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FACTORS THAT WOULD OPTIMIZE LEARNING AMONG ADOLESCENT LEBANESE STUDENTS

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ABSTRACT

Introduction: Adolescence has a huge influence on the learning potential of students .Our purpose is to look for factors that impact Lebanese adolescents' academic performance.
Materials and Methods: A multiregional epidemiological national study from 18 schools during 2014-2015.Questionnaires were distributed to 2506 students 11-18 y.old. Internationally validated scores were used. School performance was evaluated subjectively and objectively. Results were analyzed using IBM SPSS Statistics.
Results: Females had higher average (p<0.0001), lower BMI (p<0.001) and higher score on Depression scale (p=0.008). Reading (p<0.0001), doing homework (p=0.001) and praying (p=0.016) were factors influencing school performance positively. Cellphones (p=0.001), video games (p=0.011) and bedtime sports (p=0.013) negatively impact performance. Lack of sleep, sleep quality index, depression and self-esteem scores negatively influence average - p<0, 0001.
Conclusion: Adolescent's depression, self-esteem and sleep quality problems should be addressed in schools hoping to optimize adolescents' school performance.

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INTRODUCTION

Adolescence, a period extending from 10 to 19 years, is characterized by the development of secondary sexual characteristics, behavioral and psychosocial problems (WHO, 2016). Several endogenous factors disrupt and destabilize the lives of teens and impact their learning abilities (Beebe, Rose, and Amin, 2010; Fakier and Wild, 2011; Lorsque, 2016). To these endogenous factors we can add additional exogenous factors recently described as "epigenetic" such as environmental demographics, habits and family traditions. Acquired habits such as smoking (Bresson, Carsin, and Dubus, 2016; El-Roueiheb *et al*., 2008; Kerjean and Berre, 2012), alcohol (Picherot *et al*., 2010, 2016), caffeine and energy drinks affect the physical and mental health of adolescents. Sleep disruption (Beebe *et al*., 2010; Engle-Friedman, 2014; Fakier and Wild, 2011; Short, Gradisar, Lack, and Wright,

2013) and mood changes (Alamo, 2013; Bardou, Oubrayrie-Roussel, and Lescarret, 2012; Baumeister, Campbell, Krueger, and Vohs, 2003; Becerra, Muros, Cuadros, Sánchez, and González, 2015; Dorard, Bungener, Corcos, and Berthoz, 2014; Gagné and Marcotte, n.d.; Guillon and Crocq, 2016; Hankin, 2006; Short *et al*., 2013) are known factors that negatively impact the adolescent cognitive and mental functions. All the above mentioned elements give the teenager this multifactorial and complex aspect, which governs his personal, social and academic status. The purpose of our study is to look and understand the factors that affect the academic performance of our Lebanese adolescents.

MATERIALS AND METHODS

The country was divided into six districts: Beirut, Mount Lebanon, North, Bekaa, South and Nabatieh. Three private

French and/or English schools- with more than 100 students in each division- were randomly selected from each district. A total of 18 schools participated in this study. Teenagers were the only variable. Students in grades 9 and 12 were excluded from the study because they have to sit for their national boards. After the random selection of schools (list recovered from the Ministry of Education and Higher Education), they were contacted and an explanation of the purpose of the study was presented to the directors of each institution. The majority of schools gave their consent. If a school refused to participate in the study, it was replaced by another school from the same area randomly. An explanation of the study and consent forms were sent to parents by the schools. The study took place in the academic year 2014-2015, apart from exam periods. Absent students were given the questionnaire once back to school. Questionnaires in a given school were distributed simultaneously to all classes to minimize sharing of information among participants. A 5 pages questionnaire was distributed to 2506 Lebanese participants in the study. The first page explains the purpose of the study. The following four pages contain clear and concise multiple choice questions with four tables to be completed by check box and socio-demographic data. Besides the date of birth, gender, weight and height; the questionnaire consisted of questions related to the Pittsburgh Sleep Quality Index (PSQI), the last bedtime activity, waking difficulties ,school absence , the General average of each student and if he failed two main subjects. It also included questions related to the student subjective feeling of daily stress and the quality of sleep. In addition, there were questions related to the Epworth Sleepiness Scale, Adolescent Depression Rating Scale (ADRS), the scale of Rosenberg Self-Esteem and a final table on the habits of adolescents (cigarettes, hookah, coffee, alcohol, exciting or relaxing drinks, drugs or other substances).

Table 1. Population distribution by region

Region	Frequency	Percentage	Cumulative percentage
Beirut	419	16.72	16.72
Mount Lebanon	668	26.66	43.38
North	277	11.05	54.43
Bekaa	291	11.61	66.04
South	305	12.17	78.21
Nabatieh	546	78.21	100
Total	2506	100	

The survey was done in either French or English based on the primary school language. It has been tried with success in 87 bilingual students to assess for any confusing questions. The average completion time was about 10 minutes. *The Sleep Quality Index of Pittsburgh - "PSQI"* (Gelaye *et al*., 2014; Mollayeva *et al*., 2016) The Pittsburgh Sleep Quality Index (PSQI) is an effective instrument used to measure the quality and patterns of sleep in adults. It differentiates "poor" from "good" sleep quality by measuring seven areas: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medications, and daytime dysfunction over the last month. *The Epworth Sleepiness Scale - "ESS"* (Kaminska *et al*., 2010; Lecendreux, Gamble, Sanchez-Garrido, Giordanella, and Konofal, 2011; Riachy *et al*., 2012) The Epworth Sleepiness Scale is widely used in the field of sleep medicine as a subjective measure of a patient's sleepiness. The result of the addition of scores of different answers is 0 to 24. Interpretation will be such that if the score is less than or equal to 8, there is no sleep deficit; between 9 and 14 there is sleep deficit and beyond 15 there are signs of excessive daytime sleepiness. Note that this test does not diagnose any pathology, but rather is representative of the general level of daytime sleepiness.

The Adolescent Depression Rating scale- "ADRS" (Revah-Levy, Birmaher, Gasquet, and Falissard, 2007; Révah-Lévy, 2012)

French and English final version of ADRS patient version (ADRSp)
Item # English version French version

- I have no energy for work/school Je n'ai pas d'énergie pour l'école, pour le travail
- I have trouble thinking J'ai du mal à réfléchir
- I feel overwhelmed by sadness and listlessness Je sens que la tristesse, le cafard me débordent en ce moment
- Nothing really interests or entertains me Il n'y a rien qui m'intéresse, plus rien qui m'amuse.
- What I do is useless Ce que je fais ne sert à rien
- When I feel this way I wish I were dead Au fond, quand c'est comme ça, j'ai envie de mourir
- Everything annoys me Je ne supporte pas grand-chose
- I feel downhearted and discouraged Je me sens découragé
- I sleep badly Je dors très mal
- School/work doesn't interest me just now, I can't cope. A l'école, au boulot, j'y arrive pa

The Adolescent Depression Rating Scale (ADRS) evaluates 10 risk factors for depression: Having no energy for work/School, having trouble thinking, Feeling overwhelmed by sadness and listlessness, not showing interest and difficulty in being entertained, subjective feeling of uselessness, wishing death, getting easily annoyed, feeling downward and discouraged, sleeping badly and not feeling interested in school/work just now. A score between 4 and 8 points indicates a moderate risk of depression, a score beyond 8/10 identifies a significant risk of depression; while a score less than 4 means no depression risk. *The Rosenberg Self-Esteem scale- "RSES"* (Chabrol *et al*., 2004; Fourchard and Courtinat-Camps, 2013; Gana *et al*., 2013; Vallieres and Vallerand, 1990) This scale measures self-esteem states by asking 10 items: five positively worded and five negatively worded ones. Items are answered on a Four-point scale from strongly agree to strongly disagree. The score ranges from 0-30. Scores between 15- 25 are normal. Scores <15 suggest low self-esteem. *School performance:* Academic performance in our study was based on the overall average of the student (Short *et al*., 2013). A score $\geq$ 60 was considered the threshold value. Thus, an average below 60 was considered a low academic performance, while an average greater than 60 is considered an acceptable or good academic performance.

Data processing: The various data collected and statistical analysis of the results were processed with the IBM SPSS Statistics Version 22.00 program. The table included continuous and discrete variables; and the recovered structure is two-dimensional arrays: a first dimension related to school performance and the other for the different variables studied. Discrete variables were analyzed by the method of Chi square and continuous variables by the independent test "T" (Independent-Samples T Test). Probability values of $p \leq 0.05$ were considered significant.

RESULTS

Demographic data: During this study, we had a total of 2506 students (mean age 15.56 ± 1.72 years): 1154 males-46.7% - (mean age 15.5 ± 1.74 years, range 11 -18 years) and 1318 females- 53.3%- (mean age 15.6 ± 1.71 years, range 12 -18 years). The distribution of the study population in different regions of Lebanon is represented in Table 1 below.

no problems, 26.7% having some difficulties once a week, 25.4% having difficulties twice a week and 22.5% having difficulties three to four times per week. As far as enthusiasm performing daily activities,   35.5% showed no problem, 32.4% a little problem, 23.5% a certain problem and only 8.6% a very big problem. The daily habits and personal conduct are represented in the following Figure 1.

Table 2. Assessment scales frequency and percentage

| Scale	Categories	Frequency	Percentage	Cumulative Percentage
« ESS »	No sleep deficit	1117	46.1	46.1
	Minimal sleep deficit	1015	41.9	87.9
	Excessive daytime sleepiness	293	12.1	100.0
	Total	2425	100.0	
« ADRS »	No risk for depression	1773	71.5	71.5
	Moderate risk for depression	617	24.9	96.3
	High risk for depression	91	3.7	100.0
	Total	2481	100.0	
« RSES »	Very Low self-esteem « SE »	330	14.1	14.1
	Low SE	922	39.5	53.6
	Average SE	612	26.2	79.9
	Strong SE	390	16.7	96.6
	SE	80	3.4	100.0
	Total	2334	100.0	
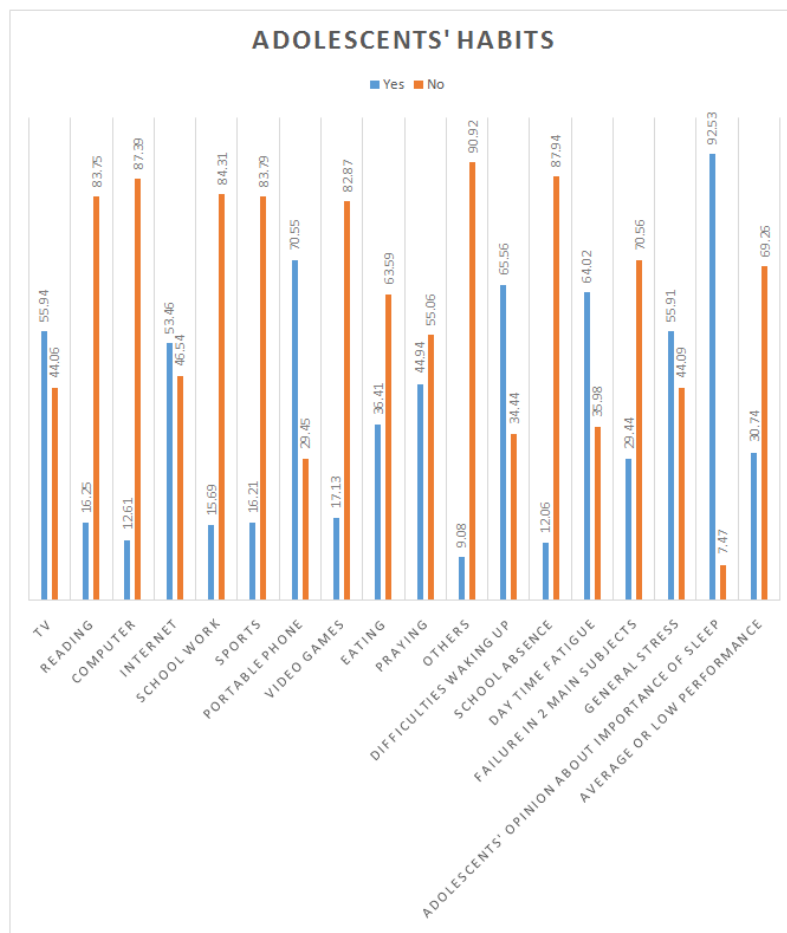
Figure 1. Habits and personal conduct

Epidemiological data by personal experiences, habits and results to scales and indexes

On the assessment of subjective sleep quality of each participant: 19.9% qualified as good sleep, 54.7% as good enough sleep, 19.7% as bad and 5.7% as very bad. The ability to stay alert during teaching hours in the last month preceding the questionnaire was evenly distributed with: 25.4% having

Note that the most common causes of school absences were medical 80.8%, while fatigue accounted for 19.2% of absences. The results of the different scales (Pittsburgh, Epworth, Rosenberg and ADRS) and the classification of the study population into classes according to each test are found in Table 2.

School performance

The results showed a strong correlation (Independent T-test) between academic performance and the different levels "RSES", "ESS", "ADRS", "PSQI" used in our study (p <0.0001). Geographical area (p = 0.001), gender (p <0.0001), body mass index "BMI" (p = 0.024), reading (p <0.0001), school work (p = 0.001), sport (p = 0.013), use of mobile phone before sleep (p = 0.001), video games (p = 0.011) and bedtime prayers (p = 0.016) were correlated to academic performance. Moreover, the correlation was significant between academic performance and the feeling of fatigue during the day (p <0.0001), the feeling of stress in general (p <0.0001) and failure in two main subjects at school (p <0.0001). This correlation was marginally significant for being out of shape during the day (calculated by Pittsburgh sleep quality index "PSQI") (p = 0.046), habitual sleep efficiency (calculated by PSQI) (p = 0.021), which is the Expression as a percentage of the ratio of the number of hours of sleep divided by the number of hours spent in bed, and subjective opinions on the importance of sleep (p = 0.006). Among the behaviors of adolescents, almost all the factors presented in the questionnaire: cigarettes, shisha, coffee, alcohol, stimulant drinks (p <0.0001) and hot soothing drinks (p = 0.047) are linked to academic performance. One exception was the use of medication and sleeping pills (p = 0.199). However, the subjective assessment of sleep quality (p = 0.163), alertness during academic activities (p = 0.082), enthusiasm in daily tasks (p = 0.143), awakening difficulties in the morning (p = 0.067), sleep latency at night (p = 0.590), computer use (p = 0.694), television viewing (p = 0.827), internet use (p = 0.862), eating at bedtime (p = 0.684) and the various other bedtime activities (p = 0.603) show no significant relationship with academic performance. Note also that school performance was not associated with school absence (p = 0.082), sleep duration (p = 0.107) and sleep disorders (p = 0.055).

DISCUSSION

This study evaluates the different factors and daily activities that influence the adolescent learning and academic performance. Adolescents living in North Lebanon sector, Mount Lebanon and Beirut had lower academic scores compared to their peers in other geographical regions. Further studies are required to sort out if cultural versus socioeconomic factors account for this difference. Female sex had better academic scores compared to males: this may be secondary to earlier cerebral maturation of females in this age group and less risky behaviors (Holzer, Halfon, and Thoua, 2011). Adolescent boys have more attention problems and worse adaptation to stress than adolescent females (Royant-parola, 2016). Surprisingly, female sex on the other hand was strongly associated with daily routine stress, fatigue, lack of enthusiasm , difficulty staying fully alert during academic activities (p < 0.0001), elevated diurnal somnolence (p,0.001) and depression score (p= 0.001). All above can be explained by biological factors (earlier puberty development in girls vs. boys, influence of female sex hormones on the cerebral cortex) and behavioral factors (introversion, excessively competitive in school) (Essau, Lewinsohn, Seeley, and Sasagawa, 2010; Holzer et al., 2011) Reading was associated with better academic results, same for praying before sleep.

This latter may be explained by the less risky activities, more discipline and stable social milieu for students who practice regular prayers. Using cellphones and video games after school hours had a negative correlation with academic performance. Unexpected was the finding that physical activities at bedtime affected academic performance negatively. Knowing the good effect of sports on the physical and psychological aspects of the adolescent, we wonder whether the problem here is in the loaded curricula and homework that these adolescents are subject to: There is no room left for sport activities after school hours without compromising the academic performance (Chomitz et al., 2009). Watching TV had no effect on academic performance. This can be explained by the decreasing number of adolescents who watch TV: they spend more time on their tablets and social media activities. Failure in 2 major subjects, daily fatigue and stress negatively influenced academic performance. Enthusiasm, level of alertness during academic activities along with absence diary did not affect the academic scores.

This may be explained by the easy communication through social media with the class to get the school agenda and the availability of Youtubes videos and other resources over the net for the student to retrieve the missing or non-understood information. Caffeine beverages and nicotine affected school performance negatively namely in male students. These drinks may be associated with a decreased threshold for risky behavior in this age group. Hot and stimulant free beverages had a positive impact on academic scores. Low self-esteem score and a BMI ≥25 are associated with a worse academic performance. These 2 factors are basically inversely related and directly affect the adolescent self-image (Bardou et al., 2012; Baumeister et al., 2003). Sleep duration, latency and difficulties did not have a direct effect on school performance. These factors indirectly affect academic scores by increasing fatigue, stress, depression score and risky behavior---(Curcio, Ferrara, and De Gennaro, 2006; Dewald, Meijer, Oort, Kerkhof, and B??gels, 2010; Engle-Friedman, 2014; Fakier and Wild, 2011) As previous studies have confirmed, an elevated depression score was associated with worse academic performance(Gagné, Marcotte, and Fortin, 2011; Walburg, Zakari, and Chabrol, 2014).

Limitations of the study

The importance of this study is in the significant link between academic performance and the geographical region. A more detailed assessment of the other demographic, cultural and socioeconomic factors could be done. The degree of parents 'involvement in the academic life of their adolescents should be assessed along with the access of adolescents to alternative learning methods. Another limitation is that only private schools were included in the study. Public schools were not included because of the excessive numbers of Syrian Refugees among the students.

Conclusion

This study highlights the impact of new markers on academic performance: bedtime prayers and physical activities along with geographical area. A national wide scale study is required to better assess for the validity of the significant and non-significant results affecting adolescents school performance. These results should be also compared to other countries.

Conflict of interest

The authors have no conflict of interest

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