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Answer Distortion on the Epworth Sleepiness Scale During the Commercial Driver Medical Examination

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Answer Distortion on the Epworth Sleepiness Scale

During the Commercial Driver Medical Examination

by

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Table of Contents

List of Tables

List of Figures

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ABSTRACT

Commercial vehicle drivers are required to maintain Department Of Transportation medical certification which entails a Commercial Driver Medical Examination (CDME) and optimally leads to a two-year certification. The examination must be performed by a licensed "medical examiner" administered by a variety of health care providers including physicians, advanced registered nurse practitioners, physician assistants and doctors of chiropractic. Unfavorable findings in the examination can yield either a shortened medical certification period or denial of certification. Sleep disorders including sleep apnea are assessed by a single question located in the health history portion of the CDME form which is filled-out by the examinee. A positive response to this single item often prompts the medical examiner to further supplement this question using a subjective questionnaire, such as the Epworth Sleepiness Scale. This particular questionnaire generates a total score based on the examinee's subjective responses to eight items regarding the propensity to doze-off or fall asleep in different scenarios, thus indicating daytime sleepiness. Commercial drivers depend on the medical certification for their livelihood and it is hypothesized that subjective responses regarding daytime sleepiness are distorted in an effort to attain optimal DOT certification.

Introduction

History of the Epworth Sleepiness Scale

The Epworth Sleepiness Scale (ESS) is a subjective questionnaire designed to ascertain a score representative of daytime sleepiness. Dr. Murray Johns established the questionnaire in the early 1990s with the intention of generating a simplified screening tool to indicate the necessity for further diagnostic testing regarding potential sleep disturbances. The objective was to provide a simple, standardized alternative to replace the cumbersome, time-consuming, and expensive multiple sleep latency test (MSLT) and maintenance of wakefulness test (MWT) [1]. The MSLT is regarded by some as the gold standard for objective determination of daytime sleepiness [2], but it requires the patient to remain in the exam room nearly all day. Recently, however, some concerns have been raised regarding the relative weakness of the relationship between the ESS and the MSLT [3] while Dr. Johns maintains that the ESS is the best indicator of daytime sleepiness and the MSLT is the worst of the three tests utilized [4]. The ESS questionnaire is designed to be self-administered and is comprised of eight questions which indicate a propensity to doze during situations where dozing is an unintended outcome. Accurate assessment of this propensity is somewhat difficult as many respondents do not interpret the situations in a similar manner. Most clinicians expect that the ESS measures subjective sleepiness, but Dr. Johns maintains that it measures a propensity to

sleep, which he considers to be a different construct [5]. The respondent answers each question using a scale from zero to three corresponding to a likelihood of dozing in each of the scenarios with zero indicating “no chance of dozing” progressing to three indicating “high chance of dozing.” Patient variability is a major source of measurement inconsistency in the ESS and is influenced by recall bias and testing conditions. The ESS attempts to avoid these biases by asking respondents to gage their responses based on propensity to sleep over the past few weeks rather than just at the time of testing [6]. One of the questions asks the respondent to rate the likelihood of dozing while lying down to rest in the afternoon when circumstances permit and it was believed that anyone, other than insomniacs, would have some possibility of dozing in this situation [1]. Other similarly soporific scenarios are provided as well as scenarios where a positive response would be more indicative of narcolepsy than daytime somnolence, such as sitting and talking to someone. This is necessary since a questionnaire composed only of highly soporific scenarios would not differentiate between sleepy and alert individuals; therefore, the selection of scenarios were likely chosen to vary from highly soporific to minimally soporific [6]. Some ambiguity exists in the question regarding sitting in a car while stopped for a few minutes in traffic as to whether the question implies the respondent is the driver or the passenger. Because there is an association between daytime sleepiness and motor vehicle accidents, which most often occur while the vehicle is in motion, it is surprising that “while driving” was not specified in this particular question [6].

At the time of this writing, a Pub Med search for “Epworth Sleepiness Scale” returns over 1000 articles. The ESS has been translated into several different languages and its validity and reliability have been established for use in different countries rendering it the most widely known and extensively used questionnaire for determining daytime sleepiness. Much of its utility is derived from the ability to have respondents answer the questionnaire while awaiting their scheduled appointment with the medical examiner. The medical examiner can then quickly sum the individual responses and determine the total ESS score. This total score is then used to categorize the respondent as having a normal or increased sleep propensity and those with an increased propensity can then be referred for polysomnography. The cutoff scores have changed over time with the initial study indicating that a score of 16 out of 24 suggested a high level of daytime sleepiness [1]. Later, the cutoff score was reduced to 9 based on a study involving 104 medical students [7]. Presently, a cutoff score of 10 is suggested [4, 8] and is the level used most extensively. Unfortunately, despite the multitude of websites offering the layperson access to the ESS, no data exist supporting the division of ESS scores into categorical labels such as ‘severe’ and ‘excessive’ sleepiness [9]. Many sleep clinicians do not believe that a cutoff score of 10 indicates that a respondent is pathologically sleepy and misunderstandings regarding the use of the ESS can result in undue reliance on its measure of excessive daytime sleepiness [10].

Obstructive Sleep Apnea

Daytime sleepiness is the most common behavioral morbidity associated with obstructive sleep apnea (OSA) and the presence of excessive daytime sleepiness along with the increased awareness of potential negative consequences of untreated OSA often motivates patients to seek medical evaluation [11]. In the population seeking treatment, the bed partner is often the precipitator for seeking medical evaluation of excessive snoring and apneic episodes. Turbulence in the upper airway causes vibrations of the soft palate and the uvula causing audible snoring which is typically benign for the afflicted, although usually not for the bed partner. People with large tongues, bulky palates or thick necks often have increased airway vibrations. Some of these people may lose the ability for the intrinsic muscles of the throat to keep the airway patent thus leading to obstruction of the airway and subsequent apneic episodes while sleeping, which represents the entity called obstructive sleep apnea (OSA). OSA is a well defined problem with significant and ongoing research into its etiology and treatment. The National Sleep Foundation estimates that 18 million people suffer from OSA yet the majority of them remain undiagnosed [12]. While cranial, facial and upper airway soft tissue abnormalities are risk factors for OSA, the most important and repeatedly documented risk factor is obesity [13] and the risk for OSA increases as the BMI increases. One study utilized a combination of clinical symptoms of sleep apnea, coupled with BMI and ESS scores which were optimized to provide a 93.4% sensitivity and 60% specificity for the presence of OSA [14]. Another study revealed that obese drivers having a BMI above 32

kg/m^2 are more likely to be sleepy during the day, yet their subjective reports of daytime sleepiness are not reliable [15]. In the symptomatic population seeking relief or treatment, the ESS is widely used and well validated; however, in a population wishing to minimize their disclosure of health problems, the ESS seems to be less reliable [16].

Commercial Driver Medical Examination

The Department of Transportation (DOT) was established by an act of Congress in 1966 and responsibility for commercial driver qualifications was transferred to the DOT following the establishment of the National Highway Traffic Safety Administration in 1970. The Federal Motor Carrier Safety Administration (FMCSA) was established in 2000 pursuant to the Motor Carrier Safety Improvement Act of 1999, with the primary mission of preventing commercial motor vehicle-related fatalities and injuries. Commercial motor vehicle (CMV) is a rather broad term and covers the following vehicle types as set forth by 49 CFR 390.5: weighs 10,001 pounds or more; has a gross vehicle weight rating or gross combination weight rating of 10,001 pounds or more; is designed or used to transport 16 or more passengers (including driver) when not for compensation; is designed or used to transport 9 or more passengers (including driver) for compensation. Additionally, a vehicle involved in interstate or intrastate commerce transporting hazardous materials in a quantity requiring placards is also considered a CMV. Further vehicular classifications are used to mandate when drivers of CMVs require controlled substance testing.

The Medical Program is one of the “Key Programs” within the FMCSA and is intended to promote the safety of America’s roadways by ensuring commercial motor vehicle (CMV) drivers engaged in interstate commerce are physically qualified. Interstate commerce is that in which trade, traffic or transportation occurs across state lines while intrastate commerce does not cross state lines. It is important to note that it is the cargo being transported, not the driver, that dictates whether the commerce is interstate or intrastate and many states have adopted the federal guidelines for certification of intrastate CMV drivers. Physical qualifications for drivers are contained in 49 CFR 391 which requires that each operator of a CMV undergo a periodic medical examination to ensure medical suitability to operate such a vehicle. The examination has specific criteria and drivers can only be medically certified for a maximum of two years while there are many circumstances, such as hypertension, whereby the duration of certification would be less than two years [17]. During the course of the examination, drivers are required to fill out the health history portion of the Medical Examination Report form which consists of 25 line items requiring either a ‘yes’ or ‘no’ response. Interestingly, the bulk of the questions in the health history section seems to focus on heart attack, stroke, hypoglycemic events, etc., yet these medical conditions are only implicated in 4% of CMV crashes [16]. The health history section is followed by a statement indicating that “the above information is complete and true” and acknowledging that “inaccurate, false or missing information may invalidate the examination” and requires the driver’s signature and the date that the form was filled-out. The Medical Examination

Report form was originally a two-page document, but in 2000 a new nine-page CDME form was created and includes a single line item entry requiring drivers to indicate whether they have a sleep disorder, pauses in breathing while asleep, daytime sleepiness or loud snoring [18]; however, the form provides no further guidance regarding diagnosis, treatment or follow-up [19]. Denial is an obstacle to obtaining an adequate sleep disorder history since respondents often refuse to admit that they snore or they attribute their sleepiness to factors such as a hectic lifestyle, all of which deter screening for excessive sleepiness by history alone [20]. Because undiagnosed OSA poses hazards in commercial truck driving, effective and simple screening methods are essential in clinical settings in which a full sleep evaluation, including overnight polysomnography, is not practical or feasible [20]. For this reason, many medical examiners elect to supplement this single line item with a subjective questionnaire, such as the ESS. The physical exam portion of the report only requires entries for height and weight, but it is advised that medical examiners also enter a calculation of BMI on the form, since BMI is a useful correlation for the risk of OSA [17]. Commercial driving operations place individuals at a higher risk for obesity due to long and mostly sedentary driving hours, irregular schedules and limited food options [21]. One particular study revealed that OSA is common in CMV operators with 28% of participants having some degree of OSA [22]. The utility of the ESS, or other subjective questionnaires, has been questioned in this population of respondents where an elevated score could hinder attainment of medical certification [16, 23].

Currently the medical exam can be completed by a person licensed to perform physical examinations including, a doctor of medicine (MD), doctor of osteopathy (DO), doctor of chiropractic (DC), physician assistant (PA) or an advanced practice nurse (ARNP). The medical examiner should be familiar with 49 CFR 391, specifically Subpart E, and be aware of the physical and emotional demands associated with operating a CMV, both for the wellbeing of the driver and in the interest of public safety. Once a driver is medically qualified, the driver can use the medical certificate in the performance of any task required of CMV operators for any company [24, 25]. This is one of the motivations behind the FMCSA Medical Review Board's recommendation to require certification and training of medical examiners performing CDMEs [17]. The Large Truck Crash Causation Study (LTCCS) analyzed several factors related to truck crashes and assigned codes to four types of driver errors [26]. One such driver error code was termed "non-performance" and included the driver falling asleep, suffering a disabling heart attack or seizure, or becoming physically impaired for another reason. The FMCSA found that truck drivers were at fault in over 80% of crashes [26] and the driver admitted to falling asleep in 7% of these crashes [23]. Daytime somnolence associated with OSA has been widely recognized as a potential cause of motor vehicle crashes. For this reason, screening recommendations have been developed for CMV operators with possible or probable sleep apnea. Unfortunately, many of the current methods of screening for OSA have either a poor sensitivity, poor specificity or both [20]. Because an elevated risk to public safety is associated with OSA in the CMV operator

population, a task force was convened and consisted of members from the American College of Chest Physicians, the American College of Occupational and Environmental Medicine and the National Sleep Foundation to address this safety hazard [24, 25]. This task force developed screening recommendations for identifying commercial drivers with probable OSA which include criteria based on both subjective responses and physical exam findings. The subjective responses include the single question on the CDME form which asks if the applicant has sleep disorders, pauses in breathing while asleep, daytime sleepiness or loud snoring along with a supplemental questionnaire, such as the ESS. The task force recommends that drivers receive a 3-month medical certificate pending an evaluation for sleep disorders if their ESS score is greater than 10 while drivers with an ESS score greater than or equal to 16 should be taken out of service pending evaluation [24, 25]. Because commercial drivers depend on medical certification for their livelihood, it is hypothesized that these subjective responses regarding daytime sleepiness are distorted in an effort to attain optimal DOT certification. Based on this hypothesis, when the ESS is administered in a non-threatening environment, such as a travel plaza, a difference in the mean ESS score is expected which should correlate with BMI and neck circumference.

Materials and Methods

Travel Plaza

Fifty commercial drivers were surveyed at a travel plaza near a major interstate in Florida. Participation was completely voluntary and participants were offered a $5.00 gift card for use in the travel plaza. The survey was absolutely anonymous and did not include any company or driver identification. The survey included the single line item question from the history portion of the CDME form as well as all eight items from the ESS. Participants also had their height and weight recorded and neck circumference measured. Demographic data such as age and prior diagnosis of OSA diagnosis were obtained and those diagnosed with OSA were further questioned regarding CPAP usage. Each participant's height was rounded down to the nearest half-inch while their weight was rounded down to the nearest whole pound. This practice was employed due to the fact that the drivers remained fully clothed with their shoes on during height and weight assessment as this was conducted outdoors at the travel plaza. Body mass index of each driver was calculated using the following equation:

$$BMI = [\ (\text{weight in pounds}) / (\text{height in inches})^2\ ] \times 703$$

Occupational Medicine Clinic

An occupational medicine clinic that performs CDMEs for a large region was chosen as the comparison location which was within the same region as the

travel plaza and is in close proximity to the same major interstate. This particular clinic conducts between 60 and 70 CDMEs each month and administers the ESS to 100% of the applicants for the DOT medical certificate, regardless of response to the history portion of the CDME or any objective findings. Each applicant for the medical certificate also has their height and weight recorded, but this clinic does not calculate BMI. Therefore, BMI was calculated using the above mentioned equation from the height and weight measurements recorded on the CDME form. Once BMI was calculated, the CDMEs were used to form matched pairs with the participants from the travel plaza survey. A matched pair consisted of a participant at the travel plaza and an applicant's CDME from the occupational medicine clinic having BMI readings with a difference no greater than 0.2 kg/m^2. Unfortunately, the occupational medicine clinic in this study did not obtain neck circumference measurements which prevented a comparison of this metric.

Statistical Analysis

A statistical comparison was conducted between the ESS scores obtained at the occupational medicine clinic and at the travel plaza using an independent 2-tailed t-test with an α of 0.05 and a 95% CI generated. Statistical analyses were performed using SPSS Version 18.0 (SPSS Inc., Chicago, Illinois). Statistical significance was accepted when $p < 0.05$. Because matched pairs for BMI were utilized, no statistical analyses or comparisons of BMI were generated between the two groups.

Results

A total of 100 ESS questionnaires were reviewed, fifty of which were filled out in a local occupational health clinic during a Commercial Driver exam and the other fifty attained at a local travel plaza. Twelve drivers met the objective consensus criteria of BMI greater than 35 kg/m^2 at both the travel plaza and the occupational medicine clinic. However, none of the drivers at the clinic that met the objective BMI criteria had an ESS greater than 10 while three of the drivers at the travel plaza meeting the criteria had an ESS greater than 10. One examinee at the occupational medicine clinic had answered affirmatively to the historical question on the CDME regarding sleep disorders, excessive daytime sleepiness or snoring; however, there was no indication that this driver had received any follow-up to this affirmative response. A total of nineteen drivers at the travel plaza answered “yes” during the survey when the CDME question was asked verbally. Interestingly, two of the respondents at the travel plaza that answered in the affirmative had BMI values less than 25 kg/m^2 and neck circumferences of 16 inches or less. Most of the respondents qualified their positive responses and denied any sleep disorders but stated that they snored or that their bed partner reported that they snored.

Table 1: Characteristics of study population

Characteristic	Clinic		Travel Plaza	
	Mean	Range	Mean	Range
Age	42.0	21 – 65	45.5	26 – 63
Weight	208.8	118 – 305	221.6	125 – 312
BMI	31.6	19.8 – 46.2	31.6	19.9 – 46.1
ESS Score	2.8	0 – 10	6.7	0 – 21

Table 2: Categorization of drivers by BMI

BMI Category	BMI (kg/m2)	Number of drivers at each the Clinic and the Travel Plaza
Normal	< 25	6
Overweight	25 – 29.9	12
Obese	> 30	32
Consensus Criteria	≥ 35	12

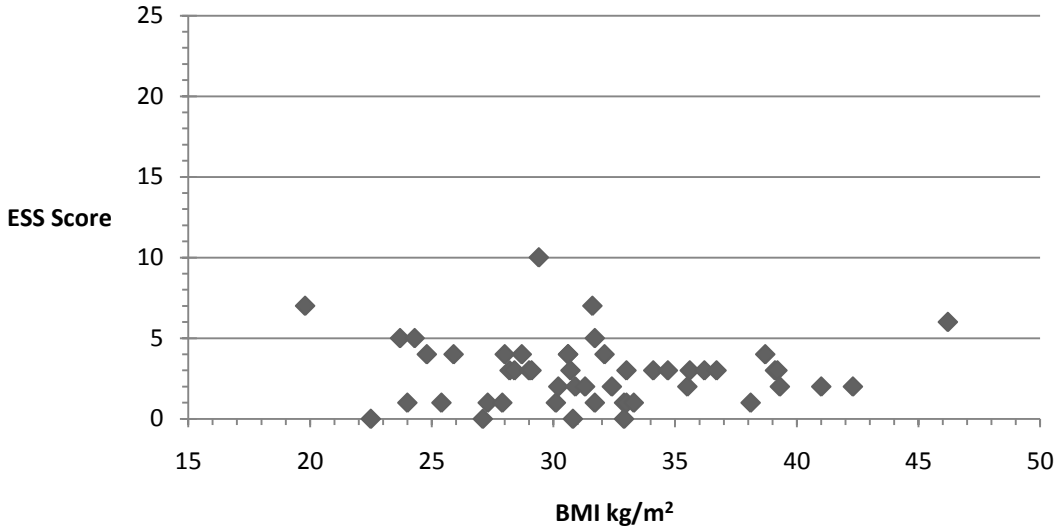

Figure 1: Total ESS compared to BMI at occupational medicine clinic

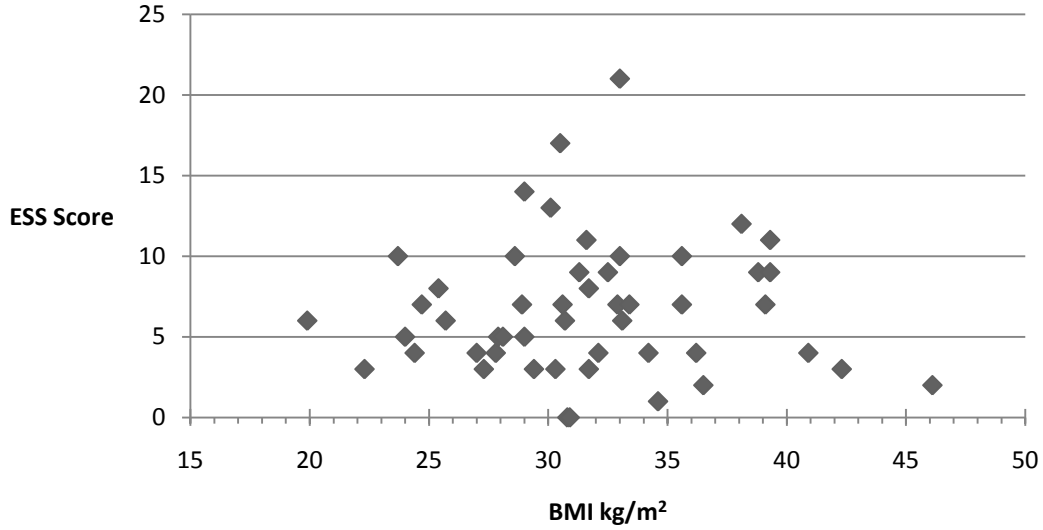

Figure 2: Total ESS compared to BMI at travel plaza

Statistical analyses were performed of the BMI values and the total ESS scores obtained at both the travel plaza and the occupational medicine clinic. When the data from the survey conducted at the travel plaza was compared to the data acquired from the occupational medicine clinic, a difference in the mean ESS total score of 3.86 (95% CI: 2.56, 5.15) was obtained and confirmed to be statistically significant with a $p < 0.001$. Although the difference was statistically significant, it was not clinically significant as the mean ESS total score (6.7) at the travel plaza was below the action level for requiring a sleep study. In comparing the BMI to the ESS total scores, no significant correlation existed at either the occupational medicine clinic or the travel plaza. The neck circumference measurements obtained at the travel plaza, however, did correlate well with the BMI readings obtained from these drivers with a positive Pearson Correlation value of 0.756.

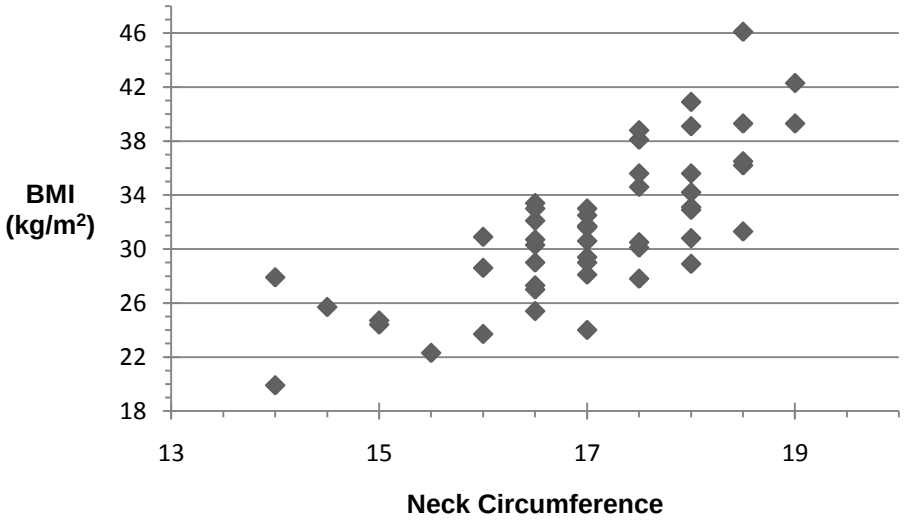

Figure 3: Neck circumference compared to BMI at travel plaza

Nine drivers at the travel plaza would have screened positive based on consensus criteria of BMI ≥ 35 and / or neck circumference > 17” but had a total ESS score < 10. Five of the drivers at the travel plaza with a total ESS score >10 fell below the consensus criteria for both BMI and neck circumference measurements. Although these drivers meet the consensus criteria for polysomnography based on their responses to the ESS, they would have been missed by objective criteria alone. Therefore, if they were less than forthcoming with their responses to the subjective questionnaire, they would not raise any clinical suspicion for excessive daytime sleepiness.

Table 3: Categorization of drivers by screening criteria

BMI (kg/m^2)	Clinic		Travel Plaza	
	ESS > 10	ESS ≤ 10	ESS > 10	ESS ≤10
< 35	0	39	5	34
≥ 35	0	11	2	9

Discussion

One needs not travel very far down the interstate to notice the abundance of tractor trailers occupying the road and anyone that has witnessed a crash involving one of these tractor trailers can attest to the severity of the outcome. The laws of physics dictate that an out-of-control vehicle weighing nearly 80,000 pounds traveling at highway speeds cannot stop quickly and will destroy everything in its path until it eventually comes to rest. Therefore, the potential for OSA-related daytime sleepiness among CMV operators creates a considerable public health hazard. The ESS is one tool currently used by clinicians, patients, the pharmaceutical industry and academic centers to gauge excessive daytime sleepiness. However, more deliberation is required regarding the use of the ESS and other alternative subjective measures for assessment of sleepiness and the possible downside of false-positive screening should not be taken lightly. While the ESS has a high degree of internal consistency and ESS scores relate to clinical outcomes such as traffic accidents [6], its use in screening commercial drivers poses some significant limitations. Ideally, objective findings indicative of preponderance towards OSA could be used in the CDME setting. Although anatomical and physiological properties of the upper airways associated with sleep apnea are more commonly found in the obese population, many people with sleep related disorders are not obese. This is a precarious situation for the health care practitioner performing the CDME as objective findings will not

always correlate with excessive daytime sleepiness. The joint task force elected to use a BMI measurement of 35 or greater as their screening criteria to maximize the specificity of this screening metric [24, 25].

The most notable bias in this study relates to the inability to survey all of the drivers at the travel plaza. Self-selection bias of the participants could have occurred as those willing to have their height and weight recorded may have yielded lower BMI readings than those that avoided participation. Self-exemption also may have been attributable to the distrust of government officials and trepidation over further governmental regulation on the trucking industry. Many of the commercial drivers, and particularly those that refused to participate, questioned the sponsorship of the research, often assuming the researchers worked for the FMCSA or the DOT. Even after repeated assurance that no direct government entity was involved in the study, the drivers remained skeptical. Based on multiple conversations with surveyed drivers, this distrust stems from the increased regulations placed on the trucking industry to prevent fatigue. Fatigue is closely regulated by Title 49 of the Code of Federal Regulations, Part 395 and by the FMCSA through limiting hours of service (HOS) of interstate commercial truck and bus drivers. The FMCSA reviewed existing research on fatigue and worked with organizations such as the Transportation Research Board of the National Academies and the National Institute for Occupational Safety and Health in establishing these HOS rules. Companies with drivers in their employ that have demonstrated serious patterns of HOS violations will soon

be required to install electronic on-board recorders (EOBRs) in all of their vehicles [27]. Trip distance was found to have the most pronounced effect on the percentage of fatal crashes and local or short-haul truck involvement in fatigue-related fatal crashes is a fraction of that of over-the-road trucks [27, 28]. Although frequently referred to synonymously, fatigue should be differentiated from sleepiness. Fatigue is generally described as a condition where maintenance of motor and mental energy levels becomes increasingly difficult and is relieved by rest, as opposed to sleep [29]. While fatigue and sleepiness often seem to share a common basis of non-restorative sleep, their relationship is still poorly described and understood [29]. Fatigue involves other factors such as eye strain, back pain and general muscle exhaustion due to factors related to operating and controlling a CMV. The common practice of having drivers participate in the loading and unloading of their cargo adds to their level of fatigue [30]. Other factors related to fatigue include somewhat intangible conditions such as depression and even low job satisfaction and additional stress factors such as multi-trailer configurations, weather extremes, traffic congestion and frequent interactions with aggressive drivers may also contribute to driver fatigue. Insufficient recovery has an additive effect on fatigue and one study found that nearly half of the respondents (47%) indicated that they began the new workweek already feeling tired or fatigued [30]. As previously mentioned, the ESS is not a diagnostic tool, but rather indicates a propensity for unintentional dozing and, for this reason, it is not capable of distinguishing between pathological sleepiness and fatigue. Compounding this problem is the

fact that many respondents describe their symptoms interchangeably as sleepiness and tiredness. The survey at the travel plaza was conducted on two different days, one weekday in the late morning and one Saturday in the early afternoon. Although fatigue of drivers may cause a bias in their answers to the ESS, the time of day the survey was conducted would likely bias the results towards the null hypothesis. Many of the drivers that were surveyed on a Saturday were “laying-over” at the travel plaza to meet regulatory down-time, or out-of-service, requirements. The surveys conducted during the work week were performed in the late morning, just prior to lunchtime. Driver fatigue would likely have a greater impact on ESS scores near the end of the day, after driving many hours without rest, or at the end of the work week. This fatigue effect is also somewhat minimized in the clinical setting since drivers typically present for the CDME before their work shift or during their lunch break.

Conclusion

This cross-sectional study was intended to evaluate the use of the ESS in a population of respondents where answer distortion could be perceived as advantageous. The importance of this study rests in the fact that OSA is prevalent in commercial drivers and has potentially disastrous consequences within the public health domain. The results of the study reveal some important limitations in the use of a subjective measure of daytime sleepiness in a population of CMV operators during the CDME. None of the respondents in the clinical setting met the task force consensus criteria for an ESS greater than 10. However, the results observed from the ESS administered in a non-threatening, completely anonymous environment did indicate an increase in the total ESS score which was statistically significant. Although the findings were not necessarily clinically significant, an unexpected yet noteworthy finding was that five drivers that would not meet objective screening criteria had ESS scores greater than 10. Although answer distortion on subjective responses to both the history portion of the CDME and the ESS remains a problem, the responses to these items may be the only viable method for identifying commercial drivers with sleep disorders or excessive daytime sleepiness that do not meet any objective criteria for further diagnostic testing. Alternatively, drivers meeting objective criteria for further testing with legitimate ESS scores < 10 will have to undergo some form of sleep study which is both expensive and time consuming.

Unfortunately, the possibility for answer distortion on subjective questionnaires, such as the ESS, precludes the CDME examiner from determining which scores are legitimate thus compelling the examiner to require further diagnostic testing based on objective criteria alone.

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Appendix 1:

Travel Plaza Survey Form

Appendix 1

Do you have any of the following?

- Sleep disorders, pauses in breathing while you sleep, daytime sleepiness, or loud snoring?
  Yes / No

Use the following scale to choose the most appropriate number for each situation:

- *0 = no chance of dozing*
- *1 = slight chance of dozing*
- *2 = moderate chance of dozing*
- *3 = high chance of dozing*

Situation	**Chance of Dozing**
Sitting and reading	
Watching TV	
Sitting inactive in a public place (e.g. theater or a meeting)	
As a passenger in a car for an hour without a break	
Lying down to rest in the afternoon when circumstances permit	
Sitting and talking to someone	
Sitting quietly after a lunch without alcohol	
In a car, while stopped for a few minutes in traffic	
Total:	

Age _____

Height _____

Weight _____

BMI _____

Neck circumference _____

Ever diagnosed with sleeping disorder (e.g. sleep apnea)? _____

Use CPAP or BIPAP (breathing machine)? _____

How often? _____

Current certification: < 1 year 1 year 2 years

Appendix 2:

Travel Plaza and Clinic Raw Data

Appendix 2

Travel Plaza				Occupational Medicine Clinic		
BMI	**ESS Total**	**CDME**	**Neck Circ**	**BMI**	**ESS Total**	**CDME**
19.9	6	0	14	19.8	7	0
22.3	3	0	15.5	22.5	0	0
23.7	10	1	16	23.7	5	0
24	5	0	17	24	1	0
24.4	4	1	15	24.3	5	0
24.7	7	0	15	24.8	4	0
25.4	8	0	16.5	25.4	1	0
25.7	6	1	14.5	25.9	4	0
27	4	0	16.5	27.1	0	0
27.3	3	0	16.5	27.3	1	0
27.8	4	1	17.5	27.9	1	0
27.9	5	0	14	28	4	0
28.1	5	1	17	28.2	3	0
28.6	10	0	16	28.4	3	0
28.9	7	0	18	28.7	4	0
29	14	0	16.5	29	3	1
29	5	0	17	29.1	3	0
29.4	3	0	17	29.4	10	0
30.1	13	0	17.5	30.1	1	0
30.3	3	0	16.5	30.2	2	0
30.5	17	1	17.5	30.6	4	0
30.6	7	0	17	30.6	4	0
30.7	6	0	16.5	30.7	3	0
30.8	0	1	18	30.8	0	0
30.9	0	0	16	30.9	2	0
31.3	9	0	18.5	31.3	2	0
31.6	11	0	17	31.6	7	0
31.7	8	0	17	31.7	1	0
31.7	3	0	17	31.7	5	0
32.1	4	0	16.5	32.1	4	0
32.5	9	1	17	32.4	2	0
32.9	7	0	18	32.9	1	0
33	21	1	16.5	32.9	0	0
33	10	1	17	33	3	0
33.1	6	1	18	33	1	0
33.4	7	0	16.5	33.3	1	0
34.2	4	0	18	34.1	3	0
34.6	1	1	17.5	34.7	3	0
35.6	11	0	17.5	35.5	2	0
35.6	7	0	18	35.6	3	0
36.2	4	1	18.5	36.2	3	0
36.5	2	1	18.5	36.7	3	0
38.1	12	1	17.5	38.1	1	0
38.8	9	1	17.5	38.7	4	0

Appendix 2 Continued

Travel Plaza				Occupational Medicine Clinic		
BMI	**ESS Total**	**CDME**	**Neck Circ**	**BMI**	**ESS Total**	**CDME**
39.1	7	0	18	39.1	3	0
39.3	11	0	19	39.2	3	0
39.3	9	1	18.5	39.3	2	0
40.9	4	1	18	41	2	0
42.3	3	0	19	42.3	2	0
46.1	2	1	18.5	46.2	6	0

About the Author

Keith E. Proctor was born and raised in Lakeland, Florida. He enlisted in the U.S. Navy in 1985 where he served onboard two aircraft carriers and a Marine transport ship as an engineroom mechanic. He was enlisted for eighteen years prior to starting medical school. He graduated with a B.S. in Manufacturing Engineering Technology from the University of West Florida in 2001. He was the recipient of a Navy Health Professions Scholarship and completed a D.O. from the Edward Via Virginia College of Osteopathic Medicine in 2007. He was subsequently accepted into the Navy Active Duty Delay for Specialists program allowing completion of graduate medical education in Occupational Medicine. Keith is returning to the Navy to continue his active duty career as a physician.