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THE EFFECT OF CHRONOTYPES ON MOTIVATION AND
ACADEMIC ACHIEVEMENT IN ELEMENTARY STUDENTS

A THESIS SUBMITTED IN PARTIAL FULLFILMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTERS OF ARTS TO THE DEPARTMENT OF SOCIAL
AND BEHAVIORAL SCIENCES AT HAIGAZIAN UNIVERSITY

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FEBRUARY, 2012

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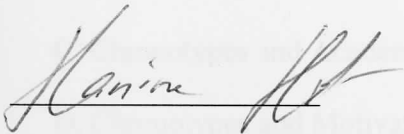
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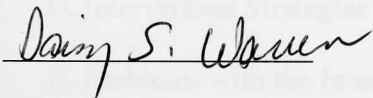
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Lale Yoghourdjian

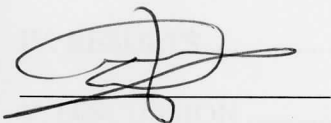
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Finally, I want to express my gratitude to my dearest family and friends for their encouragement and support through this year and their beliefs in my capability of success.

ABSTRACT

The present study examined the effect of the time-of-day preference of a sample of elementary students ($N = 103$) on their motivation level and on their overall academic achievement. The study relied on self-report measures where participants were asked to provide demographic information and fill two questionnaires: The Morningness-Eveningness Questionnaire (MEQ) and the Elementary School Motivation Scale (ESMS). The scores of both questionnaires were later analyzed along with the yearly GPA of the students. Results were computed using analyses of correlation and variance. The results of the study showed that academic achievement is positively correlated with morningness ($r = .61$) as well as motivation ($r = .71$) and that morning-preferring students (larks) tend to be more intrinsically motivated than evening-preferring students (owls).

The Effect of Chronotypes on Motivation and Academic Achievement in Elementary Students

Background of the Study

Waking up early in the morning is considered a problem by many people, especially students. Some people, young or old, complain about getting up early in the morning, whether they are going to work or school. The early morning hours are considered a time to rest to certain people and no matter how early they sleep, most of the time waking up early is a hard thing to do. For them, it takes a lot of time and energy to wake up properly and be able to concentrate.

This is even harder for adolescents, whose bodies and metabolic systems are changing, and hence it is almost impossible for most of them to go to sleep before 11 pm (Shepard, 2010). Sleep deprivation is known for its negative effects. The students who do not get the necessary amount of sleep at night will most likely suffer health wise as well as academically (Noland, Heather, Price, James, Dake, Joseph, Telljohann & Susan, 2009; Owens, Belon, Moss, 2010).

There are a few educators, teachers and parents, who argue that it is crucial to wake up early, since students are more cognitively “awake” and alert during the morning hours than later in the day. So, the morning hours are the best hours to spend studying and understanding academic material.

However, just like the students have different personalities, social backgrounds and learning styles, each one of them has a different time of the day when he/she is fully alert and is capable of understanding and grasping ideas the most (Pytel, 2006). Children and adolescents prefer evening activities, meaning that the early school start times could have a negative influence on their school functioning, health and grade point average (Randler & Frech, 2006).

Many previous researches on the subject of chronotypes concluded that “later school start times” proved to be better for the physical health and academic behavior of the students, especially adolescents (Bergin & Bergin, 2009). Starting schools later will help the students participate more during class hours and perform better during the tests. The students would not be sleepy or drowsy, so they would be able to concentrate better and pay closer attention to what is being explained.

Therefore, the time that students are most active and are most ready to learn and understand the lesson depends mostly on their preference of time (Milgram, Dunn & Price, 2004). This preference is most probably the reason that the students to get higher grades if the academic subject being taught is during the preferred time of the day.

Taking into consideration that most classes are held during the morning hours of a school day, being a “morning” student has consistently been associated with increased school performance (Randler & Frech, 2006). While being an “evening” student has been associated with poor academic achievement (Milgram, Dunn & Price, 2004). Based on the above mentioned ideas, there seems to be a positive correlation between the scores of the chronotypes and the scores of academic achievement (hypothesis 1).

Research has also demonstrated the significance of motivation and its positive effects on academic achievement for many years (Selvi, Gulec, Agargun, Mehmet & Besiroglu, 2007). Teachers, for example, who are motivated and happy in their job, tend to perform better and hence teach more effectively than those who are unsatisfied with their jobs. If this is the case, then the teachers who prefer waking up early in the morning will be more motivated during the

morning school hours than those who don't, would be actively engaged in their job, and do their best to make the students understand and learn in better ways (Bishay, 1996).

If motivation improves the teachers' performance, then it should improve the performance of the students as well; development of intrinsic academic motivation in young children is an important goal for educators because of its importance for future motivation, as well as the students' effective school functioning (Gottfried, 1990). Students seem to be more motivated at the time of day that they prefer to wake up and feel that they perform their best (Selvi et al., 2007). So, the morning-preferring students (larks) will be more motivated during the morning hours, while those who prefer waking up later (owls) will be more motivated to go to school during later hours (Pytel, 2006). Based on this, the researcher hypothesized that the motivation level of the "morning" students (larks) will be higher compared to the motivation level of the "evening" students (owls) during the school hours.

Based on the above research, morning learners are more motivated during the morning hours, meaning they prefer waking up, studying and doing activities in the morning by themselves, without being motivated by someone else, whereas evening learners are not motivated during the morning hours. Applying this logic, the researcher assumed that evening learners whose motivation levels are high during the morning hours are the ones that are extrinsically and not intrinsically motivated. In other words, they don't wake up, go to school, and study because they want to, but instead, they do so because they know that they will be rewarded for their behavior later on. In this context, the researcher hypothesized the third hypothesis and that is morning learners are more intrinsically motivated, whereas evening learners more extrinsically motivated.

Not much research has been done on the relationship between gender and chronotypes. However, some researchers such as Cavallera, Boari, Labbrozzi and Del Bello (2011) stated that females prefer to wake up and work in the morning and rest in the evening, while males prefer to rest in the morning and feel more energetic later during the day. Moreover, only a couple of studies studied the socio-economical status of the students and their families (SES) as well as gender as factors in chronotype studies (Yan & Slagle, 2006). Ludwig and Maximilians (2006) and Randler and Frech (2009) both found that male participants were more eveningness-oriented than females, while Dunn (1999) discovered that there were many female students who preferred evening activities.

Girls in Lebanon, especially students, are more likely to follow rules, go home and sleep earlier than boys, stay out less, and be less involved in drugs, smoking and other bad habits. For these, and other cultural reasons, the researcher agreed with Ludwig & Maximilians (2006) and Randler & Frech (2009) and hypothesized the fourth hypothesis: Female students are more “morning” learners than male students.

Statement of the Problem

The purpose of this study was to investigate the relationship between the “time of day preferences” among Lebanese students and their academic achievement as well as their motivation. In addition, this study sought to investigate the relationship between different chronotypes and different types of motivation (intrinsic or extrinsic), as well as the relationship of gender and the different chronotypes. In light of the above discussion, the researcher formulated the following hypotheses:

H1: There is a positive correlation between the scores of chronotypes and the scores of academic achievement.

H2: There is a positive correlation between the scores of chronotypes and the scores of motivation.

H3: Morning learners are more intrinsically motivated whereas evening learners more extrinsically motivated.

H4: Female students are more “morning” learners than male students.

Significance of the Study

All the aforementioned information stress the importance of taking into consideration the timing of optimal concentration of each age group (Klein, 2001). The assessment of individual chronotype is important not only for improving the performance of the students, but also for the diagnosis and treatment of circadian sleep disorders (Werner, LeBourgeois, Geiger and Jenni, 2009).

Understanding this issue further may help us know more about the students' time preferences and maybe raise the achievement level of the students. Ammons, Booker, James and Killmon (1995) feel that teachers should attempt to match each individual student's time-of-day preferences with his or her more difficult subjects. If students learn which time is best for them, they can use that time to study and hence benefit a lot (Rice, 2008).

By finding out what the majority of the students' time preferences are, the school can adjust the class hours in such a way that the most basic and important subjects are taught during

a time when most of the students find it easy to be fully alert and hence comprehend the material taught.

A simple change in time could make a huge difference, not only in improving the health and energy of both the students and teachers, but also by increasing the motivation and academic achievement level of most if not all students (Sunghan, Gwenden, Duekera, Hasherb & Goldstein, 2002).

Nature of the Study

The present research employed the quantitative method of statistical analysis to measure variables using correlational analysis and t-tests. It relied on self-report measures where participants were asked to provide demographic information, and fill in the following two questionnaires:

- a. The Morningness-Eveningness Questionnaire (MEQ) and
- b. The Elementary School Motivation Scale (ESMS)

The students' grade point averages (GPA) of the academic year 2010-2011 were also obtained from the principal of the school.

One hundred and three elementary school students participated in the study.

Analyses of the obtained data used correlation, and t-test of mean differences to test the hypotheses. Data were tabulated and analyzed and conclusions were drawn based on the obtained results.

Definition of Terms

Chronotype: It is a characteristic of human beings reflecting at what time of the day their physical functions (hormone level, body temperature, cognitive abilities, eating and sleeping)

are active, change or reach a certain level (Bender & Wellbery, 1991). The circadian rhythm of the body means all the biological processes occurring at 24-hour intervals (Merriam-Webster's online dictionary, 2011). Chronotype is also referred to as Morningness/Eveningness preference. Morning types are those people who prefer to do things in the morning, while evening types are those who prefer evening activities.

In this study, the term “larks” is used to refer to morning-preferring students and “owls” to refer to evening-preferring students.

Motivation: Motivation is a desire to achieve a goal, combined with the energy to work towards that goal. It is a concept which has been used by both psychologists and educators to explain differences among learners in the amount of effort they put into their learning. In everyday usage the term is linked to the underlying motives and goals of the learner on the one hand, and to the interest generated by the teacher and to the rewards provided by the system on the other (Pytel, 2006).

The actions of individuals may be affected by two types of motivation: extrinsic and intrinsic. Extrinsicly, motivation could be manipulated by rewarding or punishing the behavior of someone to make him/her do a desired action. Whereas, intrinsic motivation is when there is the desire to do something for no reason other than enjoyment or interest.

In this study, the researcher used the term "motivation" to refer to the intrinsic and extrinsic factors that interest the students so that they enjoy doing something particular.

Academic Achievement: For the purpose of this study the end of the year grade point average (GPA) of the students was used to measure their academic achievement.

Delimitations

As in any study there are some limitations that needed to be considered if the study were to be conducted again. The first was the lack of generalizability. The sample pool was restricted to only one school. Different age groups should have also been taken into consideration.

Also, the chronotypes and time of day preferences of the teachers were also important to be taken into consideration to show us when teachers are most motivated during the day. If teachers are not motivated while they teach, they may not explain the lesson as well as when they are, and affect the way the students learn and understand the explanation.

The MEQ scale is only a self-report measure, so it is qualitative. To understand the chronotypes of the students better, we need to include more objective scientific data. So, in addition to the MEQ, another biological measure should be used. This may be done by conducting physical tests on them.

CHAPTER 2

Review of Literature

Children in typical public schools in the U.S. attend school for six hours each weekday for a total of 180 days a year. In some other industrialized countries, e.g., the United Kingdom, schools operate for up to eight hours a day for as many as 220 days a year (Glass, 2001).

Lebanese students go to school for seven hours each weekday for 180 days. Most Lebanese schools start at 7 or 7:30 o'clock in the morning and end at 2:30 or 3:00 p.m. This means that for 180 days a year, Lebanese students have to wake up as early as 6 or 6:30 a.m. to go to school, sometimes even earlier, depending on the distance of the school from their home and on the means of transportation used. Among all Lebanese students, one wonders how many are evening learners and, hence, suffer academically because of that.

According to Maas (1995), twenty percent of the students in a school fall asleep in class. Among 2,201 surveyed Canadian high school students, more than 58% reported that they were really sleepy between 8 and 10 am (cited in Yan & Slagle, 2006). So, only about 20 percent of high school students get the recommended duration of sleep on school nights (Begle, 1971).

Critics claim that the current school schedule is a major reason for insufficient sleep among adolescents, which is very harmful to their development and affects their learning abilities negatively (Ludwig & Maximilians, 2006). Accordingly, altering school schedules to a later time has been proposed and practiced in some school districts, such as the Baltimore City Public Schools (Bergin & Bergin, 2009).

Through this study, the researcher came across many researches conducted on the topic of chronotypes and their relation to academic achievement and motivation in schools. There were

also many studies done about one of the main problems caused by chronotypes and early school start times and the attempts to solve it.

Chronotypes

Definition of Chronotypes

The biological clock drives all circadian rhythms in humans, whether relative to neurobehavioral function, hormones, physiology, or behavior. The most obvious rhythm is the sleep-wake cycle, which differs in timing across individuals (“chronotype”—from early-morning larks to late-night owls) (Wirz, 2007).

Chronotype is an individual difference characteristic reflecting the time of day at which individuals are “at their best”. While some people prefer to wake up early in the morning and are most active in the first part of the day, others prefer to wake up later, are most active in the evening, and prefer to go to bed late at night. In addition, recently chronotypes have also been linked with specific personality traits in young adults (Werner et al., 2009).

Chronotype is also referred to as ‘morningness/eveningness’ (M/E) preference. Morning types are those people who consistently prefer to do things in the morning, while evening types are those who prefer evening activities (Hidalgo, Caumo, Posser, Coccaro, Camozzato, Chaves & Fagundes, 2009). According to researchers, 15% of people are early types, 37.5% late types and 47.5% are afternoon types (Roenneberg, Kuehnle, Juda, Kantermann, Allebrandt, Gordijn & Merrow, 2007). With reference to age, younger children have been found to tend toward morningness, and older children toward eveningness (Cavallera et al., 2011).

There are at least two sources for individual variability in morningness – eveningness preference. First, there are differences in their circadian phase, which result in chronotypes with

early or late circadian phases. Second, for people who have intermediate circadian phases, changes in the sleep pattern may result in preferences for an early or late sleep schedule (Mongrain, Carrier & Dumont, 2006).

Motivation

However simple and easy the word motivation might appear, it is in fact very difficult to define. It seems to have been impossible for theorists to reach agreement on a single definition, since there are many different explanations and classifications of the word motivation. According to the Webster's dictionary, to motivate means to provide with a need or desire that causes a person to do something (Merriam-Webster's online dictionary, 2011).

Motivation is a desire to achieve a goal, combined with the energy to work towards that goal. It is important in schools because it determines the amount of the learner's active involvement and attitude toward learning (Entwistle, 1987).

Behaviorists, who studied motivation, saw that the actions of individuals were effected by a number of forces acting on the person. These forces could be external or internal. Externally, motivation could be manipulated by rewarding the desired behavior and punishing if the person doesn't do what he/she needs to. This results in the person being extrinsically motivated. Whereas the person is intrinsically motivated when there is the desire to do something for no reason other than his/her own enjoyment, pleasure, or interest (Gottfried, 1990).

Chronotypes and Academic Achievement

Since every student has a different time of the day when he/she understands a subject best and is fully alert, the time that students are most active and are most ready to learn and

understand the lesson depends mostly on their preferred time. However, children and adolescents in general shift their time of day preferences towards evening activities because of the changes in their bodies and metabolic systems (Shepard, 2010). Therefore, biorhythms seem to have an indirect influence on the achievement of students, and the early school start times have a negative influence not only on motivation, and mood levels, but also on school functioning, adolescent health and on the grade point average (Randler & Frech, 2006).

Studies have shown that learning achievement in school varies with the time of day at which classes are held. There are significant differences in attention levels at different times of the day. The later the hour, the lower the level of attention of the students (Klein, 2004).

Recent studies examining the influence of time of day on memory and hence academic motivation have indicated that immediate recall of material learned is critically dependent upon whether the subject is a morning or evening type (Anderson, Petros, Beckwith, Mitchell & Fritz, 1991).

In particular, it is evident that evening type students are at higher risk than morning types of not obtaining sufficient sleep and so perform poorly due to conflict between their individual circadian rhythm and early school schedules (Werner et al., 2009).

According to Randler & Frech (2006), the performance of morning-type individuals decreases throughout the day, whereas the performance of evening types improves. That is, morning preferring students perform better in the morning hours, but start falling behind in the afternoon, while evening preferring students have lower performance in the mornings, but they improve during the afternoon hours. So, students with morning preferences perform better academically, since classes are usually held in the morning hours. Negative effects on school

performance are anticipated when evening preferring students are forced to start at an early time (Randler & Frech, 2006).

Underachievers appear to be late-morning, afternoon, or evening preferents—who learn well at those times of the day. Talented students in extracurricular activities, such as art, dance, drama, music, and sports are often afternoon and evening preferents who actually achieve higher test scores when they are allowed to learn and take tests at their best time of day (Milgram, Dunn & Price, 1993).

According to researchers (for e.g. Klein, 2004 and Rice, 2008) there was an overall progress in the reading skills for lower elementary students who were instructed in the afternoon hours as compared with those who were instructed in the morning. Results showed that the morning-active students had higher academic achievement than those who are alert later in the day.

The relationship between time-of-day preferences and the English achievement of eleventh and twelfth graders was examined. It was found that students achieved significantly higher test scores, and were absent significantly fewer times when their English course periods matched their preferred time. Owens (2010) examined the effects of time preferences on average-to-high-achieving high school students on mathematics course schedules that were matched or mismatched to their time preference. When matched, even high achieving students got significantly higher scores.

Gadwa and Griggs (1985) also reported that high-school dropouts in the state of Washington preferred evening as their optimal time for learning, and they had difficulty

learning in the morning (cited in Dunn & Dunn, 1999). An explanation for dropping out of school is that either time preferences have a bigger effect on underachievers or some students become underachievers because they cannot concentrate and work well during the wrong academic time schedule for them (Dunn & Dunn, 1999).

Nevertheless, these results suggest that the memory performance of the students is critically dependent upon whether the subject is a morning or evening type. An implication of these findings is that a mismatch between older children's time of time preferences and school start time may have a negative effect on their school performance (Sunghan et al., 2002). This fact stresses the importance of taking into consideration the timing of optimal concentration of each age group (Klein, 2004). In the light of the above research, the current study hypothesized that morning students achieve higher academically than evening students.

Chronotypes and Motivation in Schools

The effect of sleep deprivation on mood in normal subjects is related to their circadian preferences. The morningness or eveningness characteristics of the students have significant impact on their mood states and motivation levels (Selvi et al., 2007). So, differences do exist among the times during which humans are more motivated to learn new and difficult academic material and those differences are based upon biologically-imposed circadian rhythms.

According to Dunn and Dunn, 40% of the students are at their peak in the morning, 40% are in the afternoon. That leaves a possibility of 40% of students learning best when school is no longer in session. So, the prime time for learning is not from 7:30-2:30, like the usual school time (Pytel, 2006).

Students who are night “owls” are more motivated at night. Afternoon students probably study when they get home from school. Morning students are the ones that get up an hour early and review their lessons one more time before a test (Pytel, 2006). According to Klein (2004), although difficulty in concentrating at certain times does not necessarily indicate poor performance during those periods, it is important that schools take into consideration the timing of optimal concentration of each age group, so students are taught during a time when they are fully concentrated and able to grasp the subject being taught.

Opinions are divided with respect to the most effective hours for keeping the attention and motivation of individuals of high school age and older (Klein, 2004). The famous idea that reading and math must be taught in the morning may not be applicable for all students (Pytel, 2006). So, adjusting school schedules, by taking the morningness and eveningness characteristics into consideration, may improve mood alterations of a lot of people and make them feel more motivated (Selvi et al., 2007).

It is important to note here that students with evening chronotypes reported more severe depressive symptoms compared to students with morning chronotypes (Hidalgo et al., 2009). In the context of this research, the current study hypothesized that morning students are more motivated than evening students.

The different types of motivation, especially intrinsic and extrinsic motivation, are well known for their effects on academic achievement. Intrinsically motivated students do much better in school, because they are willing to learn new material. Their learning experience is more meaningful, and they go deeper into the subject to fully understand it.

On the other hand, extrinsically motivated students may have to be bribed to perform the same tasks (Gottfried, 1990). According to Kreps (1997), extrinsic motivation can be

counterproductive, because it destroys the intrinsic motivation and leads to lower efforts and lower results. He also notes that intrinsic motivation results in more effort and better results.

Taking into consideration that morning students prefer morning activities, while evening learners prefer evening activities (Randler & Frech, 2006), and the fact that schools start to function in the morning hours, the researcher hypothesized that morning students are more intrinsically motivated whereas evening students are more extrinsically motivated.

Chronotypes and Gender

Differences in circadian behavior have been reported for gender. Male participants seem to be more eveningness-oriented than females. An eveningness disposition in males and a morningness disposition in females have been observed by Ludwig & Maximilians (2006). Randler (2009) has also noticed that girls and women were more morningness-oriented than boys and men (Cavallera et al., 2011).

However, alternative results were also found. While comparing the learning styles of seventh and eighth grade low-achievers in a public middle school, Dunn (1999) discovered that many of the female low achievers preferred learning in the evening, whereas male counterparts were afternoon preferents. Other scholars, such as Sunghan et al. (2002), found no gender differences in the researches done.

In the light of the above contradictory research regarding gender and chronotypes, the researcher decided to hypothesize that females are more morning learners than male students. Based on cultural observations, the researcher believed that Lebanese girls are more likely to follow rules, go home and sleep earlier than boys, stay out less, and be less involved in drugs, smoking and other bad habits.

Problems Associated with Lack of Sleep

As mentioned before, sleep problems, such as bedtime resistance, waking up at night and difficulties waking up in the morning, are common complaints that school students have.

Researchers have argued that these sleep problems may occur because the sleep and circadian characteristics of the students are not matched with parental expectations or school schedules.

According to Bates, Viken, Alexander, Beyers and Stockton (2002), it is common knowledge among parents that when toddlers are irritable, unreasonable, hyper, and unfocused, it must be nap time. Although school-aged students may have outgrown nap time, their achievement and behavior are affected by lack of sleep, just like toddlers.

There are many consequences of sleep deprivation. Some include impairments in mood, attention and memory, lower academic performance and motivation to learn as well as health-related effects, such as weight-gain, lack of exercise and use of stimulants (Owens, 2010).

Sleep-deprived students tend to be more restless, irritable, and impulsive than other students. Moreover, they also may be more depressed and have lower self-esteem than their classmates who sleep more (Bates et al., 2002). Another consequence of sleep deprivation is lower academic achievement. Students who are sleepy are more likely to fail than other students, even when they study as hard and do as much homework as the others.

Lack of sleep decreases motivation, concentration, attention, and logical thinking. It decreases memory, self-control, and increases mistakes (Bergin & Bergin, 2009). Normal variation in sleep habits are from about two hours earlier to about two hours later than average. Extremes outside of this range can cause a person difficulty in participating in normal work,

school, and social activities (Bender & Wellbery, 1991). Aside from low achievement scores, sleep deprivation in students has also been associated with unintentional injuries, and obesity (Noland et al., 2009).

Given the evidence above, improving students' sleep should be of great concern to educators. Indeed, it may be among the lowest-cost approaches to improving student learning (Bergin & Bergin, 2009).

Intervention Strategies

Since adolescents are, on average, evening types, and since school starts as early as about 7:30 in the morning, most students end up being sleepy and weak due to sleep loss, which leads to impaired performance. Both short-term and long-term strategies that address the epidemic of sleep deprivation among adolescents will be necessary to improve health and maximize school performance.

Reformers have spent a lot of time and energy trying to fix the time problem in school (Cuban, 2008). Recent research information about the sleep needs of adolescents and the influence of sleep on learning and behavior has captured the attention of school districts across the United States. Physicians, parents, school board members, and others are asking school administrators and policymakers to acknowledge the medical evidence about the biological sleep patterns of teenagers and to adjust school schedules accordingly. School administrators are being asked to weigh the factual information about the biology of adolescents' sleep patterns against the competing demands of teachers' work preferences, athletic and afterschool activity schedules, and bus transportation schedules (Wahlstrom, 2002).

The idea of flexible school hours was one means proposed to meet the diverse needs and expectations of students. If students have a preferred time of the day to learn, teachers' instruction should adjust accordingly (Rice, 2008), and schools should adjust students' academic schedules to respond to their learning style Time of Day preferences.

Such an approach would allow them to choose courses at hours that they felt would be most beneficial for their learning and increase achievement (Milgram, Dunn & Price, 1993). Klein (2004) found that students were usually accurate in identifying the hours that were optimal for their own progress.

Another long-term solution to chronic sleep deprivation among high school students could include delaying high school start times (Noland et al., 2009). According to many researches, later school schedules would improve students' socio emotional well-being and academic achievement, and make educators' jobs easier (Bergin & Bergin, 2009). A short delay in school start time appears to be associated with significant improvements in adolescent alertness, mood and health (Wahlstrom, 2010).

Students who went to bed an average of 30–40 minutes earlier improved in memory, motor speed, attention, and other abilities associated with math and reading test scores. Thus, even small, temporary increases in sleep can have enormous effects on students' academic performance and achievement (Bergin & Bergin, 2009). A study by Dr. Kyla Wahlstrom (2002) at the University of Minnesota found that all students benefited by obtaining five or more extra hours of sleep per week. So, insufficient sleep can be improved by delaying school start time (Yan & Slagle, 2006).

In the past two decades, American schools have emphasized collective faculty responsibility for a change in the curriculum, but few scholars have actually done something to realize this goal (Briggs, 2007).

Problems with the Intervention Strategies

"Why aren't more schools changing to a later time?" writes Kyla Wahlstrom, Ph.D., of the University of Minnesota, St. Paul. "The answer to that is actually very complicated... The time that a school starts is felt to be sacrosanct by those who have come to rely on it as a predictable part of their day and life." (2010, p. 677)

Even with all this convincing research, changing school start times can be challenging for many schools. Administrators have to delay busing schedules and coaches worry about scheduling practices (Wahlstrom, 2002).

Parents criticize school schedules because they want schools to be open when they go to work in the morning and to remain open until they pick up their children before dinner (Cuban, 2008). Students are also concerned that being in school early means that they will have to stay later in the day and miss after-school jobs and other extracurricular activities.

According to Wahlstrom (2002), making such a change is difficult, especially from an educational administrative perspective because there are many factors that determine when schools begin the school day. The process of change is disturbing to most people; change interferes with feelings of stability and continuity.

Nevertheless, Wahlstrom states that the fact that later school start times can now demonstrate some positive long-term effects should cause districts to seriously consider whether such a change might be feasible for them (2002).

In the light of the literature reviewed above, the following hypotheses were tested.

H1: There is a positive correlation between the scores of chronotypes and scores of the reported academic achievement.

H2: There is a positive correlation between the scores of chronotypes and the scores of motivation.

H3: Morning learners are more intrinsically motivated whereas evening learners more extrinsically motivated.

H4: Female students are more “morning” learners than male students.

CHAPTER 3

Method

The purpose of this study was to investigate the relationship between the “time of day preferences” among Lebanese students and their academic achievement. The researcher was also interested to examine the relationship between the chronotypes of the students and their motivation levels. In addition, this study sought to investigate the relationship between different chronotypes and different types of motivation (intrinsic or extrinsic), and the effect of gender on the different chronotypes.

This study was performed by having participants provide demographic information and fill in two questionnaires. Participants were students from an Armenian private school in Lebanon. The questionnaires were distributed, collected and scored by the researcher. Data were collected and analyzed using descriptive and inferential statistics.

Setting

The study was conducted in a private Armenian elementary school in Beirut. The approval of the school principal was obtained beforehand and permission was granted to administer the questionnaires during their class hours.

Participants

The participants in this research were 103 elementary students (49 girls, 54 boys) from an elementary school in Bourj Hammoud, Beirut. The students were in grades 4, 5, 6 and 7. The age range was between 10 and 16 ($M = 12.00$, $SD = 1.35$). The sample was a convenient sample.

Materials

For the purpose of this study, two questionnaires were used along with a demographics questionnaire: The Morningness-Eveningness Questionnaire (MEQ) and the Elementary School Motivation Scale (ESMS).

The Morningness-Eveningness Questionnaire (MEQ)

The identification of morning type (MT) and evening type (ET) has led to the development of specific questionnaires, of which the most frequently used is Horne and Östberg's Morningness-Eveningness Questionnaire (MEQ) (Cavallera et al., 2011).

Up to date, the MEQ is the most commonly used questionnaire concerning daily preference. It has been used to assess the tendency towards being rather a morning type (lark) or an evening type (owl) by asking respondents about their preferred timing of sleep and daily activities (Werner et al., 2009). An example of an MEQ questions is, "What time would you get up if you were entirely free to plan your day?" The students have to choose between answers such as "5:00 AM - 6:30 AM", "6:30 AM - 7:45 AM", "7:45 AM - 9:45 AM", "9:45 AM - 11:00 AM", "11:00 AM - 12 NOON" and "12 NOON - 5:00 AM".

The Morningness/Eveningness Questionnaire is a construct developed to estimate phase tendencies in circadian rhythm from self-description. Scores range from 16 to 86, with higher scores indicating greater morningness tendencies. Scores are divided into five categories of chronotypes: definite evening type, 16–30; moderate evening type, 31–41; intermediate type, 42–58; moderate morning type, 59–69; and definite morning type, 70–86. For the analysis of the differences among chronotypes, moderate evening types and definite evening types were

grouped together under evening type; the morning-type category encompassed definite morning type and moderate morning type (Hidalgo et al., 2009). The scale is presented in Appendix B.

Validity of the MEQ:

The MEQ has been validated across a variety of samples, translated into several languages, such as French, German and Italian, and modified into other versions. Validity of the original questionnaire and classification of circadian types are defined and tested with the changes in body temperature. Cronbach's alpha coefficient was 0.785 in 1st application and 0.812 in the second. Both applications were significantly meaningful ($p < 0.001$) (Werner et al., 2009).

Elementary School Motivation Scale (ESMS)

The ESMS represents a valid self-report measure of intrinsic motivation, identified regulation, and external regulation in relation to reading, writing, and mathematics among elementary school children (Guay, Marsh & Dowson, 2005).

A total of 27 items are developed to assess intrinsic motivation ($N = 9$), identified regulation ($N = 9$), and external regulation ($N = 9$) toward the three school subjects (reading, writing and mathematics). Children had to indicate whether or not the item applied to them according to the following scale: (1) Never, (2) Rarely, (3) I Don't Know, (4) Sometimes, (5) Always. The maximum score is 135, with higher scores indicating greater motivation. The scores of the nine questions that assess intrinsic motivation and the scores of the nine questions that assess extrinsic motivation were compared to check if a student was more intrinsically or extrinsically motivated. The full 27-item version of the scale is presented in Appendix C.

Validity of the ESMS:

The validity of the original questionnaire was tested previously. The Cronbach alpha values were .78 for the internal motivation subscale ($n = 9$), and .77 for the external motivation subscale ($n = 9$). The Cronbach alpha for the whole scale was $r = .77$ ($n = 27$).

Procedure

The researcher administered the questionnaires to the students. At first, the demographics questionnaire was read and explained, then the students were given 5 minutes to fill it in. The following instructions were given before continuing: "This is a chance to help me to find out how you feel. It is not a test. There are no right or wrong answers and everyone will have different answers. Choose the answer that best describes how you feel. If you do not understand a sentence or a word in a sentence, please tell us. We will not show your answers to anyone." Then, the researcher read each question out loud, explained it, and gave the students around 30 minutes to think and answer the questions (around half a minute for each). In addition, the students' average scores of the academic year were obtained from the principal at the end of the school year 2010-2011.

CHAPTER 4 Results

This study used two scales: The Morningness-Eveningness Questionnaire (MEQ) and the Elementary School Motivation Scale (ESMS). The internal reliability of each subscale of the ESMS as well as the total scales of ESMS and MEQ were determined by calculating Cronbach's alpha for each scale and subscale.

Table 1

Cronbach's alpha for the subscales and total scales of ESMS and MEQ

Scale	Previous Cronbach's Alpha	Current Cronbach's Alpha
Intrinsic Motivation (N= 9)	.78	.62
Extrinsic Motivation (N= 9)	.77	.49
ESMS (N= 27)	.77	.81
MEQ (N=19)	.78	.79

The Chronbach alpha (.40) for the extrinsic motivation was low compared to the Chronbach alpha of previous studies (.77). This is most probably due to the cultural factors of the sample. The subjects of the study were Lebanese Armenian students and the questionnaires were intended to be used with Americans. So, maybe cultural differences related to the meaning of extrinsic motivation may have resulted in misunderstanding some of the questions and hence resulted in the low Cronbach alpha score.

Hypothesis 1: There is a positive correlation between the scores of the chronotypes and the scores of academic achievement.

To test the relationship between chronotype and academic achievement a correlation was computed between the scores of the MEQ and the GPA scores of the students. The result was $r(103) = .61, p < .001$, which supports the predicted relation.

Thus, hypothesis 1 was confirmed.

Hypothesis 2: There is a positive correlation between the scores of the chronotypes and the scores of motivation.

To test for the above relationship, a correlation was computed between the MEQ and the GPA scores of the students. The obtained result was $r = .62, p < .001$.

Thus, hypothesis 2 was confirmed.

Hypothesis 3: Morning learners are more intrinsically motivated, whereas evening learners more extrinsically motivated.

To test this hypothesis, the researcher checked the results of the subscales of the ESMS questionnaire and compared the scores of "intrinsic motivation" with "extrinsic motivation" for each student (See Table 3). The results showed that morning students ($N = 44$) were more intrinsically motivated than evening students ($N = 13$), while evening learners more extrinsically motivated ($N = 30$) than morning students ($N = 16$). The researcher also conducted a paired samples t-test. The result was $t(102) = 28.14, P < 0.0005$ for internal motivation and larks. and $t(102) = 25.54, P < 0.0005$ for external motivation and owls (see Table 4).

Thus, hypothesis 3 was confirmed.

Table 3

Motivation Type * Morning/Evening Crosstabulation

Count		Morning/Evening		Total
		Morning Type	Evening Type	
Motivation Type	Intrinsic	44	16	60
	Extrinsic	13	30	43
Total		57	46	103

Table 4

Paired Samples T-Test
Chronotypes and Motivation Types

	Paired Differences	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. tail
					Lower	Upper			
Pair 1 external motivation - Morning/Evening		27.466	10.912	1.075	25.333	29.599	25.545	102	
Pair 2 internal motivation - Morning/Evening		28.456	10.263	1.011	26.451	30.462	28.140	102	

Hypothesis 4: Female students are more “morning” learners than male students.

To test the differences between males and females in MEQ, an independent-sample t-test was conducted. Results showed no significant difference in scores for males ($M = 51.83$, $SD = 10.81$) and females ($M = 49.41$, $SD = 10.7$), $t(101) = 1.142$, $p = .958$ (See Table 5).

Thus hypothesis 4 was not confirmed.

Table 5

Descriptive Statistics
Chronotypes and Gender

	Male or Female	N	Mean	Std. Deviation	t	Sig.
Morningness/Eveningness	Male	54	51.83	10.815	1.142	.958
	Female	49	49.41	10.700	1.142	.958

CHAPTER 5

Discussion

The purpose of this study was to investigate the relationship between the chronotypes and the academic achievement as well as the motivation among elementary and intermediate students. For that reason, students in a private elementary school filled in demographic information such as their age and gender, in addition to the Morningness-Eveningness Questionnaire (MEQ) and the Elementary School Motivation Scale (ESMS).

The review of the past research suggested that students, especially adolescents are not having enough sleep, due to the early school start times and that the insufficient sleep time is impairing their learning and development. (Shepard, 2010; Werner et al., 2009).

The results of this study showed that early school start times resulted in low academic performance as well as low motivation levels for the evening-preferring and afternoon-preferring students. The morning-preferring students were the only ones who had relatively high academic achievement and high motivation levels. This is in line with results obtained by researchers, Klein (2004), Owens (2010) and Randler & Frech (2006), as well as Pytel (2006), Dunn (1999) and Selvi et al. (2007), all of which confirmed that morning students had higher motivation and achievement levels than evening students.

A study conducted by Shepard (2010) in Rhode Island High Schools examined the effects of starting school at 8:30 am. The students completed a sleep habits survey both before and after the delayed school start time. The results showed that class attendance improved, there were fewer visits to the nurse, and most importantly, students reported that they were feeling happier, less depressed and more motivated. Judy Owens, MD (2010), a sleep expert, reports that a

modest delay in school start time of only 30 minutes was associated with significant improvements in adolescent attentiveness, mood and health. While Dr. Kyla Wahlstrom found that students benefited by obtaining five or more extra hours of sleep per week (2002).

This shows the need to make schools start later than the usual time in the morning and prepare the schedule in an organized way to ensure that all students get an equal chance to study at their preferred time of the day.

The results for the different motivation levels and chronotypes showed that morning students were more intrinsically motivated than evening learners. Using the paired samples t-test it seemed that there is a significant difference in both groups on both scales. The morning types are more intrinsically motivated and the evening types are more extrinsically motivated, and it is a highly statistical difference. It seems likely that in the actual population, larks are more likely to be intrinsically motivated than owls.

The researcher found no studies conducted on this topic. The reason for this result is most likely due to the fact that schools and most jobs start early in the morning, so the morning-preferring people will wake up excited in the morning, feel energetic and be happy during work or school and hence intrinsically motivated.

Whereas those who don't enjoy waking up, working and studying in the morning will have a very difficult time waking up in the morning and most probably need an alarm clock or someone to wake them up. They also find it hard to concentrate at work or school and will probably not do anything unless there is a very important reason to do so or he/she will be punished for not doing it.

The researcher also conducted an independent samples t-test to check chronotype differences in gender. These results back up the research done by Sunghan et al. (2002) who noted no particular chronotype differences in gender and not the other researches (Ludwig & Maximilians, 2006; Cavallera et al., 2011; Dunn, 1999) who stated that females were larks while males were owls, and on which the researcher based her fourth hypothesis upon. This may be due to the selected sample background and its size.

Conclusion

The present study investigated the relationship between different chronotypes, academic achievement and motivation, taking into consideration the different subscales of motivation as well as demographic variables such as gender.

The results of this study showed that the morningness-eveningness preferences of the students or their different chronotypes, is significantly related to their motivation levels and academic performance in school. Also, the assumption that larks are more intrinsically motivated than owls turned out to be true. However, gender didn't seem to be related to the chronotypes.

There were some delimitations to this study. First, the sample of the students selected was small and a convenient sample. A more representative sample is recommended in the future. Moreover, more data are needed about the socioeconomic status of the students, the geographic location of the school and differential needs and expectations among students, their parents and teachers in order to further understand the differences between the chronotypes.

Besides the students, the teachers also have time preferences when to start their work. So, the chronotypes and the motivation levels of the teachers are also important factors to be taken

into consideration. Both factors affect the morale and the ability of the teachers to teach. Motivated teachers are proven to be much better in their teaching methods, and in making the lesson more interesting and easier to comprehend for the students, hence producing better achieving students (Bishay, 1996).

In addition to these, the MEQ scale is not enough to measure the time-of-day preferences of the students, since it is self-report measure, i.e. a subjective one.

The original MEQ questionnaire was tested for validity using instruments that measure the brain waves and other physical and biological changes in the body of the people who filled in the questionnaire. A biological scale, like that one, should be used with the MEQ for the results to be more objective and reliable.

The major findings of this study bear two important suggestions for the schools in Lebanon. The first is to delay school start times, since it will be beneficial for most if not all students and teachers as well. Although this seems to be a hard task to fulfill, it would be a major step in improving the academic as well as the motivation level of the students.

Sleep deprivation is a very important matter in education as well as health. If schools are seriously interested in the students' well being and academic success, then measures should be taken to make schools start at least half an hour later than the usual early morning starting time. Half an hour of sleep can be very beneficial for the student, not only by increasing the time of rest, but as research shows, increasing the academic achievement level in the school (Wahlstrom, 2010).

Second, the different subjects should be scheduled according to their importance taking into consideration the different chronotypes in the classroom. According to Klein (2004),

responsibility for scheduling in schools is usually given to administrators, whose planning considerations are technical rather than psycho-educational. So, the administrators of the schools should be professional educators and psychologists, who understand the different needs and backgrounds of the students, or they should let professionals do the scheduling instead of them.

Investigation of this matter may well offer new insights with respect to diurnal changes in student achievement. In planning the daily time table, those responsible must take into account the subjects in which classes perform best. At the same time it is necessary to note which study hours are most effective among pupils with different academic potentials.

As mentioned previously, most schools in Lebanon have scheduled the important-considered subjects, such as mathematics and sciences during the first few periods of the school day. This probably results in lower academic achievement rather than improving the grades of the students, since many students if not most of them, are still sleepy and they are not able to concentrate and grasp the material taught during the early morning hours.

School administrators must determine which subjects to schedule for the hours during which the attention of the students is high and which subjects to teach them when their attention is typically low (Klein, 2004).

For future studies, the researcher suggests duplicating the study in more schools, taking into consideration all age groups as well as teachers, since the interaction between the biorhythms of teachers and pupils, has not been studied.

In addition to all these, experiments should be conducted in the schools in Lebanon. For example, a comparison of learning effectiveness in schools which operate in two shifts is needed, i.e. scheduling classes in such a way that the same subject is taught twice per day, once in the morning and once in the afternoon. This way, it would be easier to observe the effect of time on the students' motivation and academic results.

Experiments with delayed school start times, like the study done in the University of Minnesota, should also be conducted in Lebanon to fully comprehend the impact of the different chronotypes on students.

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APPENDIX A

Demographics Questionnaire

Name: _____

School: _____

Grade Level: _____

- 1) What is your gender? Male Female
- 2) What is your age? _____
- 3) What is your nationality: _____
- 4) Where do you live? _____
- 5) What language is spoken most frequently in your home?
- English
 - Arabic
 - Armenian
 - French
- 6) Do you have siblings? Yes No
- 7) If yes, how many? _____
- 8) Also, if so, what is your birth order? (i.e. first, second, etc.) _____
- 9) Are you sleepy when you wake up in the morning? Yes No
- 10) At what time do you prefer to sit for an exam?
- Early in the morning (7:30 a.m – 9:00 a.m.)
 - Around noon (10 a.m. – 12 p.m.)
 - In the afternoon (12 p.m. – 2:30 p.m.)

APPENDIX B
Morningness-Eveningness Questionnaire (MEQ)

Please read very carefully and circle the answer that best describes how you feel. Answer all questions as honestly as possible. Each question should be answered independently of others.

1. What time would you get up if you were entirely free to plan your day?

- 5:00 AM - 6:30 AM
- 6:30 AM - 7:45 AM
- 7:45 AM - 9:45 AM
- 9:45 AM - 11:00 AM
- 11:00 AM - 12 NOON
- 12 NOON - 5:00 AM

2. What time would you go to bed if you were entirely free to plan your evening?

- 8:00 PM - 9:00 PM
- 9:00 PM - 10:15 PM
- 10:15 PM - 12:30 AM
- 12:30 AM - 1:45 AM
- 1:45 AM - 3:00 AM
- 3:00 AM - 8:00 PM

3. If there is a specific time at which you have to get up in the morning, to what extent do you depend on being woken up by an alarm clock?

- Not at all dependent
- Slightly dependent
- Fairly dependent
- Very dependent

4. How easy do you find it to get up in the morning (when you are not woken up unexpectedly)?

- Not easy at all
- Not very easy
- Fairly easy
- Very easy

- 5. How alert do you feel during the first half hour after you wake up in the morning?**
- Not alert at all
 - Slightly alert
 - Fairly alert
 - Very alert
- 6. How hungry do you feel during the first half-hour after you wake up in the morning?**
- Not hungry at all
 - Slightly hungry
 - Fairly hungry
 - Very hungry
- 7. During the first half-hour after you wake up in the morning, how tired do you feel?**
- Very tired
 - Fairly tired
 - Fairly refreshed
 - Very refreshed
- 8. If you have no commitments the next day, what time would you go to bed compared to your usual bedtime?**
- Never or seldom later
 - Less than one hour later
 - 1-2 hours later
 - More than 2 hours later
- 9. You have decided to engage in some physical exercise. A friend suggests that you do this for one hour twice a week and the best time for him is between 7:00 – 8:00 am. Bearing in mind nothing but your own internal “clock”, how do you think you would perform?**
- Would be in good form
 - Would be in reasonable form
 - Would find it difficult
 - Would find it very difficult

10. At what time of day do you feel you become tired as a result of need for sleep?

- 8:00 PM - 9:00 PM
- 9:00 PM - 10:15 PM
- 10:15 PM - 12:45 PM
- 12:45 PM - 2:00 AM
- 2:00 AM - 3:00 AM

11. You want to be at your peak performance for a test that you know is going to be mentally exhausting and will last for two hours. You are entirely free to plan your day. Considering only your own internal “clock”, which ONE of the four testing times would you choose?

- 8:00 AM - 10:00 AM
- 11:00 AM - 1:00 PM
- 3:00 PM - 5:00 PM
- 7:00 PM - 9:00 PM

12. If you got into bed at 11:00 PM, how tired would you be?

- Not tired at all
- A little tired
- Fairly tired
- Very tired

13. For some reason you have gone to bed several hours later than usual, but there is no need to get up at any particular time the next morning. Which ONE of the following are you most likely to do?

- Will wake up at usual time, but will NOT fall back asleep
- Will wake up at usual time and will doze thereafter
- Will wake up at usual time but will fall asleep again
- Will NOT wake up until later than usual

14. One night you have to remain awake between 4:00 – 6:00 AM in order to carry out a night watch. You have no commitments the next day. Which ONE of the alternatives will suite you best?

- Would NOT go to bed until watch was over
- Would take a nap before and sleep after
- Would take a good sleep before and nap after
- Would sleep only before watch

- 15. You have to do two hours of hard physical work. You are entirely free to plan your day and considering only your own internal “clock” which ONE of the following time would you choose?**
- 8:00 AM – 10:00 AM
 - 11:00 AM – 1:00 PM
 - 3:00 PM – 5:00 PM
 - 7:00 PM – 9:00 PM
- 16. You have decided to engage in hard physical exercise. A friend suggests that you do this for one hour twice a week and the best time for him is between 10:00 – 11:00 PM. Bearing in mind nothing else but your own internal “clock” how well do you think you would perform?**
- Would be in good form
 - Would be in reasonable form
 - Would find it difficult
 - Would find it very difficult
- 17. Suppose that you can choose your own work hours. Assume that you worked a FIVE hour day (including breaks) and that your job was interesting and paid by results). Which FIVE CONSECUTIVE HOURS would you select?**
- 5 hours starting between 4:00 AM and 8:00 AM
 - 5 hours starting between 8:00 AM and 9:00 AM
 - 5 hours starting between 9:00 AM and 2:00 PM
 - 5 hours starting between 2:00 PM and 5:00 PM
 - 5 hours starting between 5:00 PM and 4:00 AM
- 18. At what time of the day do you think that you reach your “feeling best” peak?**
- 5:00 AM – 8:00 AM
 - 8:00 AM – 10:00 AM
 - 10:00 AM – 5:00 PM
 - 5:00 PM – 10:00 PM
 - 10:00 PM – 5:00 AM
- 19. One hears about “morning” and “evening” types of people. Which ONE of these types do you consider yourself to be?**
- Definitely a “morning” type
 - Rather more a “morning” than an “evening” type
 - Rather more an “evening” than a “morning” type
 - Definitely an “evening” type

APPENDIX C
Elementary School Motivation Scale (ESMS)

Please mark the answer that best represents how you feel about each of the statements below.

	Never	Rarely	I don't know	Sometimes	Always
I like reading.					
Reading interests me a lot.					
I read even when I am not obliged to do so.					
Reading will allow me to learn many useful things.					
I chose to read to learn many things.					
In life, it's important to learn how to read.					
I read to get a nice reward.					
I read to please my parents or my teacher.					
I read to show others how good I am.					
I like writing.					
Writing interests me a lot.					
I write even when I am not obliged to do so.					
Writing will allow me to learn many useful things.					
I chose to write to learn many things.					
In life it's important to learn how to write.					
I write to get a nice reward.					
I write to please my parents or my teacher.					
I write to show others how good I am.					
I like mathematics.					
Mathematics interests me a lot.					
I do mathematics even when I am not obliged to do so.					
Mathematics will allow me to learn many useful things.					
I chose to do mathematics to learn many things.					
In life, it's important to learn how to do mathematics.					
I do mathematics to get a nice reward.					
I do mathematics to please my parents or my teacher.					
I do mathematics to show others how good I am.					