
Entrepreneurship: an insomniac discipline? An empirical study on SME owners/directors

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Abstract: The aim of this article is to highlight an area rarely addressed: the sleep patterns of SME owners. We are all aware of the importance of sleep for one's health, but sleep remains an under-investigated subject. The sleep patterns of SME owners/directors and their impact on alertness are therefore worthy of investigation. We draw on three complementary sleep assessment tools: the Pittsburgh sleep quality index, the Epworth sleepiness scale and the fatigue severity scale. We reveal our initial results based on these tools and emphasise the need to go further by comparing these tools to problems rooted in entrepreneurship.

Keywords: small and medium enterprises; owners/directors; sleep patterns.

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1 Introduction

According to Buttner (1992, p.223), "entrepreneurship is a risky process". The literature on health entrepreneurship shows that running a business is generally a significant source of work tension for entrepreneurs (Lechat and Torrès, in press; Tomasino, 2007; Torrès, 2011). Work tension can be defined as the extent to which individuals experience psychological symptoms associated with work-related stress (Hmieleski and Carr, 2007). Entrepreneurs' work involves long working hours, time constraints, role conflict or ambiguity, operating with a lack of essential resources, and addressing the high dependence of family members, employees and investors on the success of the company (Jamal, 1997; Rauch et al., 2007). The demands of work can be a potential source of work tension. Symptoms of work-related stress include a lack of concentration, sleep latency or an inability to sleep when the entrepreneur is unable to wind down after work (Hmieleski and Carr, 2007).

A case control study on healthy employees has shown a relationship between the occurrence of sleep disorders and the presence of professional stressors such as cognitive saturation (excessive mental load), multiplicity of tasks, shortening deadlines, aggressiveness of interlocutors, or inadequate staffing levels (Åkerstedt et al., 2002). Entrepreneurs are also exposed to these professional stressors (Baron, 1998). Some researchers have shown that entrepreneurs report higher job demands and workloads than employees (Chay, 1993; Stephan and Roesler, 2010). Studies conducted in France, Germany, Great Britain and Italy show that the main factors associated with insomnia are stress, loneliness, personal or professional life events and high work overload (Chan-Chee et al., 2011; Léger et al., 2011; Ribet and Derriennic, 1999). Ribet and Derriennic (1999) have shown that large amplitudes of shift work schedules or time constraints in performing a task are risk factors for sleep disorders. The results of the few epidemiological studies to have included occupational categories are mixed. In a survey conducted by Quera-Salva et al. (1991), insomnia was found to be less prevalent among farmers, but there were no significant differences for other socio-professional categories. A survey conducted by Léger et al. (2000) also failed to find any association between occupational statuses and sleep disorders. However, a study of a French sample conducted by the French Institute of Sleep and Vigilance (Léger and Adrien, 2012) shows that 25% of French people sleep fewer than 6 hours per night. This proportion of the sample includes higher categories such as owners/directors, craftsmen and traders, executives, intellectual professions and intermediate professions. However, most studies focus on employees' sleep patterns and how they affect their productivity. We assume this approach is adopted because employees experience significantly low levels of job control; therefore, it is the responsibility of the employer or the human resources department to worry about their well-being at work. On the contrary, by experiencing higher levels of job control, SME owners/directors could be expected to have greater flexibility to optimise the balance between their careers and private lives (Chay, 1993; Lewin-Epstein and Yuchtman-Yaar, 1991; Parslow et al., 2004).

The objective of this article is to provide new knowledge and statistics regarding sleep patterns among SME owners/directors, drawing on recent studies on this subject. Our unique contribution is an improved understanding of the structure of SME owners'/directors' sleep patterns and its effect in terms of vigilance. We measured the sleep patterns and vigilance of 282 French SME owners/directors using three tools, one measuring the quality of sleep and two others measuring sleepiness and fatigue. The initial results of this survey highlight certain sleep-related characteristics of these business leaders.

2 Literature review

2.1 Sleep patterns of SME owners/directors

Studies have shown that SME owners/directors are part of the population who work the most (Jamal and Badawi, 1995). DARES (2003–2010) shows that in France the average time spent at work by employees are 39.4 hours per week. The occupational group who works the most is the self-employed, a banner label for all employers, domestic helpers and independent workers with no employer. They work approximately 53.4 hours or more per week, 14 hours more than employees (DARES, 2003–2010). Validated data from the recent study conducted in France by the Observatoire Amarok and the insurer Malakoff Mederic show that 88% of SME owners/directors interviewed reported working at least 40 hours per week, with one-third working more than 60 hours. Their working schedule is long: 57% of them work six days per week. “Work and its demands profoundly dominate the lives of the self-employed” [Jamal, (2007), p.250]. This characteristic of the entrepreneurial world explains why work overload, cognitive saturation, stress, loneliness, low flexibility and high versatility can directly impact the quality and quantity of sleep. Indeed, a survey conducted by Léger et al. (2011) on the French population shows that people working more than 10 hours per day are usually ‘short sleepers’ and have a higher prevalence of insomnia and sleepiness. According to sleep experts, a person must sleep for as long as is needed, and this amount can differ from one individual to another. However, the links between sleep and work are obvious. Weekdays are traditionally considered to be made up of eight hours of work, eight hours of sleep and eight hours of ‘free time’. The World Health Organization has estimated that the ideal average amount of sleep is approximately 7 to 8 hours per night. The few empirical studies to have looked at French company directors show that these directors have a prevalence of partial sleep deprivation, which can lead to sleep debt (Leger and Adrien, 2012; Léger et al., 2000, 2011) and a decline in sleep quality (Léger et al., 2007; Torrès and Chabaud, 2013). However, these studies offer heterogeneous and contrasting results because executives are often studied alongside storekeepers, craftsmen, independent professions or executive managers.

Mullens et al. (2004) are among the few sleep specialists who have shown an interest in the sleep of ‘decision makers’, including owners/directors, craftsmen, executive managers and independent professionals. Taking into account industry sector and the size and legal structure of companies, they surveyed a representative sample of 1,981 business owners in Tarn (Midi-Pyrénées, France). The authors observed cases of sleep debt during work hours, with 49% of the owners/directors surveyed reporting poor sleep quality and problems of insomnia due to work circumstances such as worries or overworking.

Concerning specific aspects of sleep quality, 21% of those surveyed suffered from sleep latency and 25% from nocturnal awakenings. To the question ‘Why do you think you suffer from poor quality of sleep?’, respondents answered that it was because of stress (25%), worries (18%), family (9%), health issues (9%) or anxiety (6%). Sleepiness during work hours affected 47% of the owners/directors surveyed. The Observatoire Amarok conducted a study on the health of owners/directors in October 2011. The survey was carried out by telephone, with a representative sample of 700 French SME owners/directors (excluding the farming sector). The representativeness of the sample was based on four criteria: industry sector, company size, age and gender. Regarding sleep quality, 55.4% of respondents reported sleep disorders, and 30.3% said they benefited from adequate sleep.

“Sleep is a periodic state characterized by a loss of conscious awareness and in which the interaction with the external environment is abolished or reduced” (De Saint-Hilaire, 2006). Sleep consists of different phases, which directly or indirectly affect the psychomotor, cognitive and physical activities of an individual (Institut national du sommeil et de la vigilance (Leger and Adrien, 2012). The effects of sleep loss reduce an individual’s work capacity, concentration and performance (Geiger-Brown et al., 2012), and of course, concentration is very important when running a business because quick decisions and many different tasks are required. It seems probable that insomnia affects sick leave and other indicators of workplace productivity. Several preliminary studies have suggested that insomniacs report more absenteeism at work than do persons who sleep well (Léger et al., 2002; Leigh, 1991). Kuppermann et al. (1995) reported that workers with sleep issues have lower self-ratings for job satisfaction and job performance. As a long-term problem, insomnia may affect daytime behaviour. Professional activity can heavily affect an individual’s sleep, and in turn, a lack of sleep can have a significant effect on behaviour and abilities (Kaliterna et al., 2004). Studies on this issue have usually involved employees (Folkard and Tucker, 2003; Léger and Guilleminault, 1997), but the positive or negative impact of sleep management on the vigilance of SME owners/directors has received little attention.

2.2 *Sleep and alertness*

Overwork and a lack of sleep inevitably lead to a decrease in vigilance, which may result in poor performance and an increased risk of accidents (Pilcher and Huffcutt, 1996; Macchi et al., 2002). The impact of sleepiness on performance has been widely studied in sectors such as transport and industry (Horne and Reyner, 1999). Following these studies, many researchers have highlighted the importance of developing and implementing countermeasures against fatigue and sleepiness (Macchi et al., 2002). In the USA, the National Highway Traffic Safety Administration reported that fatigue and sleepiness were involved in 15% of fatal truck accidents.

Vigilance is the “state of reactivity to the environment in which we find ourselves when we are awake” (Leger and Adrien, 2012). Alertness varies according to the time of day but also according to stimulation and personal motivation. It is possible to appreciate the consequences of a lack of vigilance for certain activities in terms of performance linked to alertness. Many intellectual and motor activities are modified by a decrease in vigilance.

Studies have demonstrated the impact of acute and chronic sleep deprivation on the physical, mental and cognitive abilities of individuals (Åkerstedt et al., 2002). Indeed,

acute sleep deprivation or a deterioration in sleep quality can cause many physical and psychological dysfunctions, which are often relatively mild, as in the case of fatigue and sleepiness (Léger and Guilleminault, 1997); sometimes more problematic as in the case of irritability, dizziness, anxiety, and loss of appetite; and can be even more serious, as in the case of depression, digestive disorders or heightened predisposition to disease (Giordanella, 2006).

Sleepiness is identified in a decrease in the physiological arousal manifested by a need to sleep (Besset, 2004). There are two types of sleepiness: physiological, resulting from sleep debt, and pathological, a symptom of sleep disorders. Some studies have reported the effects of fatigue and sleepiness on individuals, as well as on their performance. It has been shown that sleepiness can lead to a lower level of attention and alertness (Léger and Guilleminault, 1997), preceded by a reduction in both physical and mental responses; memory loss or a reduced ability to remember details; a reduced ability to stay awake (e.g., falling asleep while operating machinery or driving a vehicle); or an increase in distractibility. According to the study conducted by the French Institute of Sleep and Vigilance in 2014, 27% of French suffer from sleepiness. In sum, there are many occupational factors that reduce the sleep and daytime vigilance of SME owners/directors. Thus, we expect the majority of SME owners/directors to report poor sleep quality and insufficient quantities of sleep during the week. As we discuss in the following sections, a variety of reasons can account for this behaviour. However, what interests us is the impact of sleep patterns on levels of sleepiness and fatigue among SME owners/directors.

3 Methods

3.1 Sampling frame, questionnaire distribution, and collection

The sample used is derived from the database of the Observatoire Amarok. Established in 2012, this observatory aims to study the beliefs, attitudes and behaviour of SME owners/directors in France. The cohort is made up of 338 owners/directors from French SMEs, representing different company types, industries and locations. The voluntary nature of participation in the study generated non-representative sampling. Of the 338 owners/directors in this cohort, 287 were available to answer an online questionnaire. The methodology adopted is based on a study of quantitative cross-sectional data. The questionnaires were completed between May and July 2014. We excluded from our sample all companies not considered SMEs under the European Commission's definition. SMEs are "enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/or an annual balance sheet not exceeding 43 million euro" (European Commission, 2003). We also excluded companies that depend on another company.

The sample comprises 64 women (22.3%) and 223 men (77.7%). Their mean age is 44.46 (SD = 6.64). Overall, the sample is rather young, with 52.3% of participants under 45. Their level of education is quite high, with only 13.6% reporting a low level of education. The majority of respondents (51.9%) are at the head of a company with fewer than 10 employees (micro-enterprise as defined in the European Union). Approximately 37.3% run a small enterprise (SE) with 10 to 49 employees, and only 9.1% are at the head of a medium-sized enterprise (ME) with 50 to 249 employees. The main activities of

respondents represent all market sectors with a very high proportion of business services (51.9%). In addition to the services sector, the following were represented: industry (16%), construction (14.3%), commerce (13.6%), hotel trade (3.5%) and transport (0.7%).

3.2 *Measurement*

We used the 19-item Pittsburgh sleep quality index (PSQI) (Buysse et al., 1989). The index was created to measure the quality of sleep and to screen for related disorders in the general population over a period of one month. It differentiates between 'good' and 'bad' sleepers (Buysse et al., 1989).

The PSQI is composed of 19 self-reported questions and five additional questions for the spouse or roommate, where applicable. The items are grouped into seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. The addition of each component provides a total score. The first four items are open questions. Subjects rate the other five items on a four-point scale ranging from 0 (not at all) to 3 (extremely). The total score ranges between 0 and 21. A score of greater than 5 indicates disturbed sleep with respect to one or more components. In our analysis, higher values for this variable correspond to low levels of sleep quality. Table 1 shows the mean and standard deviation (SD) of all the PSQI components.

In addition to the PSQI, we asked three questions related to sleep duration. First, we asked how many hours of actual sleep respondents obtained at night during weekends and during holidays. Second, we asked how many hours of actual sleep they felt they needed ideally?

Vigilance can be evaluated by subjective measurement tools such and we used the Likert-type eight-item Epworth sleepiness scale (ESS) because it has been widely used to measure sleepiness with a multitude of samples, whether in a clinical or research setting.

The ESS was developed by Johns (1991). This scale measures the general level of sleepiness, using eight different situations. Some situations are known to be highly soporific and some less so. The ESS generates an overall score based on the level at which an individual may feel drowsy in eight situations. Subjects rate the eight situations on a four-point scale ranging from 0 (no chance of dozing) to 3 (high chance of dozing). The total score ranges from 0 to 24 and is divided into three levels: normal sleepiness (≤ 10), abnormal sleepiness (11–15) and severe sleepiness (≥ 16) (Olathe et al., 2012). In our analysis, high values using the ESS represented high levels of sleepiness. The mean score is 11.46 (SD = 5.34).

Fatigue is a subjective and non-specific symptom found in various pathologies such as depression and influenced by many factors (treatments, lack of sleep, etc.). In addition, several types of fatigue can be identified: physical and mental fatigue occurring during an activity and manifested by a feeling of exhaustion and a lack of energy or an inability to produce an effort; and asthenia perceived as a feeling of exhaustion at rest. The fatigue severity scale (FSS) was developed by Krupp et al. (1989). With nine items assessing physical fatigue, the impact of fatigue in the psychosocial environment and fatigue in general (three items in each category), the FSS measures the impact of fatigue on various functions more than the intensity of the symptoms. Subjects response to the nine questions using a seven-point Likert-scale ranging from 1 (strongly disagree) to 7 (strongly agree). The scores from each question are totalled, with low scores indicating

low fatigue in everyday life. The total score for the FSS is calculated as the average of the individual item responses. The mean score on the FSS is 3.59 (SD = 1.17).

Table 1 Descriptive statistics (N = 282)

<i>Variables</i>	<i>Mean</i>	<i>SD</i>
<i>Pittsburgh sleep quality index</i>		
Sleep disturbances	1.40	0.56
Subjective sleep quality	1.29	0.63
Daytime dysfunctions	1.13	0.71
Sleep latency	1.00	0.84
Sleep duration	0.59	0.68
Habitual sleep efficiency	0.34	0.67
Sleep medication use	0.20	0.64
<i>Epworth sleepiness scale</i>		
Lying down to rest in the afternoon when circumstances permit	2.34	.99
Watching TV	2.04	1.01
As a passenger in a car for an hour without a break	1.74	1.11
Sitting and reading	1.64	1.07
Sitting quietly after lunch without alcohol	1.40	1.00
Sitting inactive in a public place (e.g., theatre or a meeting)	.96	.94
In a car, whilst stopped for a few minutes in traffic	.96	.99
Sitting and talking to someone	.38	.59
<i>Fatigue severity scale</i>		
My motivation is lower when I am fatigued	5.03	1.64
Fatigue interferes with my physical functioning	4.00	1.70
I am easily fatigued	3.96	1.52
Fatigue interferes with my work, family or social life	3.74	1.86
Fatigue is among my three disabling symptoms	3.68	1.90
Fatigue interferes with carrying out certain duties and responsibilities	3.40	1.65
Fatigue causes frequent problems for me	2.98	1.57
My fatigue prevents sustained physical functioning	2.97	1.69
Exercise brings on my fatigue	2.52	1.46
<i>Key control</i>		
Age	44.46	6.64

Sleep patterns are associated with two major demographic criteria: age and gender (Beaudreau et al., 2012). Many researchers have highlighted the differences between men and women in terms of sleep patterns, revealing that women complain more often of insomnia than men do (Hohagen et al., 1993). However, these studies must be put into perspective because other factors could explain these differences, such as psychiatric disorders, endocrine factors or differences in attitudes towards insomnia or in self-perceptions of sleep (Voderholzer et al., 2003). Sleep researchers report that age can

also affect sleep patterns. According to Beaudreau et al. (2012, p.2) “sleep disturbances are highly prevalent in older adults”. Studies show that more elderly subjects tend to report problems while sleeping or difficulties in falling or remaining asleep (Suzuki et al., 2009). These factors were included in all of our analyses.

4 Analysis, findings, discussion

4.1 Analysis

Our sub-sample is composed of 282 SME owners/directors who agreed to respond to sleep-related questions. We used the PSQI, the ESS and the FSS. All the sleep questionnaires were normally distributed; the results of parametric tests are reported where appropriate.

We calculated descriptive statistics for the total sample and stratified them by gender and age. For the scales, we computed the mean and SD or N (%). Descriptions of key variables are provided in Table 1. We used the cut-off proposed in the literature for all the scales. A total PSQI score higher than five (> 5), an ESS score higher than ten (> 10) and an FSS score higher than four (> 4) were used to define clinically significant abnormalities (Buysse et al., 1989; Johns, 1991; Krupp et al., 1989). Groups were compared using Student’s t-test. To evaluate the reliability of each measure, we calculated internal consistency using Cronbach’s alpha. According to DeVellis (2003), a Cronbach’s alpha of 0.65 is the minimum for adequate internal consistency. Correlations were described using the Pearson correlation coefficient.

4.2 Findings

The PSQI consists of seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction (Buysse et al., 1989). The study of these components provides some insight into the sleep habits of SME owners/directors, including the most problematic aspects. The 19 items of the PSQI yielded adequate internal consistency for the overall PSQI score in the total sample ($\alpha = 0.65$ for seven elements) among respondents.

Table 2 PSQI internal consistency data

<i>PSQI components ($\alpha = 0.65$)</i>	<i>Correlation with overall score*</i>
Sleep quality	0.702
Sleep latency	0.613
Sleep duration	0.498
Sleep efficiency	0.530
Sleep disturbance	0.525
Sleep medication	0.380
Daytime dysfunction	0.514

Notes: N = 282. *Spearman correlation with overall score; p-values < 0.01 .

The cut-off for distinguishing between good and bad sleepers is 5. Subjects with PSQI scores greater than 5 are considered to suffer from poor sleep quality. The mean score of respondents is 5.94 (SD = 2.71).

Women have, on average, significantly worse quality of sleep than their male counterparts (PSQI means = 6.57 vs. 5.76). This is the only significant difference found between the groups of respondents.

At an individual level, the distribution of scores reveals that nearly half of respondents suffer from poor quality of sleep. We observe that 48.9% of the SME owners/directors interviewed report poor sleep quality (Figure 1). Torrès and Chabaud (2013) obtained similar results in their study, which showed that one out of every two SME owners/directors in France describes his sleep as poor. According to these authors, there is no discrimination based on gender, but rather on industry and age. Storekeepers and those aged under 50 suffer less from degraded sleep quality.

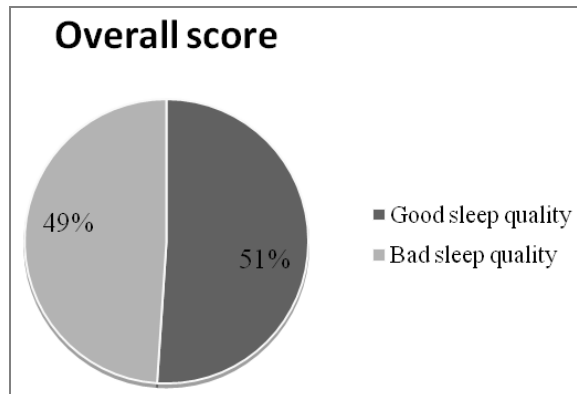
Table 3 Descriptive statistics

Group	PSQI ^a	Test-t (ddl) ^b
Men (n = 219)	5.76 (0.18)	-2.06 (280)*
Women (n = 63)	6.57 (0.38)	
Under 45 (n = 147)	5.93 (0.21)	-0.05 (280)
Over 45 (n = 135)	5.95 (0.25)	
Micro (n = 149)	5.99 (0.24)	0.31 (280)
SE or ME (n = 133)	5.89 (0.22)	

Notes: ^aMean score for the group (standard error).

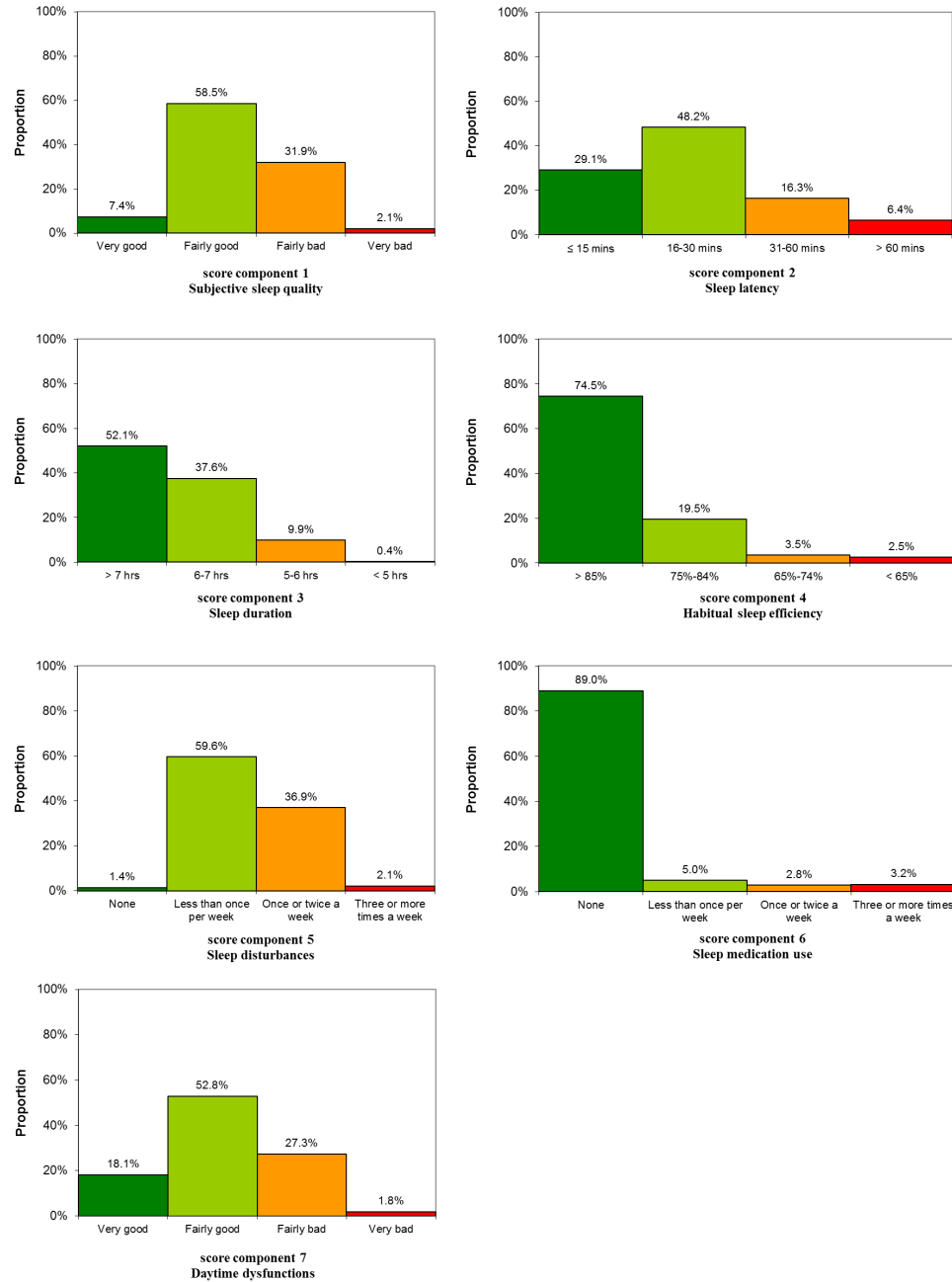
^bBilateral significance.

Figure 1 Overall sleep quality score for SME owners/directors



The results of the examination of the different components of the index show that the difficulties encountered by respondents are sleep disorders, poor sleep quality and daytime dysfunction, as well as difficulty falling asleep (sleep latency). Conversely, sleep medication use, sleep efficiency and even sleep duration do not appear to be issues affecting the majority of respondents (Figure 2).

Figure 2 PSQI components (see online version for colours)



These results are interesting because empirical studies show a prevalence of short sleep duration among directors (Leger and Adrien, 2012). The SME owners/directors interviewed sleep an average of 6 hrs 42 mins each night (SD = 50 mins) during their working week, 7 hrs 49 mins (SD = 1 hr 1 min) on weekends, and 8 hrs 9 mins (SD = 54 mins) during holidays. In terms of sleep duration during the working week,

SME owners over 45 sleep significantly less than their younger counterparts (6 hrs 36 mins vs. 6 hrs 47 mins). This is the only significant difference found between groups for this measurement.

Regarding sleep duration during the holidays, several significant differences ($p < 0.05$) and trends ($p < 0.10$) were detected within the groups of respondents. Women tend to sleep more than their male counterparts on weekends (8 hrs 01 min vs. 7 hrs 45 mins). SME owners under 45 sleep longer on the weekends (7 hrs 55 mins vs. 7 hrs 42 mins) and during holidays than their elders (8 hrs 18 mins vs. 7 hrs 59 mins), the final difference being highly significant.

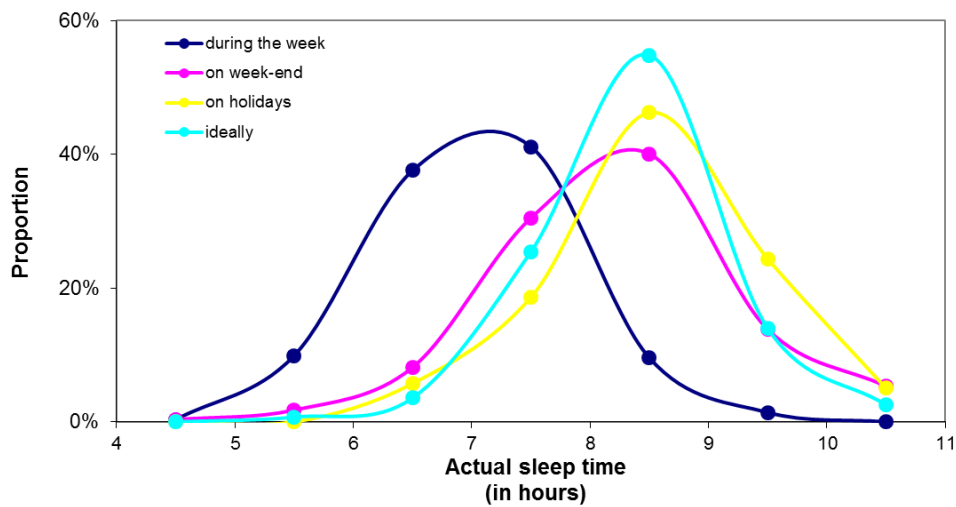
Table 4 Sleep duration differences between groups

Group	Weekend ^a	Test-t (ddl) ^b	Holidays ^a	Test-t (ddl) ^b
Men (n = 219)	7:45 (0:04)	-1.79 (280) [†]	8:10 (0:03)	0.44 (280)
Women (n = 63)	8:01 (0:07)		8:06 (0:06)	
Under 45 (n = 147)	7:55 (0:04)	1.88 (280) [†]	8:18 (0:04)	3.02 (280)*
Over 45 (n = 135)	7:42 (0:05)		7:59 (0:05)	
Micro (n = 149)	7:48 (0:05)	-0.28 (280)	8:05 (0:05)	-1.16 (280)
SE or ME (n = 133)	7:50 (0:04)		8:13 (0:03)	

Notes: ^aMean sleep time for the group (standard error) in hh:mm.

^bBilateral significance: [†] $p < 0.10$; * $p < 0.01$.

Figure 3 Actual sleep durations of SME owners/directors (see online version for colours)



To be in good health, the respondents surveyed said they would ideally need to sleep 7 hrs 58 mins (SD = 48 mins), slightly less than they sleep during their holidays (8 hrs 9 mins on average) but much more than they usually sleep during their working week (6 hrs 42 mins on average). At an individual level, the most common response (54.8%) was between 8 and 9 hours of sleep. A small number of respondents (4.3%) considered a sleep duration of less than 7 hours as ideal. In contrast, 16.5% of managers surveyed said they needed to sleep at least 9 hours to be in good health.

Sleep issues form a vicious circle if we consider the case of the owners/directors in our sample. The results show that the most disabling disorders from which they suffer are waking up early and frequent awakenings during the night. These problems have a direct impact on their vigilance during the day.

Figure 4 ESS scores (see online version for colours)

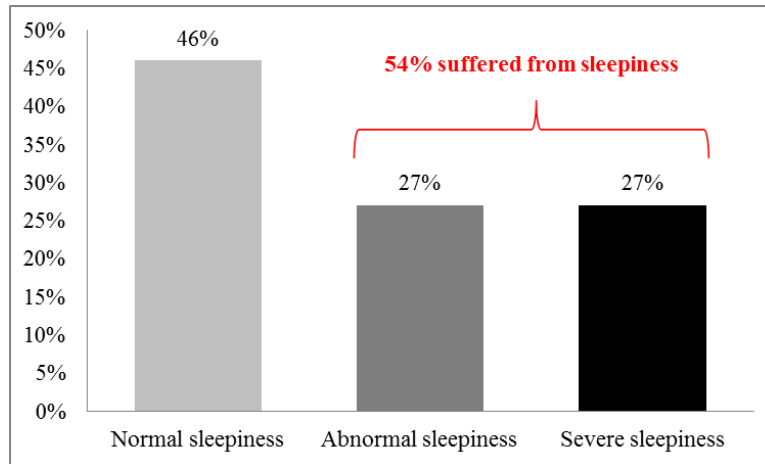
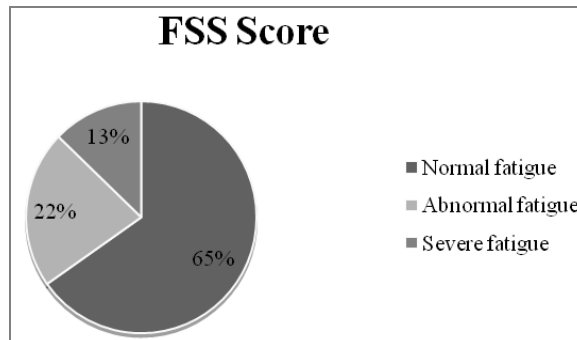


Table 5 ESS internal consistency data

<i>ESS items ($\alpha = 0.84$)</i>	<i>Item-total correlation*</i>
Sitting and reading	0.764
Watching TV	0.577
Sitting inactive in a public place (e.g., theatre or a meeting)	0.766
As a passenger in a car for an hour without a break	0.713
Lying down to rest in the afternoon when circumstances permit	0.66
Sitting and talking to someone	0.533
Sitting quietly after lunch without alcohol	0.738
In a car, whilst stopped for a few minutes in traffic	0.728

Notes: N = 282. *Pearson correlation with total score; all p values < 0.01.

Figure 5 FSS scores



At an individual level, the distribution of the ESS scores reveals that 68.1% of respondents suffer from a more or less significant sleep deficit. In our sample, 27% of owners/directors show signs of abnormal sleepiness, with a further 27% feeling severely sleepy.

The distribution of individual FSS scores shows that the vast majority of SME owners/directors surveyed (65.2%) suffer from no or little fatigue (score ≤ 4) and that 9.9% are not tired at all. In contrast, 34.8% of respondents indicate a state of fatigue affecting their professional and social lives, which has a strong impact on physical and intellectual capacities in 8.2% of cases.

As expected, poor sleep quality was also significantly associated with a decrease in vigilance among respondents (Table 6). Not all of the seven distinct components of the PSQI were significantly related to the level of vigilance among the managers interviewed. The daytime dysfunction is logically closely related to sleepiness and fatigue ($r = 0.47$ and 0.49 , respectively), but it is also very significantly related to the sleep disorders component ($r = 0.25$ and 0.35) and perceived quality of sleep ($r = 0.23$ and 0.34).

Table 6 Pearson correlation on PSQI, ESS and FSS

	<i>Pearson correlation</i>	
	<i>Sleepiness</i>	<i>Fatigue</i>
Overall PSQI score	0.267***	0.400***
Subjective sleep quality	0.225***	0.339***
Sleep latency	-0.080	0.086
Sleep duration	0.137*	0.104
Habitual sleep efficiency	0.028	0.170**
Sleep disturbance	0.247***	0.345***
Sleep medication use	0.100	0.111
Daytime dysfunction	0.467***	0.487***

Notes: For the PSQI and all its components, higher values on this variable correspond to low levels of sleep quality.

Bilateral significance: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

4.3 Discussion

In their study, Moen et al. (2013) showed that overworked professionals with highly demanding jobs experience higher levels of stress. They explored the effects of this common and chronic stress on the personal lives of professionals. Sleep studies have shown that intense time constraints, high job demands or high levels of stress can cause insomnia or sleep disorders (latency or nocturnal awakenings). Sleep takes up one-third of an individual's life. At 75, we will have slept approximately 25 years. Everyone is fully aware of the importance of sleep as an essential factor in one's health. Sleep is necessary for good recovery of physical and mental abilities. It is also associated with a good quality of life. However, attitudes and behaviours regarding sleep do not reflect its crucial role in health. One of the reasons for this discrepancy is that individuals do not have enough information about the impact that poor sleep management may have on their daily behaviour. At the same time, public opinion continues to regard sleep as a 'waste of

time' (Léger and Guilleminault, 1997), a view that is exacerbated by current lifestyles, punctuated by more or less disruptive work schedules. "Clearly, the acceleration of life in terms of the rhythm of social constraints has made hyperactivity a positive value" (Léger and Guilleminault, 1997) because it generates time savings and productivity. This reasoning continues to amplify the gap between an individual's real sleep needs and the time actually spent sleeping. We used a quantitative method to understand sleep patterns and their diurnal repercussions for SME owners/directors. We found that the owners/directors report experiencing not only poor sleep quality but also insufficient sleep duration. In response to the question regarding the impact of sleep patterns on their vigilance, we found that some of them experienced high levels of sleepiness or fatigue.

This study makes key contributions. First, we focus on an often overlooked population in studies on occupational health. Most research on the impact of sleep on individuals has focused primarily on employees or athletes (Åkerstedt and Wright, 2009; Folkard and Tucker, 2003; Kageyama et al., 2001). The high proximity between employees and owners/directors in small and medium enterprises compared with that in big businesses may account for why this population has been overlooked. The hierarchical proximity in SMEs that centralises power in the hands of the owner/director is very strong. However, this centralisation can only occur under conditions of close proximity and within a relatively compact structure (sharing the same spaces and working conditions). The fact that the manager constantly remains close to employees increases his hierarchical domination. However, smaller companies benefit from more direct and personal contact and often from a people-oriented management style. Moreover, their functional proximity explains the lack of separation between duties and functions (strategic, administrative and operational) and the ubiquity and versatility of the manager. The functions and commitments of SME managers are different in nature compared with those of a CEO. Studies show that SME managers play a central role in their business. They are often characterised as 'jacks-of-all-trades' because they often carry out several functions and change roles depending on the situation. Most studies show that SME managers fill three roles. The first is that of an employee, for example, by ensuring the quality of production, overseeing technical aspects or actually producing a good or providing a service (e.g., a carpenter who himself makes furniture). The second role is that of a manager: They are responsible for the production inventory and purchasing management or planning their employees' tasks. The third is that of a shareholder because in most cases SME managers make investment and financial decisions alone (e.g., acquisition of a new machine). The second key contribution of this study is the investigation of sleep patterns among SME owners/directors. There is currently a dearth of knowledge and statistics on the health of SME managers. At the same time, many studies have shown that sleep affects the work effectiveness of employees. However, SME managers are ubiquitous and are generally essential in all of the functions and decisions relating to their business. Therefore, if they suffer from a lack of sleep or sleep disorders, what are the consequences for their business? Sleep deprivation is known to have effects on alertness, monitoring task performance, the ability to make decisions, work accidents and well-being at work. Many physiological and neurocognitive processes take place during sleep (Curcio et al., 2006). Our third contribution is that we have gone further than previous studies by exploring the effects of sleep patterns on daytime vigilance. To this end, we used two measurement tools: the ESS and the FSS.

Buysse et al. (1989) designed the PSQI as a simple and valid assessment of both sleep quality and sleep troubles. Their goal was to apply the index to clinical populations. The

advantages of this tool are, first, the determination of sleep dysfunction patterns over a 1-month period and, second, the calculation of an overall score that conveys both the number and severity of sleep problems. We studied the internal consistency and validity of the PSQI in 282 SME owners/directors. The internal consistency of the overall PSQI score was at the limit of the satisfactory range ($\alpha = 0.65$). Our findings concerning SME owners/directors differed from the high internal consistency reported in the original PSQI publication ($\alpha = 0.83$). The sleep medication and sleep duration components had the lowest correlations with the overall score. Even when these components had been removed, the PSQI internal consistency did not increase. We assume that this finding may be related to the nature of the measurement tool. Sleep quality is a latent construct. "Latent constructs are phenomena of theoretical interest which cannot be directly observed and have to be assessed by manifest measures which are observable" [Diamantopoulos et al., (2008), p.1204]. These constructs can be assessed using formative or reflexive measurement modelling. We assumed that the PSQI is a formative scale and that its seven components create the latent construct. In other words, sleep quality is modelled as the product of its measures (subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbance, sleep medication use, and daytime dysfunction). The formative nature of the PSQI offers two explanations for its low level of internal consistency. First, in formative scales, the measures are not interchangeable because each of the measures represents an essential and distinct part of the conceptual domain of the latent construct. Thus, sleep latency does not represent the same part of the conceptual domain of sleep quality as daytime dysfunction does. In this respect, it is not appropriate to seek satisfactory correlation between the measures and therefore internal consistency. Researchers instead recommend examining the measures' external validity. Second, each component is assessed predominantly by only one item. According to Himmelfarb (1993), it is recommended to use measures with several items to offset their intrinsic limits. We observe that men experience, on average, better sleep quality (PSQI mean = 5.76) than women (PSQI mean = 6.57). These findings are consistent with other research showing that women report having worse sleep quality than men. Our analyses show that 49% of owners/directors report having poor sleep quality, and 54% have proven (27%) or severe (27%) sleepiness during the day. Meanwhile, 30% of them report that they have trouble staying awake during the day (especially when driving, at mealtimes or when engaged in a social activity) and lack enthusiasm for what they have to do. This observation is confirmed by our results because the component of the PSQI with the highest average is sleep disturbance. These results show that managers who suffer from low sleep duration and poor sleep quality can experience a decrease in their vigilance.

SME owners/directors report sleeping an average of 6 hrs 42 mins each night during their working week. This result is consistent with the studies conducted by Mullens et al. (2004) and Torrès and Chabaud (2013). To reduce their working day sleep debt, SME owners/directors try to sleep more during their weekends. They sleep during the weekend an average of 7 hrs 49 mins, i.e., 1 hr 07 mins more than during the working week. A study conducted on a national sample by the French Institute of Sleep and Vigilance in 2014 shows that French people sleep an average of 6 hrs 55 mins on working days and 8 hrs 2 mins on weekends. This study provides us two important pieces of information. First, managers are among those who sleep less relative to the entire population. Therefore, they are rightly considered short sleepers. Second, they also recover less of

their sleep debt over the weekend than the average French person. The fact that they report sleeping 8 hrs 9 mins during their holidays shows that they consciously reduce their sleep time during the week. The amount one sleeps during holidays is an accurate indicator of the amount of sleep an individual needs to be in good health because it takes into account the individual's lifestyle without job demands and strains or any other occupational responsibilities. Asking an individual about the amount of sleep he needs during holidays is more accurate than asking him about the amount of sleep he would ideally like to have. The question about the ideal amount of sleep needed is usually used to assess sleep debt. However, this question is too subjective because it carries an individual bias about sleep (for example, some SME owners/directors perceive sleep as a waste of time, so they want to sleep less than they actually need). Studies have investigated the link between sleep issues and daytime dysfunctions such as sleepiness or fatigue.

Buysse et al. (2008) conducted one of the few studies examining the relations between the PSQI and ESS. They showed that the two scales are weakly correlated. The results of this study suggest that the relationship between sleep-related symptoms and those related to sleepiness are distinct. For these researchers, the PSQI primarily assesses the quality of nocturnal sleep, whereas the ESS indicates a tendency to doze off in certain situations during the day, which is why we added another symptom of poor sleep: fatigue level. We examined the internal validity of the ESS and FSS for this sample. The results show that these measures are valid for use among a segment of SME owners/directors. The ESS and FSS have adequate psychometrics, with $\alpha = 0.84$ and $\alpha = 0.87$, respectively. Approximately 54% of our respondents report having abnormal sleepiness during the day, and 35% experience fatigue. We found that both subjective sleep quality and sleep disturbance are the PSQI components most strongly associated with daytime sleepiness and fatigue (when we remove the daytime dysfunction component). These are interesting results because they demonstrate that sleep quality, rather than quantity, affects daytime alertness the most.

The issues that need to be explored further are the antecedents and consequences of our findings. What is the history in terms of partial sleep deprivation? We can assume, for example, that business owners cut back on sleep duration for various reasons, such as the need to take a train at 5:20 to make an appointment or go abroad for business reasons, sleeping late after reading their e-mails one last time, or because they had a meal and alcoholic drinks with a client (Guiliani and Torrès, 2012). This effort represents a deliberate attempt to reduce sleep duration to increase working time: sleep less to work more. This sleep time/work time substitution may be harmful to the body and cause sleep debt, which will negatively impact the managers' vigilance. Poor sleep quality or insufficient sleep will affect the cognitive abilities of the owner/director. In fact, Mitchell et al. (2002) suggest that the problematic aspects of entrepreneurial cognition occur in and are characterised by information overload, high uncertainty or novelty, excitement, significant time pressures and fatigue, which can generate counterfactual thoughts, outright deceit, planning fallacy, self-justification, overconfidence or representativeness errors (Baron, 1998; Busenitz and Barney, 1997). Hence, there is a need to go further by measuring not only the impact of sleep on the vigilance of SME owners/directors but also on their managerial and entrepreneurial abilities.

Medical studies have demonstrated the important role of sleep in terms of cognitive functioning (Harrison and Horne, 2000). Good sleep promotes mood stability (Giordanella, 2006; Paquereau and Bruel, 2010). From a medical point of view, cognition

refers to the mechanisms of thought and information processing of the brain. A distinction is made between basal cognitive functions involving elementary cognitive processes, such as alertness, and high-level cognitive functions, which include processes such as memory, reasoning, problem-solving and analysis, divergent thought, judgment, decision-making and speech. The executive functions are often stimulated to address new and unknown situations, which are integral parts of the entrepreneurial process. For example, the ability to scan one's environment is an essential function for entrepreneurs (Lumpkin and Dess, 1996). However, some authors have shown that poor sleep can impair a large number of changes in the environment and increase errors of judgment and can lead to an increase in risky decisions (Harrison and Horne, 2000; Léger and Guilleminault, 1997; Mullens, 2007; Renn and Cote, 2013). Sleep can affect the innovative capacity of the company owner (Drago et al., 2011; Healey and Runco, 2006). Paquereau and Bruel (2010) showed that fatigue has a negative influence on creativity. Sleep is essential for memory and decision making (Harrison and Horne, 2000). Similarly, the hypothesis that quality of sleep and quality of human relationships or mood are directly linked can be made (Thomsen et al., 2003). Many authors show that fatigue impairs one's ability to communicate and can lead to violent and aggressive behaviour (Kamphuis et al., 2012). It has been shown that fatigue reduces the ability to manage stress at work (Paquereau and Bruel, 2010). These aspects demonstrate how sleep can affect the strategic activities of an SME by reducing the alertness of its owner/director.

Optimal sleep management is a guarantee of sound management of SMEs in general. Protecting the sleep of the entrepreneur also affects the overall well-being of the company, of which he is the cornerstone. This quantitative study highlighted the effects of sleep on daytime alertness of SME owners/directors. Qualitative studies can be an interesting complement to this quantitative study and provide many elements of understanding on managerial and entrepreneurial effects of their sleep (Dana and Dana, 2005). Because it is through a better understanding of sleep management, a topic rarely discussed in the field of entrepreneurship, that we can improve the capacity of SME owners/directors to manage their sleep and efficiency in their business.

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