driver attitudes, a factor related to turnover and safety, may be a useful screening tool to employ prior to hire to identify drivers more likely to engage in "job churning" (Knipling et al., 2011). Many factors that are common in CMV operations can negatively influence driver attitude and morale, including time away from home and loneliness, long work hours, irregular schedules, job dissatisfaction, and poor diet and exercise habits. Taylor (1997) reported that negative attitudes toward a driver's company and job, including fairness, pay, dispatching, performance evaluation, and other factors related to job satisfaction and morale, were associated with intent to quit and unsafe driving records.

Cost Savings

Operational cost savings, another goal of pre-employment screening, are achieved largely due to the impacts of pre-hire screening processes on safety, driver quality, and driver retention. Identifying and eliminating "high-risk" drivers from the driver pool would potentially save the carrier costs in the long run (Knipling et al., 2004). The literature strongly supports that drivers judged as low-risk will be involved in fewer future crashes and violations, saving the carrier costs related to crashes, citations and fines, legal fees, and rehiring costs to replace terminated drivers (Knipling et al., 2004; Lueck & Murray, 2011; Mejza et al., 2003; Murray et al., 2005). Furthermore, quality drivers are likely to stay with the carrier longer, thereby reducing costs associated with driver turnover in addition to reducing crash and safety-related costs.

The primary cost benefit to pre-employment screening is avoiding potentially large financial hits that could stem from a poor hire selection, including liability, lawsuits, and company reputation (Keller, 2004). For this reason, it can be difficult to value the cost savings of employing pre-employment screening practices in CMV operations. Although few studies assessed the cost savings of pre-employment screening practices, Keller (2004) highlighted case studies of employer costs and potential cost savings due to pre-employment screening. One example from a 2001 case involved a carrier and CMV driver who were responsible for paying a $10 million settlement to the family of a couple who was killed in a crash with the CMV driver. The driver tested positive for cocaine after the crash, had a history of disciplinary and company violations with previous employers, and was in violation of DOT regulations by holding two CDLs. Evidence from the driver's log revealed 235 violations of DOT regulations during the driver's 10-month employment with the carrier. Including legal fees and the settlement, the total cost to the carrier was $10.2 million. This case might have been avoided with effective pre-employment screening practices in place to check the driver's driving record and verify previous employment, as well as the required drug and alcohol testing. Although Johnsen et al. (2013) demonstrated the impact of the PSP on safety performance, they did not evaluate cost savings for carriers.

Company Reputation

Maintaining a positive and reputable company name is an important, yet more subtle goal of pre-employment screening practices to hire and retain the highest quality drivers. Carrier reputation is important for customer relationships and public persona, but also for attracting high-quality employees. Elite motor carriers that have a reputation for safety have been able to establish rigorous hiring and driver selection processes that enable identification and hiring of a small number of high-quality employees from a large pool of applicants (Knipling et al., 2004). By attracting many applicants, reputable carriers such as Schneider National, Inc., can be highly selective in hiring. In a presentation at the 83rd Annual Meeting of the Transportation Research Board, Don Osterberg, Vice President of Safety at Schneider National, shared the outcomes of Schneider's selective hiring process. Of 320,000 recruiting calls answered by potential applicants, only 3% of all inquiries were ultimately hired after advancing through the company's selective criteria (Osterberg, 2004).

Company reputation is also important for attracting and maintaining customers and reflecting a safe work culture. Carriers that are reputable for hiring safe and responsible drivers, which is reflected in optimal safety records as well as Compliance, Safety, and Accountability scores, will

attract and retain customers who prioritize safety. The general public is more likely to judge a carrier's reputation from negative attention or behavior. For example, if a driver is involved in a catastrophic crash which later reveals he or she was on drugs or alcohol at the time or had a blemished safety record or record of risky driving behaviors, the general public may be more likely to make a snap judgement of the carrier and label them as unsafe or irresponsible. Pre-employment screening practices can support carriers in achieving and maintaining a positive company reputation through driver selection and hiring practices that identify high-quality drivers who uphold carrier safety practices.

Non-discriminatory Practices

Although pre-employment screening tests can be helpful in identifying high-quality employees, they need to be legally employed by organizations as any selection test must meet criteria established by federal regulations to prevent discrimination. Knipling et al. (2004) detail the pre-employment screening restrictions imposed under Title VII of the Civil Rights Act, as well as the requirements of the EEOC. Furthermore, to abide by Department of Labor regulations, the pre-employment measures must correspond to the job task and must be shown to be necessary for performing the job. It is important to keep these restrictions in mind when designing a pre-employment screening measure, especially when choosing selection tests that assess individual characteristics and traits, including personality factors.

EXISTING PRE-EMPLOYMENT PRACTICES

Background Checks

The EEOC, Office of the Legal Counsel (as cited in Cavico et al., 2014) found that 92% of employers use criminal background checks for some or all job openings. Negligent hiring due to lack of a background check can leave an employer open to blame for misdoings such as property loss, sexual assaults, or even murder (Jund & Kleiner, 2004). Criminal background checks typically list any felony, arrest, conviction, misdemeanor, or warrant that an individual might have on their record. However, an individual's past criminal history cannot be used to deny employment according to the EEOC. The individual has paid his or her debt to society and is therefore free to once again obtain employment (Cavico, et al., 2014). However, employment can be denied if the crime committed is relevant to the duties of the job. In the case of CMV drivers, this background check can be relevant to the type of haul the drivers are transporting, such as high-security items (Warczyglowa, 2012). In 2012, HireRight reported that 64% of employers in the transportation industry conduct criminal background checks (HireRight, 2012). Currently, there is a movement to "ban the box," referring to legislative movements to remove the box in which applicants disclose their criminal record (Cavico et al., 2014). In answer to this movement, many states have laws that restrict the use of criminal background checks during hiring procedures (Zeitler & Luisi, 2016). In support of this legislation, research with young adults has shown no correlation between criminal activity and future poor behaviors at work (Roberts et al., 2007).

Background checks can include checks beyond criminal background history. Below is a list of possible background checks employers can perform and what information they provide:

- Social Security Number check: verification that the Social Security Number is valid and matches the name presented
- Identity verification: verification of name, address, and date of birth
- Driver's license: check for any violations in the last three years
- Education verification: request for transcripts for verification of education completed
- Employment verification: contacting previous employers regarding applicant's performance
- Personal credit history
- Financial reports
- Military discharge records
- Professional license verification (Jund & Kleiner, 2004)

Two of the above, employment verification and driver's license check, are suggested as a best practice for hiring CMV drivers (Travelers, n.d.; Warczyglowa, 2012). Employment verification checks are required for regulated commercial fleets and 90% of fleets in general require reference checks on employment (Stock, 2001). Ten to thirty percent of job applicants falsify their resume in some way (Fisher et al., 2003). Verifying an applicant's previous employment can help employers from hiring individuals with undesirable qualities (if stated by previous employer), and ensure applicants' statements on knowledge, skills, and experiences with previous employment are indeed true. This verification saves the employer time and money from hiring an unqualified employee (Sarode & Deore, 2017).

Driver's license checks or motor vehicle reports are required by the FMCSR (49 CFR 391.51). Motor vehicle reports will inform an employer of an applicant's driving history, including any suspensions, restrictions, or violations the applicant has had over the last 3 years, as well as any special endorsements he or she may hold. According to NTSB (2015), 94% of the critical events leading to a crash are assigned to the driver. In addition, 20% of drivers account for 60% of safety-critical events (Hanowski et al., 2000). This study indicated that only a few drivers are responsible for most crashes on the road. As previously mentioned, a study by Murray et al. (2005) found that having a past crash increased the likelihood of a future crash by 87%. Thus, hiring drivers with verified safety records is highly beneficial for a company as it involved less risk of future crashes.

Through the FMCSA-developed PSP, motor carriers can receive the last 5 years of DOT-reportable crash data and 3 years of inspection data from the MCMIS for any driver (FMCSA, 2013). A 12-month study of the PSP program revealed that companies that used the PSP had a decrease in crash rates and driver out-of-service (OOS) rates by 8 and 17%, respectively, compared to companies that did not use the PSP (FMCSA, 2013).

Drug Screening

In 2014, 5% of all large truck drivers involved in fatal crashes tested positive for at least one illicit drug in their system following the crash. However, the true prevalence of drug use among CMV drivers involved in a fatal crash is unknown, as 62% of drivers involved did not undergo post-crash drug testing (US Department of Transportation, 2017). It is widely believed that illicit drug usage could lead to crashes, costing companies' money and lives. This led the DOT to

mandate a required pre-employment drug screening for interstate truck drivers in 1989 (Jacobson, 2003). Currently, under 49 CFR part 40, all individuals who operate a CMV in the United States must go under pre-employment drug testing before any driver performs a safety-sensitive task. This pre-employment screening was introduced with the assumption that multiple benefits would result, including preventing workplace injuries by deterring drug use, enhancing public confidence, improving medical conditions of workers, lowering health care costs, improving absenteeism, and reducing turnover (Cashman et al., 2009; Kitterlin & Moreo, 2012). In a literature review focusing on the effects of pre-employment alcohol and drug screening for occupational drivers, Christian (2011) concluded that there was insufficient evidence to state whether pre-employment drug screening is effective at preventing injuries. A 5-year longitudinal study examining 48 Wisconsin businesses that paid state worker's compensation premiums and employed 100 or more workers also concluded there was no significant reduction in injuries or accidents with pre-employment drug screening in the workplace (Feinauer & Havlovic, 1993). Pidd and Roche (2014) echoed similar results, finding no significant reduction in crash rates when pre-employment drug screening was used; however, a reduction in crashes was observed when random drug testing was instated at the workplace.

The DOT currently requires urinalysis to screen for drugs in all safety-sensitive workers. A urinalysis determines whether drugs have been used by an individual in the previous 2–3 days, possibly up to a month, depending on the drug and how frequently they engage in it (Knipling et al., 2011). This means that a recreational drug user could potentially wait a few days after drug use to be tested in order to have a clean drug test. JB Hunt began using hair analysis for pre-employment drug testing in 2006 (Knipling et al., 2011). Though hair analysis is not able to determine recent drugs usage (i.e., within the previous few days), it does have the ability to determine whether an individual used drugs in the previous 90 days. Four years after JB Hunt began using hair analysis for drug testing, they observed a 75% decrease in the rates of positive urine drug tests. The hair drug testing most likely served as a deterrent for individuals who engaged in drugs from applying to positions with JB Hunt. However, one major concern for drug testing via hair is that hair with more pigmentation can show higher concentrations of drugs than lighter-colored hair, which can negatively bias minority individuals (Kidwell & Smith, 2007).

Exploring beyond accident rates, Kitterlin and Moreo (2012) investigated rates of employee absenteeism and turnover between restaurants with and without pre-employment drug screening and found no significant difference between them. Pre-employment drug testing may deter drug-using applicants, which could affect the pool of job candidates, but the evidence to support this concept is lacking (Lange et al., 1994; Pidd & Roche, 2014). In addition, there is both a monetary and psychological cost associated with conducting drug tests (Independent Inquiry into Drug Testing at Work, 2004). Not only do thorough cost analyses still need to be conducted regarding pre-employment drug testing to see monetary benefits from drug screening, but there is also a cost associated with the stigmatization of individuals who test positive for drugs. Individuals who are not hired due to a positive drug test could potentially be very valuable employees (Independent Inquiry into Drug Testing at Work, 2004). Employers need to uphold the rules of how to perform the job; however, monitoring and regulating leisure time activities that do not affect job performance can lead to lower moral throughout employees, impacting the company. Despite being a common and regularly employed pre-employment screening tool, no solid evidence supports pre-employment drug screening as having a significant impact on the

major reasons for which it was first employed: lower turnover, lower rates of absenteeism, and lower rates of injuries or accidents.

Physical Ability Testing

For various time- or safety-sensitive jobs, there are physical tasks that an applicant should be able to do in order to perform their job effectively and safely (Boyd et al., 2015). For CMV drivers, there are often elements of loading or unloading that are part of the daily job duties along with driving. The Americans with Disabilities Act (2008) prohibits discrimination against an applicant with a disability and requires that employers accommodate a disabled individual to perform their job within reason. Though this rule does not apply to any transportation safety-sensitive positions (Knipling et al., 2011), individuals in the CMV industry should receive a conditional job offer before any testing of physical abilities is administered (Fisher et al., 2003). The main motivation behind physical ability or fitness testing for a CMV driver employer is to lower injury rates and workers' compensation for claims with loading, unloading, truck entry, and truck exit (Fisher et al., 2003; Knipling et al., 2011). Some research has supported the notion that a physical ability or fitness evaluation may be effective at reducing injuries and associated costs (Reime et al., 1994).

The physical demands for a CMV driver are sitting, walking, lifting, carrying, bending, crouching, kneeling, forward reaching, reaching above the shoulder, pushing, pulling, and climbing (Knipling et al., 2011). Some carriers test a number of these abilities and beyond. One private firm offers two physical tests along with the DOT-required Commercial Driver Medical Exam (CDME) for drivers. Individual carriers can hire a third-party company, Road Ready, to test hired drivers for cardiovascular and musculoskeletal health. The cardiovascular health test is a 3-minute step test that requires the driver to step onto an 8-inch box at a cadence of 24 steps per minute. Medical professionals supervising the test then measure the individual's heart rate immediately after the test and during the 5 minutes of recovery to ensure an appropriate physiological response to exercise and recovery. The musculoskeletal exam looks at restrictions, flexibility, range of motion, balance, and strength. Safety managers believe that general poor physical health is related to crash risk (Knipling et al., 2011). Physical ability testing is suggested as an effective carrier hiring practice (American Trucking Associations Foundation, 1999a; Knipling et al., 2011).

Medical Exam

As previously mentioned, certain medical conditions such as cardiovascular disease, sleep disorders, diabetes, and obesity are associated with driver risk. These are all conditions that can result in shock, seizure, loss of conscientiousness, or even a sudden cardiac event, causing a driver to lose their ability to operate their vehicle (Knipling et al., 2011). Currently, the FMCSA requires that all CMV drivers pass the CDME in order to obtain or renew their CDL. The CDME is performed by registered medical examiners at least every 2 years and more frequently depending on the driver's health status and risk. Vision and hearing impairment, insulin-dependent diabetes, and epilepsy are disqualifying conditions that preclude a driver from passing the CDME and driving a commercial vehicle, unless the driver is granted a waiver for their condition by the FMCSA. Since the medical examination is federally mandated, all carriers must comply with having a valid CDME for all drivers; thus, the CDME is currently a required pre-

employment screening tool to consider whether an individual is medically able to operate a CMV.

Performance or Skills Testing

Placing job applicants into a situation in which they perform the duties of the job provides direct evidence of their ability or skill, which employers can then use to inform the hiring decision (Gatewood & Field, 2001). Being able to describe a procedure is very different from performing the procedure. It is possible to be able to clearly describe how to do something but not actually be physically able to do it yourself. This fact, and the knowledge that CMV driving knowledge and skills are related to risk, is why some employers have applicants complete a performance or skills test (Knipling et. al., 2011).

In order to obtain a CDL, applicants complete a road test required by the DOT. The required road test has a motor carrier, or a designated person, evaluate the following:

1) The pre-trip inspection (as required by Sec. 392.7)
2) Coupling and uncoupling of combination units, if the equipment to be driven includes combination units
3) Placing the equipment in operation
4) Use of vehicle's controls and emergency equipment
5) Operating the vehicle in traffic and while passing other vehicles
6) Turning the vehicle
7) Braking, and slowing the vehicle by means other than braking
8) Backing, and parking the vehicle

However, many employers do their own testing at hire to verify driver skills or ask additional skills beyond those federally required (Knipling et al., 2011; Stock, 2001). Some carriers use simulators for road testing in lieu of actual on-road driving. Simulator testing can be beneficial since it does not pose potential danger to the public, standardizes testing, presents numerous scenarios, and is able to offer more precise measurements of performance (Knipling et. al., 2011). Safety managers equate poor vehicle handling with crash risk and hence rate the road and range driving test as one of the most favorable screening tools for selecting potential hires. Knipling et al. (2011) synthesized the tests and measures that are used to screen potential drivers and listed *conducting a standardized road and range test* to be an effective applicant screening practice for carriers.

Personality Testing

Some occupational positions, such as police officers, pilots, and other safety-sensitive jobs, can inherently have a great impact, positive or negative, on the individuals and communities around them. Organizations need to be particularly attentive to the individuals they hire for such authoritative positions (Cochrane et al., 2003). A national survey of 155 municipal police agency personnel departments across the United States reported that 91.6% used some type of psychological assessment in order to screen applicants for employment (Cochrane et al., 2003). Employers hope to find a lasting individual who is a good fit for the job and performs well in their job duties (Youngman, 2016). Finding a good fit for a position saves a company money that

would otherwise be spent on rehiring later. Using psychological or personality testing assumes that an applicant's future job performance can be determined by certain personality traits and not only their environment, intelligence, and previous job performance (Black, 1994).

Employers have increased the use of psychological and personality testing since the mid-2000s (Calvasina & Calvasina, 2016). Employers are screening for traits that they find both desirable and undesirable for a job (King, 2014). However, these tests do not guarantee better insight on the hiring of an individual. In fact, the Myers-Briggs personality test states their test should not be used for any hiring process (Myers and Briggs Foundation, 2017). There are legal issues in using personality testing in the hiring process. Any testing that screens for a personality disorder is not allowed under the Americans with Disabilities Act and thus can only be completed after an individual has been given a conditional offer of employment (King, 2014). It is also possible that certain personality testing will discriminate or adversely affect a group of minorities in a way that is not associated at all with the job (Calvasina & Calvasina, 2016). Both issues are something to consider when using personality testing for screening purposes. Applicants can also lie when answering the questions in order to seem more desirable for a job (O'Neill et al., 2017). As a precaution against potential dishonesty, a lie scale or social desirability scale should be embedded in the personality questionnaires to potentially indicate if an individual is trying to present him or herself in a positive light. However, if an individual does falsify their answers, the test has essentially become useless. Regardless, a meta-analysis on the Big Five personality factors (extraversion, neuroticism, conscientiousness, agreeableness, and openness) showed a relationship between personality and driver safety (Clarke & Robertson, 2005). According to the meta-analysis, individuals scoring low in conscientiousness and agreeableness are more likely to be involved in a crash.

Social Media Screening

The Internet has changed our world dramatically, including how we look and apply for jobs and what resources employers must use for screening job applicants. Today, job search engines like *CareerBuilder* and *GlassDoor* advertise jobs and even accept applications through the Internet. Employers can use Google and social networking sites such as Facebook, Twitter, Instagram, YouTube, and LinkedIn to investigate applicants. In a survey of 825 human resource and recruiting professionals by *Jobvite*, a maker of recruiting software, over 73% of respondents used social media sites to find out more information about an applicant and over 9% of additional respondents anticipated using social media sites in their application review process within the year (Levinson, 2010). Human resource professionals assume that social networking screening gives an honest picture of the applicant (Davison et al., 2012).

Searching via social networking sites can gather relevant job information for an employer (Davison et al., 2012). Applicants may post information regarding their termination at a previous job that former employers may not provide. However, employers must remember there is no verification process on these sites to confirm which posts are true and which merely reflect how the individual wants to present him or herself (Waring & Buchanan, 2010). Since there are no such verifications, social media information that an employer may use to help decide on hiring an individual might be based on false information (Davison et. al., 2012). Nonetheless, there are areas which employers find useful in making hiring decisions, such as looking for evidence of experience, knowledge, skills, and abilities for a job. All this information should be on a resume;

however, employers can find more evidence by searching through various social media sites. Criminal activity may also be displayed on social media sites, such as drug use or underage drinking (Davison et al., 2012). Furthermore, some activities posted to social media, such as smoking cigarettes, drinking alcohol, or dating, can create impressions that may influence the hiring decision. It is important to note that these activities are legal and that an employer should not take them into consideration when hiring an individual.

EEOC laws specifically protect such things as age, religious affiliation, and race that employers might learn about from social media (Davison et al., 2012). On the other hand, employers may be able to gauge person-organization fit via screening through social media websites. Research by Kluemper and Rosen (2009) offers evidence that personality can be gauged via social media sites with internal consistency and interrater reliability, once again leading human resources professionals to believe that social network screening can help guide them to a more-informed hiring choice. However, Stoughton et al. (2015) found that employees believed their privacy was invaded when employers reviewed their social media. The applicants even rated the organization as less attractive to work for after learning about the review (Waring & Buchanan, 2010).

RESEARCH OBJECTIVES

As stated in *SafeReturns* (American Trucking Associations, 1999a), "starting with the right people is key to overall safety performance." However, the CMV industry is experiencing a shortage of quality drivers, and when these drivers are found, they are unlikely to stay with the carrier for longer than 1 year. Not only does this put tremendous pressure on the human resources department to find quality drivers, it also makes hiring an expensive process. The objective of this study was to document innovative and successful practices for pre-employment screening in the CMV industry, and assess the prevalence and effectiveness of these pre-employment screening practices in a sample of CMV operations (see Chapter 3). The practical delivery from this project will be information that can assist CMV organizations and federal agencies to develop practical and cost-effective pre-employment screening practices and guidelines to reduce the risk of injury from crashes.

CHAPTER 2. METHODS

SURVEY DESIGN

A Web-based survey, informed by the literature review above, was developed to assess participating carriers' (i) use of various pre-employment screening practices, (ii) effectiveness of pre-employment screening practices, (iii) reasons why pre-employment screening practices are used or unused, and (iv) descriptive data on the participating carrier (fleet size, operation type, etc.). Appendix A shows an example of the 47-item online survey administered via Qualtrics.

RECRUITMENT

The initial contacts were survey respondents who had responded to prior Virginia Tech Transportation Institute surveys. They can be characterized as safety-conscious managers from many types of CMV transport operations (e.g., truckload, less-than-truckload, private). Additional safety managers were identified based on collected information and through industry contacts (i.e., National Private Truck Council, American Bus Association, Truckload Carriers Association, United Motorcoach Association, and Owner-Operator Independent Drivers Association). The recruitment email (which contained a link to the online survey) was developed by research personnel. To keep participant contact information anonymous, the recruitment email was sent by industry contacts via their listservs rather than directly by research personnel.

To increase participation, a raffle for five $50 winners was held upon the close of the survey. Winners were selected among those who agreed to give researchers contact information. The contact information was not linked to survey responses; thus, the research team could not link survey responses with any of the contact information. The raffle was held on December 13, 2019.

CHAPTER 3. RESULTS

A total of 40 respondents completed the survey. The response rate is unknown as the research team did not have access to the number of potential respondents on each listserv. The small sample size does not allow statistical analysis beyond reporting descriptive statistics. Also, the sample should be viewed as a convenience sample. Not all the 40 respondents answered each question; thus, the totals may not sum to 40 (and some may total more than 40 when respondents could select more than one response).

RESPONDENT DEMOGRAPHICS

Table 1 shows the demographic makeup of survey respondents, reporting the frequency and percentage of power units, type of power units, and operation type. Most respondents were from smaller carriers (1 to 10 power units), using cab or sleeper berth trucks, and in for-hire truckload, for-hire less than-truckload, and private truckload operations.

Table 1. Demographic makeup of survey respondents.

Item in Survey		Number (%)
Power Units in Carrier	1-10	32 (80%)
	11-50	0 (0%)
	51-100	1 (2.5%)
	101-500	4 (10%)
	Over 500	2 (5%)
	Do not know	1(2.5%)
Type of Power Units	Passenger van	1 (1.9%
	Bus	2 (3.9%)
	Motor coach	1 (1.9%)
	Box truck	5 (9.6%)
	Day cab	14 (26.9%)
	Sleeper	26 (50%)
	Dump trucks	2 (3.9%)
	Bucket trucks	1 (1.9%)
Operation Type	Private passenger	1 (1.9%)
	Private: truckload	10 (18.9%)
	Private: less than truckload	3 (5.7%)
	For hire: passenger	2 (3.8%)
	For hire: truckload	27 (50.9%)
	For hire: less than truckload	8 (15%)
	Do not know	2 (3.8%)

DEPARTMENT OF TRANSPORTATION ROAD TEST

Respondents were asked about their use of the DOT-required road test. Approximately one-third (34.5%) of respondents stated that applicants completed the DOT road test upon hire, that they accepted proof of CDL in lieu of the road test, or that they accepted a road test certificate from the last 3 years. More specifically, 48.3% used a road test completed upon hire and proof of CDL accepted in lieu of road test; 17.2% only used a road test completed upon hire. This shows variation among carriers in how a driver's prior record dictated if the road test was necessary (with more experienced/safer drivers' proof of CDL used in lieu of the road test). Few respondents that indicated they did not use proof of CDL accepted in lieu of road test or a road

test certificate in the last 3 years (37.5% and 15% of those respondents, respectively) reported they would use these procedures in the future (to replace the DOT road test).

Table 2 displays the effectiveness rankings for the DOT road test as a pre-employment screening practice to identify safe drivers. As shown in Table 2, the road test completed upon hire was ranked as very to extremely effective, proof of CDL accepted in lieu of road test was ranked as moderately effective, and the road test certificate in the last 3 years was viewed as slightly effective.

Table 2. DOT road test effectiveness rankings.

Pre-Employment Screening Practice	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective
Road Test Completed Upon Hire	4.3%	4.3%	0%	26.1%	65.3%
Proof of CDL in Lieu of Road Test	21.8%	13%	13%	26.1%	26.1%
Road Test Certificate in Last 3 Years	34.8%	13%	21.8%	17.4%	13%

Of the respondents that used an on-road test, a variety of approaches were used in assessing drivers' road skills: 13.8% used a combination of driving simulator, on-road test, range/yard/lot maneuvering test, and written test on driving skill; 10.4% used a combination of on-road test, range/yard/lot maneuvering test, and written test on driving skill; 62.1% used only an on-road test; 10.4% used a combination of on-road test and range/yard/lot maneuvering test; 3.4% used a combination of driving simulator, on-road test, and range/yard/lot maneuvering test. Of those respondents not using an on-road test, driving simulator, range/yard/lot maneuvering test, or written test on driving skill, 42.9%, 4.5%, 26.7%, and 15%, respectively, indicated they would consider using these approaches in the future to assess drivers' road skills. Table 3 displays the effectiveness rankings for the type of road test in identifying safe drivers. As shown in Table 3, the on-road test was rated as the most effective type of DOT road test, followed by range/yard/lot maneuvering, written, and simulator.

Table 3. Type of road test effectiveness rankings.

Type of Road Test	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective
Driving Simulator	54.6%	18.2%	18.2%	4.5%	4.5%
On-road Test	4.5%	0%	13.6%	31.8%	50.1%
Range/Yard/Lot Maneuvering Test	13.6%	9.1%	9.1%	40.9%	27.3%
Written Test	18.2%	18.2%	40.9%	18.2%	4.5%

DRIVER CRASH/VIOLATION RECORDS

Respondents were asked for the source of the driver crash/violation records used in screening candidates. Of all respondents, 31.1% used reports from state motor vehicle records, FMCSA's PSP, a third-party vendor, and their insurance company; 41.3% used reports directly from state motor vehicle records, FMCSA's PSP, and their insurance company; 27.6% only used reports from state motor vehicle records. Although all carriers used state records to verify drivers' prior crash and violation history, they also relied on other databases. Of those respondents who did not use their insurance company, FMCSA's PSP, or a third-party vendor to obtain these driver crash and violation records, 40%, 33.3%, and 15.8%, respectively, would be willing to try these approaches to obtain driver crash and violation records. Table 4 displays the effectiveness

rankings for driver crash/violation records as a pre-employment screening practice to identify safe drivers. As shown in Table 4, state motor vehicle records were ranked the highest, followed by FMCSA's PSP, third-party vendor, and insurance company.

Table 4. Driver crash/violation records effectiveness rankings.

Pre-Employment Screening Practice	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective
State Motor Vehicle Records	0%	4.3%	13%	34.8%	47.9%
FMCSA's Pre-Employment Screening Program	4.3%	8.7%	21.8%	21.8%	43.4%
Third-party Vendor	17.4%	8.7%	13%	34.8%	26.1%
Insurance Company	21.8%	13%	21.8%	26.1%	17.4%

COMMERCIAL DRIVER MEDICAL EXAM

Respondents were asked about the CDME: 44.8% performed their own CDME and accepted a valid CDME, 10.4% only performed their own CDME, and 44.8% only accepted a valid CDME. Most carriers were willing to accept an existing, valid CDME (depending on its expiration date); however, they also offered the option to complete the CDME using their in-house staff. Most of the respondents indicating that they did accept a valid CDME (76.9%) would be willing to consider using in-house staff to medically qualify their drivers; however, only 33.3% respondents who indicated they did not complete their own CDME thought this approach was something they would implement in the future. Table 5 displays the effectiveness rankings for using the CDME as a pre-employment screening practice to identify safe drivers. As shown in Table 5, both approaches were ranked similarly; however, performing your own CDME was viewed as slightly less effective.

Table 5. CDME effectiveness rankings.

Pre-Employment Screening Practice	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective
Completed CDME with In-house Staff	17.4%	8.7%	21.8%	30.4%	21.8%
Accepted a Valid CDME	8.7%	13%	26.1%	30.4%	21.8%

Many respondents indicated they performed additional health and fitness testing prior to hire: 24.1% of respondents conducted musculoskeletal/functioning testing (i.e., range of movement testing, balance), and/or cardiovascular/fitness testing (i.e., stepping or walking test with or without heart rate or blood pressure monitoring), and 35.5% conducted strength/lifting testing (i.e., grip strength, lifting loaded objects, carrying loaded objects). Only 5.3% of the respondents that did not use musculoskeletal/functioning testing indicated they would like to use this approach in future pre-employment screening. None of the respondents who indicated that they did not use musculoskeletal/functioning testing or cardiovascular/fitness testing would try this procedure in the future. Table 6 displays the effectiveness rankings for additional health and fitness testing to identify safe drivers. As shown in Table 6, none of the additional health and fitness testing approaches were ranked effective in identifying safe drivers; however, of these approaches, strength/lifting was viewed as the most effective approach.

Table 6. Additional health and fitness effectiveness rankings.

Pre-Employment Screening Practice	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective
Musculoskeletal/Functioning	30.4%	17.4%	30.4%	13%	8.7%
Cardiovascular/Fitness	31.8%	18.2%	31.8%	9.1%	9.1%
Strength/Lifting	26.1%	17.4%	26.1%	21.7%	8.7%

DRUG TESTING

Respondents were asked about drug testing their drivers, and 17.2% stated they used a combination of urinalysis, hair follicle testing, and an oral fluid test; 82.8% used only urinalysis. Only a few (4.5%) of the respondents that did not use the oral fluid test or hair follicle test would try this procedure in the future as a pre-employment screening drug test. Table 7 displays the effectiveness rankings for drug testing to identify safe drivers. As shown in Table 7, urinalysis was ranked as most effective, followed by hair follicle testing and oral fluid testing.

Table 7. Drug testing effectiveness rankings.

Pre-Employment Screening Practice	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective
Urinalysis	9.1%	0%	13.6%	45.5%	31.8%
Hair Follicle Testing	22.7%	0%	27.3%	36.6%	13.6%
Oral Fluid Test	22.7%	4.5%	40.9%	27.3%	4.5%

PREVIOUS EMPLOYER CHECKS

Respondents were asked about what method they used to perform a previous employer check on their drivers: 13.8% used a combination of telephone interviews, letters, and emails; 3.4% used letters and emails; 24.1% used telephone interviews and emails; 41.4% used only email; 20.7% used only telephone interviews. Most carriers performed drivers' prior employment checks using email or the telephone, which they view as quicker and more efficient approaches compared to letters. Telephone interviews were viewed favorably because employers can ask immediate follow-up questions, which is not viewed as readily available via emails and letters. None of the respondents who reported that they did not use the telephone for a previous employer check would consider using this approach in the future. Only 13.3% and 22.2% of the respondents who indicated they did not use email or letters, respectively, for previous employee checks believed they would implement these procedures. Table 8 displays the effectiveness rankings for conducting previous employer checks as a pre-employment screening practice to identify safe drivers. As shown in Table 8, telephone interviews were ranked as most effective, followed by letters and emails.

Table 8. Previous employer checks effectiveness rankings.

Pre-Employment Screening Practice	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective
Telephone Interview	13.6%	13.6%	31.8%	31.8%	18.2%
Letters	31.8%	13.6%	18.2%	22.7%	13.6%
Emails	31.8%	9.1%	27.3%	22.7%	9.1%

BACKGROUND CHECK

Respondents were asked what types of additional background checks they performed on their drivers: 70.9% performed no additional background checks on their drivers; 18.8% checked their drivers' education, credit history, military discharge records, financial reports, Social Security (i.e., identity check), criminal background, and social media accounts; 6.9% only checked their drivers' education; 3.4% only checked their drivers' credit report. Most carriers did not perform additional background checks on their drivers as they indicated they did not have the time necessary to perform these activities. However, those that did use these additional checks indicated they preferred to use these approaches with less-experienced drivers. Some of the respondents who did not use checks on criminal background (18.2%), Social Security (33.3%), education verification (5.9%), credit report (9.5%), financial records (4.8%), and military discharge (15%) would be willing to implement these approaches with new hires in the future. None of the respondents who indicated they did not use social media accounts would use this approach in the future. Table 9 displays the effectiveness rankings for conducting background checks as a pre-employment screening practice to identify safe drivers. As shown in Table 9, only Social Security and criminal background checks were ranked as effective techniques to identify safe drivers.

Table 9. Background check effectiveness rankings.

Pre-Employment Screening Practice	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective
Education	27.3%	22.7%	22.7%	22.7%	4.5%
Credit History	36.4%	18.2%	22.7%	22.7%	0%
Military Discharge Records	36.4%	13.6%	27.3%	22.7%	0%
Financial Reports	54.5%	4.5%	22.7%	18.2%	0%
Social Security	13.6%	9.1%	18.2%	31.8%	27.3%
Criminal Background	18.2%	4.5%	18.2%	40.9%	18.2%
Social Media	50%	9.1%	27.3%	4.5%	9.1%

DRIVER INTERVIEW/ASSESSMENT

Respondents were asked if they performed a face-to-face interview and other driver assessment techniques: 79.3% performed a face-to-face interview and 17.2% assessed drivers' personality via a standardized assessment test (e.g., Myers-Briggs Type Indicator, California Psychological Inventory, etc.). Only 20% and 4.7% of the employers who did not perform a face-to-face interview or use a standardized assessment test, respectively, thought these driver interview/assessment approaches were something they would implement in the future. Table 10 displays the effectiveness rankings for conducting driver interviews/assessments as a pre-employment screening practice to identify safe drivers. As shown in Table 10, face-to-face interviews with drivers were viewed as a very effective approach in identifying safe drivers; however, standardized assessment tests were not viewed as an effective approach.

Table 10. Driver interview/assessment effectiveness rankings.

Pre-Employment Screening Practice	Not Effective	Slightly Effective	Moderately Effective	Very Effective	Extremely Effective
Face-to-Face Interview	9.1%	0%	13.6%	36.4%	40.9%
Standardized Assessment Test	31.8%	18.2%	31.8%	9.1%	9.1%

CHAPTER 4. DISCUSSION

Safety-conscious carriers understand that starting with the right people is critical to ensuring a safe driver workforce. Unfortunately, it is not always easy to identify these drivers. Although most CMV drivers are reliable and safe, a small percentage (10% to 15%) are over-involved in crashes and violations (Knipling et al., 2011). The objective of this study was to document innovative and successful practices for pre-employment screening in the CMV industry and assess the prevalence and effectiveness of these pre-employment screening practices in a sample of CMV operations. Pre-employment screening practices attempt to identify safe drivers to lower crash and moving violation exposure. However, pre-employment screening practices can also increase driver retention, lower costs (through reduced crashes, turnover, and training), and increase the company's reputation as a safe carrier.

The practical delivery from this project provides information that can assist in the development of cost-effective pre-employment screening practices and guidelines for CMV organizations and federal agencies to reduce the risk of unintentional injury from crashes. Although our 40 survey respondents included carriers of different sizes and operation types, it should be viewed as a convenience sample and not reflective of the overall CMV population. Thus, discussion of the results in the context of the CMV population is not appropriate.

The extant literature supports the influence of driver factors and environmental or workplace factors on driving performance and CMV safety. Driver factors, such as younger male drivers (Blower et al., 1996; Cantor et al., 2010; Chen et al., 2016; de Almeida et al., 2013; Duke et al., 2010), life events, such as recent divorce or separation (Kposowa et al., 2009), alcohol and/or other legal and illegal substances (Compton & Berning, 2015), performing risky driving behaviors (e.g., speeding, not wearing a seat belt, following too close, etc.; Bunn et al., 2005; Olson et al., 2009), and a history or prior violations and crashes (Lueck & Murray, 2011) have all been shown to increase future crash risk. Drivers' physical health has also been associated with greater crash risk, including obesity (Mabry et al., 2016), cardiovascular disease (Thiese et al., 2015), diabetes (Laberge-Nadeau et al., 2000), OSA (Burks et al., 2016), and musculoskeletal conditions (Thiese et al., 2015). Lastly, workplace factors, such as driver turnover (Corsi & Fanara, 1988; Suzuki et al., 2009), driving inexperience (ATRI, 2008; FMCSA, 2017), low compensation rates (Braver, 1992a, 1992b), weak training and scheduling practices (ATRI, 2008; McCartt et al., 1996), and safety culture (Corsi & Barnard, 2003) increase crash risk. Although these factors help identify what types of driver characteristics to avoid (or, conversely, possess), carriers need to ensure that any prescreening criteria are legal and meet the criteria established by federal regulations to prevent discrimination.

EFFECTIVE PRE-EMPLOYMENT TECHNIQUES

Performance or Skills Testing

Placing job applicants in a situation in which they are required to perform the duties of the job provides direct evidence of their ability or skill. Poor vehicle handling is associated with crash risk; thus, the road and range driving test is viewed as a favorable pre-employment screening tool (Knipling et al., 2011). Respondents in the current study viewed the DOT road test as the most effective pre-employment screening technique to identify safe drivers. Most required the test to

be completed upon hire, but some accepted a recent road test certificate if the applicant was an experienced driver. Respondents thought there was no substitute for the "real thing": a driving simulator and written test were not viewed as effective as the on-road test or range/yard/lot maneuvering test.

Background Checks

Background checks can include prior crash and moving violation history, employment history, criminal background checks, Social Security Number, education verification, credit history, financial reports, and military discharge records. Most of these background checks attempt to verify the veracity of information on the driver's application. An applicant's previous employment can assist in identifying individuals with undesirable qualities, as 10% to 30% of job applicants have falsifications on their application (Fisher et al., 2003). This verification also saves the employer time and money from hiring an unqualified employee (Sarode & Deore, 2017).

By far, a driver's license check to verify a driver's motor vehicle report is one of the most effective ways to identify a safe driver. Murray et al. (2005) found that having a past crash increased the likelihood of a future crash by 87%. Using FMCSA's PSP to verify drivers' motor vehicle reports decreased crash rates and driver OOS rates by 8% and 17%, respectively (FMCSA, 2013). Respondents in the current study agreed with these studies as motor vehicle reports were viewed as the second most-effective pre-employment screening technique to identify safe drivers. Most respondents obtained these records from either the state where the driver obtained his/her license or FMCSA's PSP. Other types of background checks were generally viewed as ineffective (and rarely used) at identifying safe drivers. The Social Security check was viewed as moderately effective, but rarely used. Prior employment checks as a category were viewed as very effective. Although emails to prior employers were the most common approach to request information from prior employers, they were also viewed as less effective compared to telephone conversations. Most respondents indicated a telephone interview with a prior employer allowed follow-up questions and the ability to gauge the emotion on the interviewee, which was difficult with an email and/or letter. However, an email and letter required less of a time burden to complete and allowed documentation of the request.

Drug Screening

Although alcohol and illicit drug usage increases the likelihood of crashes, the link between drug testing for pre-employment screening and lower crash rates is unsupported (Christian, 2011; Feinauer & Havlovic, 1993). However, random drug testing has been found to reduce crash rates (Pidd & Roche, 2014). Respondents viewed pre-employment drug testing as the third most-effective pre-employment screening technique. All respondents used urinalysis, which is required by the DOT. A few used hair follicle or oral fluid tests in addition to urinalysis.

Personality Testing

Finding a good fit for a position can save a company money via increased productivity, improved retention, and fewer crashes. Personal interviews and personality testing are techniques used by employers to identify desirable personality traits. There are legal issues with using personality

testing in the hiring process. Any testing that screens for a personality disorder or that discriminates or adversely affects a group is not allowed (Calvasina & Calvasina, 2016). A meta-analysis on the Big Five personality factors (extraversion, neuroticism, conscientiousness, agreeableness, and openness) found a relationship between personality (i.e., low in conscientiousness and low agreeableness) and increased crash risk (Clarke & Robertson, 2005). Most respondents performed a face-to-face interview with prospective applicants, and they viewed this pre-employment screening technique as very effective in identifying safe drivers. A few respondents used other assessment techniques and ranked them as slightly effective; thus, it appears this is an area where more resources could be expended in educating CMV management on the usefulness of these assessments.

Medical Exam

As indicated in the literature review above, certain medical conditions were found to increase crash risk. The medical examination is federally mandated; all carriers must comply with this regulation, and all CMV drivers are required to pass the CDME in order to drive a CMV. Respondents viewed the CDME as the fourth most-effective pre-employment screening technique to identify safe drivers. Most respondents accepted a valid CDME; however, a few carriers also required all potential hires to complete a CDME with their in-house personnel. Carriers accepting a valid CDME typically had a time restriction that determined which path the applicant would take (i.e., 6 months or less until the CDME expired required the applicant to perform a CDME with their staff).

Physical Ability Testing

Truck drivers often do more than drive, and loading or unloading are included as part of their daily job duties. A physical ability or fitness evaluation has been shown to reduce injuries and associated costs (Reimer et al., 1994). More than half of respondents performed additional health and fitness testing beyond the CDME prior to hire. However, these tests were only viewed as slightly effective in identifying safe drivers. Respondents indicated that these tests were not implemented for safety, but to identify drivers who could perform the physical abilities necessary to load and unload the truck. Thus, the purpose of this test was not related to crash risk but for the safety of the driver by reducing the likelihood of a musculoskeletal injury from loading and unloading.

Social Media Screening

Although social media screening allows employers to gauge person-organization fit and identify undesirable characteristics, none of the respondents used this approach in pre-employment screening. Respondents rated this as an ineffective technique in identifying safe drivers. Respondents indicated it was too time consuming, and, regardless of time, viewed it as an invasion of the driver’s privacy.

APPENDIX A. PRE-EMPLOYMENT SCREENING SURVEY

Background

1. Please estimate the number of power units in the carrier you work for?
a. 1-10
b. 11-50
c. 51-100
d. 101-500
e. Over 500
f. Do not know

2. Please indicate the types of power units in the carrier you work for (check all that apply)
a. Passenger van
b. Bus
c. Motorcoach
d. Box truck
e. Day cab
f. Sleeper
g. Other (please list)
h. Do not know

3. Please indicate the operation type for the carrier you work for (check all that apply)
a. Private passenger
b. Private: Truckload
c. Private: Less than truckload
d. For: hire: passenger
e. For hire: Truckload
f. For hire: Less than Truckload
g. Other (please list)
h. Do not know

Mandatory Pre-employment Screening Requirements

4. Did the carrier you work for implement the following pre-employment screening practices as part of the DOT-required ***Road Test*** (check all that apply)?
- ☐ Road test/certificate conducted with our carrier upon hire
- ☐ Proof of CDL accepted in lieu of road test
- ☐ Road test certificate less than 3 years old accepted in lieu of road test
- ☐ Other (list all):
- ☐ Do not know

5. Do you feel your carrier should implement the DOT-required ***Road Test*** as a pre-employment screening practice? Why or why not? (open-ended short answer option)

6. In your opinion, how effective is conducting the ***Road Test*** to identify quality drivers who prioritize safety?

- Not Effective
- Slightly Effective
- Moderately Effective
- Very Effective
- Extremely Effective

7. Please share any additional comments you may have regarding the DOT-required ***Road Test*** as a pre-employment screening practice (open-ended short answer option).

8. Did the carrier you work for obtain your ***Driver Crash/Violation Records*** as a pre-employment screening practice from the following sources (check all that apply)?

- Directly from State motor vehicle records
- Insurance company or captive (or equivalent)
- FMCSA's Pre-employment Screening Program
- 3rd party provider
- Other (list all):
- Do not know

9. Do you feel your carrier should obtain ***Driver Crash/Violation Records*** as a pre-employment screening practice? Why or why not (open ended short answer option)?

10. In your opinion, how effective are ***Driver Crash/Violation Records*** in identifying quality drivers who prioritize safety?

- Not Effective
- Slightly Effective
- Moderately Effective
- Very Effective
- Extremely Effective

11. Please share any additional comments you may have regarding carrier's obtaining ***Driver Crash/Violation Records*** as a pre-employment screening practice (open ended short answer option).

12. Did the carrier you work for conduct the following pre-employment screening practices as part of the ***Commercial Driver Medical Examination (CDME)***? (check all that apply):

- DOT-required CDME conducted by carrier upon hire (regardless of existing valid medical card)
- Valid medical card accepted in lieu of medical exam

13. Do you feel your carrier should conduct the ***CDME*** as a pre-employment screening practice? Why or why not? (open ended short answer option).

14. In your opinion, how effective is the ***CDME*** at identifying quality drivers who prioritize safety?

- Not Effective
- Slightly Effective
- Moderately Effective
- Very Effective
- Extremely Effective

15. Please share any additional comments you may have regarding the ***CDME*** as a pre-employment screening practice (open ended short answer option).

16. Did the carrier you work for conduct pre-hire ***Drug Testing*** as a pre-employment screening practice (check all that apply)?

- Urinalysis
- Hair follicle testing
- Oral fluid testing
- Other (list all):
- Do not know

17. Do you feel your carrier should conduct pre-hire ***Drug Testing*** as a pre-employment screening practice? Why or why not? (open ended short answer option).

18. In your opinion, how effective is pre-hire ***Drug Testing*** for identifying quality drivers who prioritize safety?

- Not Effective
- Slightly Effective
- Moderately Effective
- Very Effective
- Extremely Effective

19. Please share any additional comments you may have regarding pre-hire ***Drug Testing*** as a pre-employment screening practice (open ended short answer option).

20. Did the carrier you work for conduct ***Previous Employer Checks*** of new-hire drivers as a pre-employment screening practice? YES NO DO NOT KNOW

a. Prompt if YES, How did the carrier you work for conduct ***Previous Employer Checks*** of new-hire drivers?

- Personal interviews
- Telephone interviews
- Letters
- Emails
- Other (list all that apply):
- Do not know

21. Do you feel carriers should conduct ***Previous Employer Checks*** of new-hire drivers as a pre-employment screening practice? Why or why not? (open ended short answer option)

22. In your opinion, how effective are ***Previous Employer Checks*** in identifying quality drivers who prioritize safety?

□ Slightly Effective
□ Moderately Effective
□ Very Effective
□ Extremely Effective

23. Please share any additional comments you may have regarding ***Previous Employer Checks*** as a pre-employment screening practice (open ended short answer option).

Pre-employment Screening Options

24. Did the carrier you work for use ***Background Checks*** as a pre-employment screening practice?
YES NO DO NOT KNOW

25. Do you feel your carrier should use ***Background Checks*** as a pre-employment screening practice? Why or why not? (open ended short answer option)

26. In your opinion, how effective are ***Background Checks*** in identifying quality drivers who prioritize safety?

□ Not Effective
□ Slightly Effective
□ Moderately Effective
□ Very Effective
□ Extremely Effective

27. Please share any additional comments you may have regarding ***Background Checks*** as a pre-employment screening practice (open ended short answer option).

28. Did the carrier you work for use ***Personal Interviews*** with driver applicants as a pre-employment screening practice? YES NO DO NOT KNOW

a. Prompt if indicated YES: In your experience, what type of information did the carrier you work for obtain from pre-employment ***Personal Interviews***? (open ended short answer option)

29. Do you think your carrier should conduct ***Personal Interview***s as a pre-employment screening practice? Why or why not? (open ended short answer option)

30. In your opinion, how effective are ***Personal Interviews*** with driver applicants in identifying quality drivers who prioritize safety?

□ Not Effective
□ Slightly Effective
□ Moderately Effective
□ Very Effective
□ Extremely Effective

31. Please share any additional comments you may have regarding ***Personal Interviews*** with driver applicants as a pre-employment screening practice (open ended short answer option).

32. Did the carrier you work for use ***Personality Profiles/Behavioral Assessments*** as a pre-employment screening practice (i.e. Myers Briggs Type Indicator, California Psychological Inventory, etc.)?

YES NO DO NOT KNOW

33. Do you feel your carrier should use ***Personality Profiles/Behavioral Assessments*** as a pre-employment screening practice? Why or why not? (open ended short answer option)

34. In your opinion, how effective are ***Personality Profiles/Behavioral Assessments*** in identifying quality drivers who prioritize safety?

□ Not Effective
□ Slightly Effective
□ Moderately Effective
□ Very Effective
□ Extremely Effective

35. Please share any additional comments you may have regarding ***Personality/Behavioral Assessments*** as a pre-employment screening practice (open ended short answer option).

36. Did the carrier you work for use ***Driver Skills Testing*** as a pre-employment screening practice?

YES NO DO NOT KNOW

a. Prompt if YES, please check all that apply:
□ Driving/Skills using a simulator
□ On-road driving test
□ Range/yard/lot maneuvering test (e.g. backing and parking)
□ Written test on driving skill knowledge
□ Other (please list all):
□ Do not know

37. Do you feel your carrier should use ***Driver Skills Testing*** as a pre-employment screening practice? (open ended short answer option)

38. In your opinion, how effective are ***Driver Skills Testing*** in identifying quality drivers who prioritize safety?

□ Not Effective
□ Slightly Effective
□ Moderately Effective
□ Very Effective
□ Extremely Effective

39. Please share any additional comments you may have regarding ***Driver Skills Testing*** as a pre-employment screening practice (open ended short answer option).

40. Did the carrier you work for conduct ***Additional Health/Medical Assessments*** beyond the requirements of the CDME as a pre-employment screening practice?
YES NO DO NOT KNOW

a. Prompt if YES, please check all that apply:
□ Musculoskeletal/functioning testing
□ Cardiovascular/fitness testing
□ Strength/lifting testing
□ Other (please list)
□ Do not know

41. Do you feel your carrier should conduct ***Additional Health/Medical Assessments*** as a pre-employment screening practice? Why or why not? (open ended short answer option)

42. In your opinion, how effective are ***Additional Health/Medical Assessments*** in identifying quality drivers who prioritize safety?

□ Not Effective
□ Slightly Effective
□ Moderately Effective
□ Very Effective
□ Extremely Effective

43. Please share any additional comments you may have regarding ***Additional Health/Medical Assessments*** as a pre-employment screening practice (open ended short answer option).

44. Did the carrier your work for examine applicants' ***Social Media Accounts/Posts*** as a pre-employment screening practice? YES NO DO NOT KNOW

45. Do you feel your carrier should examine ***Social Media Accounts/Posts*** as a pre-employment screening practice? Why or why not? (open ended short answer option)

46. In your opinion, how effective are ***Social Media Accounts/Posts*** in identifying quality drivers who prioritize safety?

□ Not Effective

□ Slightly Effective
□ Moderately Effective
□ Very Effective
□ Extremely Effective

47. Please share any additional comments you may have regarding ***Social Media Accounts/Posts*** as a pre-employment screening practice (open ended short answer option).

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