

RISK FACTORS ASSOCIATED WITH DRIVER FATIGUE

Wijesuriya, N., Tran, Y. & Craig, A.
Department of Medical and Molecular Biosciences, UTS

ABSTRACT

Driver fatigue is a major risk for road accidents. However, debate still exists concerning risk factors associated with driver fatigue. Because of the complex nature of fatigue, this paper reports a study that investigated both physiological and psychological determinants of fatigue. Three fatigue outcome measures were used, including a physiological, psychological and a combined physiological and psychological measure. Fifty participants performed a driving simulator task till they showed symptoms of fatigue. Significant factors associated with physiological fatigue included higher levels of baseline delta activity and an extraverted personality. Factors related to the psychological fatigue outcome measure included sleepiness, low healthy lifestyle status, an extraverted and tension prone personality, and negative mood states. The combined fatigue outcome measure was associated with factors such as a tension prone and extraverted personality, low systolic blood pressure, and negative mood states. The findings reinforce the importance of assessing fatigue using a range of outcome measures in order to achieve a thorough understanding of what may predispose a driver to be at risk of fatigue related accidents. The study also highlights a priority of road safety research, that is, the need to establish definite risk factors associated with driver fatigue and develop fatigue countermeasures that utilize these risk factors.

INTRODUCTION

Driver fatigue has been identified as a major cause of road accidents worldwide (Connor, et al., 2002; Horne & Reyner, 1995), accounting for up to 40% of road crashes (Fletcher, et al., 2005). The number of fatigue-related crashes reported is most likely underestimated due to a lack of a reliable method to measure objectively the level of fatigue after a crash (Dobbie, 2002) and by the driver's denial that they had fallen asleep while driving for fear of prosecution or loss of insurance claims (Horne & Reyner, 1995). Furthermore, survey research suggests that fatigue is prevalent among drivers. For example, a survey among New York State drivers found that 54.6% of the drivers had driven while fatigued within the previous year (McCartt, Ribner, Pack, & Hammer, 1996). An additional area of concern is the lack of a so called "gold standard" definition to describe the experience of tiredness, with terms such as fatigue, sleepiness and drowsiness often used interchangeably (Shen, Barbera, & Shapiro, 2006). It is accepted that developing definitions has proven to be difficult as the concepts of sleepiness and fatigue are known to be complex phenomena involving physical, psychosocial and behavioral processes (Shen, et al., 2006). Approaches that have been employed to measure aspects of "tiredness" include: (i) performance decrement measures that focus on reduced alertness (Williamson, Feyer, & Friswell, 1996). (ii) Physiological measures that attempt to capture the individual's physical tiredness based upon factors such as time of the day or the individual's sleep debt (ie. the cumulative effect of not getting enough sleep). Drowsiness, for instance, is thought to be a state that varies between wakefulness and sleep, and believed to occur before the onset of stage 1 micro-sleep (Johns, 2000). Sleepiness on the other hand, has been defined as an individual's inclination to sleep, sleep propensity or as the difficulty remaining awake even while carrying out activities (Shen, et al., 2006). Sleepiness is thought to be related primarily to circadian rhythm and homeostatic influences (Philip et al., 2005). (iii) Psychological or self-report measures.

For instance, the term “fatigue” is often used to refer to the subjective nature of tiredness (Craig, Tran, Wijesuriya, & Boord, 2006). Brown (1994, p. 298), for instance, describes fatigue as a “subjectively experienced disinclination to continue performing the task at hand”.

Due to the above limitations in our understanding of fatigue, this paper will use the term “fatigue” in a broad sense to refer to a state that involves psychological (mental) and physical tiredness or exhaustion. In terms of driving performance, it is quite likely and reasonable to assume that fatigue involves both mental (eg. driving workload, perception of driving difficulty and one’s state and trait anxiety level) and physical components (eg. time of the day, propensity to fall asleep, and health status). Given the variety of definitions used in fatigue research, we believe it important to clarify the multiple determinants of fatigue by studying various types of fatigue outcome measures as this could result in an improved understanding of the nature of fatigue (Craig, et al., 2006). Usually, researchers employ a single measure of fatigue outcome such as a performance decrement measure or self-reported fatigue. Craig, et al., (2006) investigated the psychological determinants of fatigue by employing a variety of fatigue outcome measures, including performance decrement, physiological and psychological outcome measures. They found that psychological (self-report) determinants contributed strongly to psychological outcome measures. However, psychological factors were shown to have little association with performance decrement and physiological fatigue outcome measures (Craig, et al., 2006). Craig et al., (2006) concluded that this lack of association between physiological and psychological factors supported a two-level processing model of fatigue (Verwey & Zaidel, 2000) in which physiological factors tap into automatic lower level processing, while the psychological factors tap into higher-level “executive” cognitive processes.

Psychological factors have been found to be determinants of fatigue. For example, an extraversion/ sensation seeking dimension has been found to be implicated in fatigue (Craig, et al., 2006; Thiffault & Bergeron, 2003; Verwey & Zaidel, 2000). In contrast, De Vries and Van Heck (2002) found that persons more likely to fatigue were those who scored lower on measures of extraversion. Anxiety is another factor that has been shown to predispose an individual to fatigue. Higher anxiety levels increase the tendency to fatigue (Craig, et al., 2006; Lal & Craig, 2002), while Jiang et al., (2003) found that individuals with high trait anxiety were more susceptible to life stresses and therefore, were more prone to fatigue. Physiological determinants of fatigue have also been widely researched such as the electroencephalogram (EEG) in which significant changes in the activity of delta, theta and alpha wave activity has been found to be associated with driver related fatigue (Lal & Craig, 2002; Macchi, Boulos, Ranney, Simmons, Campbell, 2002). The electrooculogram (EOG) or eye movement/ blink rate signal has been found to be an indicator of the onset of fatigue (Stern, Boyer, & Schroeder, 1994) and heart rate variability (HRV) and heart rate (HR) have also been shown to be potential indicators of fatigue (Verwey & Zaidel, 2000), where it has been shown that the sympathetic activity component of HRV is related to fatigue in a simulated driving study. Though there have been a number of studies that have investigated determinants of fatigue, few if any have studied the relationship of both psychological and physiological factors using a variety of outcome measures. Therefore, this study was designed to determine risk factors that may be associated with driver fatigue.

METHODS

Participants

Fifty non-professional drivers with a mean age of 31.7 years (SD=12.5; 23 females and 27 males) participated in a simulated driving session in a temperature controlled laboratory (24-25°C). Subjects were randomly selected from a large group that consisted of university students and staff as well as people from the general community.

Participants were only admitted into the study if they were currently healthy, did not have a diagnosed sleep disorder (as determined by a pre-study interview), had a current drivers license and reported no prior brain disease or injury. For the 24 hours prior to the experiment participants were asked to refrain from drinking alcohol and for 12 hours prior to the study, from drinking caffeine based drinks. The study was approved by the institution's research ethics committee and participants were only entered into the study after informed consent.

In order to avoid the potential confounding influence of circadian rhythm on the EEG participants were tested in one of two time periods during the day, that is, 9.00-12 noon and 2.00-5.00pm. Forty percent of the subjects were tested in the morning and 60% in the afternoon. These two periods have been shown to be similar in circadian rhythm influence (Cummings, Dane, Rhodes, Lynch, & Hughes, 2000) and avoids the period of time in which the greatest change in EEG magnitude occurs, that is, from 12 noon to 1 pm (Cummings et al., 2000). However, the subjects who were assessed in the 9-12 period were found to have lower levels of self reported fatigue than those assessed in the 2-5 period (difference in the Chalder Fatigue Scale of 9.4 in the morning compared to 13.9 in the afternoon session; $p < .05$). Furthermore, a small but consistent increase in theta wave activity was found in the afternoon subjects. Delta, alpha and beta wave activity was not different between the two groups. Although the afternoon group may have begun the experiment slightly more fatigued, both groups were found to fatigue to the same extent during the monotonous task as measured by the Chalder Fatigue Scale and the mean time it took for the subjects in both the groups to fatigue was also not significantly different.

Study Design and Procedure

The study consisted of assessing physiological, psychological and demographic data for each participant in order to establish baseline variability. This was followed by a cognitive-motor vigilance task involving the Divided Attention Steering Simulator or DASS (Stowood Scientific Instruments). The aim of the driving task was to steer an image of a car down the centre of the road using a game steering wheel (Grandprix 1, Thrustmaster, USA). At the same time participants were asked to monitor numbers (digits from 1-9), which changed randomly, approximately every 8-10 seconds, and which were displayed at the corner of the computer screen. To test vigilance and reaction time, the subjects were required to identify the number "2" when it appeared by pressing a button on the same side of the steering wheel as it appeared on the screen. During the simulator task participants' faces were videoed, as they were required to 'drive' in the centre of the road (shown on the computer screen) till they exhibited signs of fatigue. The maximum time was set at two hours of driving for all subjects, and if a subject did not show signs of fatigue in the two hours they were eliminated from the study and another subject selected to replace them.

However, all the original 50 subjects showed definite signs of fatigue during the task within the time specified. Participation in the task was terminated by the researcher when participants continued to exhibit either (i) fatigue related facial symptoms such as head nodding with increased blink rates and prolonged eye closure, or (ii) erratic driving behaviour, that is, deviating off the road for more than 15 seconds.

Video Analysis

The participants were monitored by video throughout the simulated driving task in order to record their facial expressions and mannerisms. These video recordings were used offline in order to determine the time each participant took to fatigue. Observation of fatigue symptoms such as head nodding, yawning, sore and tired eyes and prolonged eye closure (in conjunction with EOG analysis) were used to determine the time taken to fatigue. Eye closure times of at least 400 ms during eye blinks were considered evidence (Caffier, Erdmann, & Ullsperger, 2003) that the subject was definitely experiencing fatigue (as determined by the EOG signal in post analysis). The video analysis component of the physiological measure was shown to be a reliable assessment.

Psychological and physiological measures

All participants were required to complete a battery of questionnaires that were used to assess their personality, mood-state, anxiety and lifestyle before the task. These included (a) the state-trait anxiety measured by the Spielberger State-Trait Anxiety questionnaire (Spielberger, Gorsuch, Luschene, Vagg, & Jacobs 1983); (b) an assessment of mood by the Profile Of Mood States (POMS; McNair, Lorr, & Droppleman, 1971) which includes the six POMS sub-constructs and the total POMS mood state score; and (c) an assessment of personality using the primary and secondary factors of the 16 Personality Factor (16 PF) questionnaire (Cattell, Eber, & Tatsuoka 1986). All these questionnaires have been shown to be reliable and to have acceptable validity.

Sleepiness was measured by the Epworth Sleepiness Scale (ESS; Johns, 1991), while the Stanford Sleepiness Scale (SSS) was used as a global measure of sleepiness (Hoddes, Zarcone, Smythe, Phillips, & Dement, 1973). Health status was measured by the Lifestyle Appraisal Questionnaire (LAQ; Craig, Hancock, & Craig, 1996), which includes body mass index, alcohol intake, medications, cigarette intake, exercise, social support and so on. Scores above 20 on the LAQ suggest lower health status (Craig et al., 1996). Electroencephalogram (EEG) was collected while participants were seated in an upright position, sitting quietly and looking ahead with minimum movement, while subjects alternately closed and opened their eyes. EEG baseline values were taken from a mean of the three 30 seconds eyes closed recordings. The Biosemi™ Active-Two System was used (www.biosemi.com) to record the EEG. Thirty-two EEG channels were recorded following the International 10-20 system, referenced to linked ears and sampled at 1025Hz. Mean magnitude values from delta activity (0.5-3.5 Hz), theta activity (4-7.5 Hz), alpha activity (8-13 Hz) and beta activity (14-30Hz) were used. HRV was assessed by measuring the electrocardiogram in which two surface flat-type Ag-AgCl Biosemi™ Active electrodes were placed on the left side of the chest region. The ECG signal was acquired at a sample rate of 2048Hz for five minutes. Electroculogram (EOG) data was taken throughout the simulated driving task and enabled the identification of possible artifact (eg eye blinks and movements).

Peripheral skin temperature was recorded using a temperature probe made of heat-sensitive electrical material (thermistors). This temperature probe was attached to the upper right hand part of the chest using microporous surgical tape (Livingstone™). A Nihon Kohden TR-753T respiration belt was used to measure respiration. Systolic and diastolic blood pressure of each participant was recorded using an automated blood pressure monitor that has demonstrated reliability and validity (Omron: HEM-402C).

Fatigue Outcome measurements

Fatigue was measured three ways: (i) a physiological measure that assessed the time it took for a subject to show signs of fatigue based on facial appearance and eye blink duration (whichever occurred first). Fatigue was initially recognized by the observation of the consistent appearance of physical facial symptoms such as head nodding and yawning (validated by video analysis). In post analysis, the presence of fatigue and then the time it took for the driver to fatigue was validated by the video analysis of facial symptoms and the duration of eye closure during blinking as determined by the EOG signal. The higher the score of the physiological measure, the longer it took for subjects to fatigue. (ii) A psychological measure using a questionnaire called the Chalder Fatigue Scale (CFS), which has been shown to have acceptable reliability and validity (Chalder, et al., 1993). (iii) A measure that contained physiological and psychological components. This was created by integrating the above physiological and psychological outcome measures into a weighted combination, here called the Overall Fatigue outcome measure. The physiological and the psychological measures were weighted equally and added to obtain an overall fatigue measure. Scores were calculated as a percentage value and weighted so that higher scores indicated higher levels of fatigue.

Data Analysis

To determine the unique contribution of the psychophysiological factors to the fatigue outcome measures, all variables were then entered into a series of forward deletion multiple regression analyses (entry criteria set at F of 1.5) and the regression analysis was stopped when the strongest five factors were isolated. All analyses were performed using Statistica software (Version 7, Statsoft).

RESULTS

Table 1 shows the means for the physiological and fatigue outcome measures. The majority of the group was healthy with the LAQ mean falling well below the unhealthy range (> 20 for people aged 20 to 50 years; Craig et al., 1996). This is also suggested by the mean scores for blood pressure and heart rate, and only 14% of the sample reported that they smoked cigarettes. The subjects were found to have fatigued as a result of the driving task. For example, blink rates (blinks per minute) of the group taken after 5 minutes into the task and at the time they were asked to stop the task were shown to have significantly increased from 15.98 to 24.5 ($t=-5.11$, $p<.001$). Furthermore, the Stanford Sleepiness Scale and the CFS scores increased as a function of the driving (eg. $t=4.1$, $df=49$, $p<.05$ for the CFS).

In order to determine potential risk factors that uniquely contributed to the Fatigue Outcome measures, multiple regression analyses were performed. The variables were divided into physiological factors (including ESS, SSS and LAQ measures), trait psychological factors (eg. the 16 PF primary factors) and state psychological factors (eg. POMS measures). Forward deletion multiple regressions were run till the strongest five variables were isolated that contributed to the fatigue dependent variables. The semi-partial correlation variances that each variable contributed to the fatigue outcome measures (Sp^2 as a percentage value) are also presented.

Physiological Fatigue Outcome measure.

The physiological factors accounted for 26% of the variance in the Physiological Fatigue Outcome measure ($R=.51$, $R^2=.26$, $p<.05$), with only peripheral temperature ($p<.05$; $Sp^2 = 8.1\%$) negatively contributing (that is, high temperatures related to quicker onset of fatigue) and EEG delta activity in the O2 cortical site ($p<.05$, $Sp^2 = 9.9\%$) negatively contributing (ie. higher amounts of delta activity related to quicker onset of fatigue). Trait psychological measures accounted for only 8% of the variance in the Physiological Outcome measure ($R=.29$, $R^2=.08$, $p<.05$), with only the extraversion factor Q2 ($p<.05$, $Sp^2 = 8.4\%$) positively contributing (low self sufficiency related to quicker onset of fatigue). State psychological measures were not found to contribute significantly to the Physiological Fatigue Outcome measure.

Table 1. Descriptive statistics for the physiological independent measures and for the fatigue outcome measures (dependent variables).

Physiological Factors	Mean	±95% CI
Age	31.7 (12.5)	28.1-35.2
LAQ	13.8 (6.1)	12.1-15.6
Systolic BP	117.7 (10.6)	114.7-120.7
Diastolic BP	70.3 (11.4)	67.1-73.5
Temperature (°C)	33.2 (1.3)	32.8-33.6
Breaths/min	15.6 (3.6)	14.6-16.7
Heart Rate (bpm)	71.2 (11.3)	67.9-74.4
Sympathetic (low spectral HRV)	0.07 (.04)	0.06-0.08
Parasympathetic (high spectral HRV)	0.19 (.10)	0.17-0.22
LF/HF (HRV)	0.40 (.16)	0.36-0.45
Epworth sleepiness Scale	8.1 (4.0)	6.9-9.2
Pre: Stanford Sleepiness Scale	3.5 (1.3)	3.1-3.8
Post: Stanford Sleepiness Scale	4.7 (1.3)	4.3-5.1
Fatigue Outcome dependent variables		
Physiological	30.3 (13.8)	26.3-34.2
Chalder Fatigue Scale (pre task)	12.1 (6.9)	10.1-14.0
Chalder Fatigue Scale (post task)	16.8 (7.9)	14.5-19.0
Overall Fatigue Outcome Measure	48.8 (13.6)	44.9-52.7

CFS Fatigue Outcome measure (pre task).

The physiological factors accounted for 48% of the variance in the pre task CSF Outcome measure ($R=.69$, $R^2=.48$, $p<.01$), with the Stanford Sleepiness Scale measure (SSS) before the task ($p<.01$; $Spc^2 = 10.3\%$) positively contributing (that is, higher levels of sleepiness related to greater levels of psychological fatigue). Health status as measured by the LAQ ($p<.05$, $Spc^2 = 8.5\%$) was found to positively contribute (ie. less healthy lifestyle status related to higher levels of psychological fatigue), as was systolic BP ($p<.01$, $Spc^2 = 15.3\%$) which was found to negatively contribute (ie. low systolic BP related to higher levels of psychological fatigue). Heart rate ($p<.01$, $Spc^2 = 9.9\%$) was found to positively contribute with higher heart rate related to higher levels of fatigue. Trait psychological factors were found to account for 42% of the variance in the pre task CSF Outcome measure ($R=.65$, $R^2=.42$, $p<.01$), with the extraversion factor “self sufficiency” significantly contributing ($Q2$, $p<.05$, $Spc^2 = 4.9\%$), that is, high levels of extraversion (or low self sufficiency) was found to be related to high levels of fatigue. Trait anxiety ($p<.01$, $Spc^2 = 30\%$) was found to be positively related to the CFS Fatigue Outcome measure (ie. high levels of anxiety were related to high levels of fatigue). State psychological factors were found to account for 48% of the variance in the pre task CFS Outcome measure ($R=.69$, $R^2=.48$, $p<.01$), with three factors found to significantly contribute. POMS total score ($p<.01$, $Spc^2 = 30.3\%$) was positively related (higher negative mood scores related to higher fatigue scores). POMS depression and tension were found to contribute ($p<.01$, $Spc^2 = 9.5\%$ for depression and $p<.01$, $Spc^2 = 12.9\%$ for tension) to higher levels of fatigue.

Overall Fatigue Outcome measure.

The physiological factors accounted for 38% of the variance in the Overall Fatigue Outcome measure ($R=.61$, $R^2=.38$, $p<.01$), with systolic BP ($p<.05$, $Sp^2 = 9.4\%$) found to negatively contribute (ie. low systolic BP related to higher levels of psychological fatigue). Heart rate ($p<.01$, $Sp^2 = 11.6\%$) was found to positively contribute with higher heart rate found to be related to higher levels of fatigue, while peripheral temperature ($p<.05$; $Sp^2 = 5.9\%$) was found to positively contribute (that is, high temperatures related to higher levels of fatigue). Trait psychological factors were found to account for 35% of the variance in the Overall Fatigue Outcome measure ($R=.59$, $R^2=.35$, $p<.01$), with two extraversion factors significantly contributing, that is, self sufficiency (Q2, $p<.05$, $Sp^2 = 9.5\%$) and privateness (N, $p<.05$, $Sp^2 = 10.5\%$). High levels of extraversion (ie. low self sufficiency and low privateness) were found to be related to high levels of fatigue. The 16 Personality Factor Q4 “Tension” ($p<.05$, $Sp^2 = 8.9\%$) was found to be positively related to the CFS Fatigue Outcome measure (ie. high levels of tension related to high levels of fatigue) and the factor M “Abstractedness” ($p<.05$, $Sp^2 = 8.9\%$) was found to be positively related to fatigue (higher levels of abstractedness related to higher levels of fatigue). State psychological factors were found to account for 23% of the variance in the Overall Fatigue Outcome measure ($R=.48$, $R^2=.23$, $p<.01$), with two factors found to significantly contribute. POMS total score ($p<.01$, $Sp^2 = 15.7\%$) was positively related (higher negative mood scores related to higher fatigue scores). Additionally, POMS depression was found to contribute ($p<.01$, $Sp^2 = 9\%$ for depression) to higher levels of fatigue.

DISCUSSION

Table 2 presents a summary breakdown of the potential risk factors related to driver fatigue. An inspection of Table 2 demonstrates that a driver fatigue risk profile is emerging, depending on the type of fatigue outcome measure. These are: (i) physiological fatigue was related to risk factors such as higher amounts of slow wave EEG delta activity and warmer periphery, fitting a pattern of someone who is physically tired. It was also associated with an extraversion personality trait. It was interesting to note that factors like smoking status, health status, and sleepiness were not found to be uniquely associated with physiological fatigue. (ii) Self-reported fatigue (CFS) was related to potential physical risk factors such as increased sleepiness, poor health status, low systolic BP and increased heart rate were related to driver fatigue. Self-reported fatigue was also related to trait psychological risk factors such as an extraverted personality and trait anxiety. State measures also contributed such as negative mood states. (iii) The combined physical and psychological measure of fatigue was related to potential physical risk factors such as low systolic BP, higher HR and warmer peripheral temperatures. Psychological trait factors included an extraverted, tension prone personality. The study findings also suggest that a person who is more abstract has a greater risk of experiencing fatigue. State measures included negative mood states.

The trait psychological measures may well be useful in predicting people who are at risk of driver related fatigue accidents. People who are at risk could well be those with an extraverted and tension prone personality. People with a tendency towards extraversion are believed to lack personal and individual resolution and depend more upon others and this study suggests such people have higher risks of experiencing driver related fatigue. Higher levels of trait anxiety and a tension prone personality were also found to be associated with driver fatigue. In the present study it was interesting that extraversion also predicted physiological fatigue. This suggests that the risk of experiencing physiological fatigue is partly determined by having an extraverted personality. This demonstrates the complex nature of driver related fatigue, and reinforces the need to study multi-factorial fatigue determinants and a range of fatigue outcome measures. The findings from this study also suggest that a self report fatigue measure could possibly be used as a fatigue countermeasure strategy.

In contrast, physiological fatigue as measured by the presence of physical symptoms of fatigue, had the lowest amount of variance explained and therefore may be the most difficult to predict and this is somewhat concerning given that the majority of proposed fatigue countermeasures are based on monitoring physical aspects of fatigue (Lal & Craig, 2002). It was also interesting to note that a measure of sleepiness was found to be significantly associated with self-reported fatigue rather than with physical fatigue. This reinforces the importance of appropriately defining factors related to the fatigue process (Craig et al., 2006; Johns, 2000). Perhaps if future studies employed a range of fatigue outcome measures then the association between fatigue and EEG and other physiological factors would be clarified.

Research has identified a need for improvement in fatigue self-assessment strategies (Fletcher, McCulloch, Baulk, & Dawson, 2005), and there is a developing recognition that self-assessment of fatigue could be a possible fatigue countermeasure strategy. This research has demonstrated the importance of isolating trait and state psychological measures that are associated with driver fatigue. Isolating reliable physical and/or trait measures (such as an extraverted and tension prone personality) that are related to driver fatigue would strengthen our capability to predict drivers that are at risk of fatigue related accidents. On the other hand, isolating reliable state measures (such as negative mood states including anger, anxiety, confusion and low levels of vigor) would strengthen our understanding of factors that may contribute to elevated risks of accidents. The findings of this research therefore strengthen the possible use of self-assessment as a fatigue countermeasure. Unfortunately, much still needs to be explored in this self-assessment area before it could be used effectively to reduce road accidents (Fletcher, et al., 2005). The challenge for improving road safety will involve the continued development of the physiological and psychological profile of a driver who has a higher risk of fatiguing and becoming drowsy while driving, and then integrating such a profile into an effective fatigue countermeasure strategy.

Table 2. Profile of factors associated with the various fatigue outcome measures

Physiological measure of fatigue	Pre-task psychological measure of fatigue	Overall measure of fatigue
Warmer peripheral temperatures	Physical attributes such as higher levels of sleepiness, low systolic BP and higher HR	Physical attributes such low systolic BP, higher HR and warmer peripheral temperatures
High levels of baseline delta wave EEG activity	Less healthy lifestyle status	Extraverted personality traits (low self sufficiency and privateness)
Extraverted personality (lower levels of self-sufficiency)	Extraverted personality trait (low self sufficiency)	Tension prone personality
	Higher levels of trait anxiety	More abstract personality
	Negative mood states	Negative mood states

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