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Chronotype and academic achievement among online learning students

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ABSTRACT

In the last decade a growing number of researches that investigate the relationship between circadian rhythm and academic performance have been conducted. Most of these studies were conducted on face-to-face students. These researches have indicated that there is an asynchrony problem between circadian rhythm of individuals and face-to-face course times. Online learning can be seen as a potential solution. Therefore, the study sought to investigate whether academic achievement changes with respect to chronotype among online learning students. The sample consisted of 724 online learning students. A significant difference was observed in academic motivation scores where morning type students had higher academic motivation scores when compared to other types of students. No significant difference was observed among chronotype groups with respect to academic achievement and attitude towards web-based instruction. Finding no difference in academic achievement scores according to chronotype supports the idea that online learning can be used to diminish asynchrony problem existing in face-to-face education and thus enhance the academic performance of evening type students.

1. Introduction

Individual differences among students have an influence on learning in diverse instructional situations. Students' learning differs because they have different learning styles, traits, approaches, intelligence, interests, prior knowledge, readiness, experiences and so on. These differences determine, to some extent, if and how well one can learn (Jonassen & Grabowski, 1993). Therefore, individual differences in education should be taken into consideration while teaching and designing instruction. A growing number of studies investigate the importance of individual differences in education. Biological rhythm is also one of these individual differences (Carskadon, Vieira, & Acebo, 1993; Roenneberg, Wirz-Justice, & Merrow, 2003) that affect human life in many aspects. Although biological rhythms of individuals have been known for a long time, in recent decades, educators and researchers in education have placed importance on, and initiated investigations into, their effects on education. There are varieties of biological rhythms such as annual, seasonal, monthly, weekly, daily (circadian), and hourly, and rhythms that can vary in seconds (Beşoluk & Önder, 2011; Lemmer, 2009). Circadian rhythm is the most important of these rhythms in affecting learners' cognitive and school performance.

1.1. The importance of circadian rhythm in education

Circadian rhythm may influence a variety of psychological and physiological functions such as psychological and physiological well being, physical performance, cognition, school performances, and sleep (Adan et al., 2012; Escribano, Díaz-Morales, Delgado, & Collado, 2012; Prieto, Díaz-Morales, Escribano, Mateo, & Randler, 2012; Roeser, Brückner, Schwerdtle, Schlarb, & Kübler, 2012). Circadian rhythm is an approximately 24-hour period and is synchronized with light. Individuals are commonly classified as morning, neither and evening type persons according to their preference of morning or evening activities (Preckel, Lipnevich, Schneider, & Roberts, 2011; Vollmer & Randler, 2012). A morning type person wakes up easily and is more alert in the morning than an evening type person. On the other hand, an evening type person has difficulty with early rising, and is more alert at night. Most individuals lie in between these two extremes and are called neither type (Horne & Östberg, 1976). Circadian typology, which is commonly called morningness–eveningness preference, is generally determined with self-reported instruments such as Composite Scale of Morningness (CSM; Smith, Reily, & Midkiff, 1989), Morningness Eveningness Questionnaire (MEQ; Horne & Östberg, 1976), Morningness/Eveningness Scale for Children (MESC; Carskadon et al., 1993), and Munich ChronoType Questionnaire (MCTQ; Roenneberg et al., 2003).

Morningness–eveningness preference of individuals may change according to age and gender (Díaz-Morales & Sorroche, 2008; Randler, 2007). While children are usually more morning oriented, in adolescence they become more evening oriented (Díaz-Morales & Randler, 2008; Werner, LeBourgeois, Geiger, & Jenni, 2009). Moreover, the ratio

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of evening type individuals has increased in the modern age since factors such as artificial lightening, television, amount of light emitted from computer screens, information communication technologies and life style regulation affect individuals' sleep–wake cycle (Vollmer, Michel, & Randler, 2012). Sleep duration and quality, which are associated with circadian rhythm, may affect individuals' academic success. Most of the face-to-face education programs start early in the morning and standard tests are generally administered in the morning (Beşoluk, 2011). While this is an advantage for morning types, evening types are affected adversely. Because evening type individuals sleep late and have difficulty in waking up early in the morning, they cannot get enough sleep, lose their appetite, and usually skip their breakfast and go to school with low motivation and attitude (Jovanovski & Bassili, 2007; Martin & Marrington, 2005; Randler & Frech, 2009). This fact may affect evening type individuals' school/exam performance (Boschloo et al., 2012). Two of the important factors that affect achievement are motivation and attitude (Gottschling, Spengler, Spinath, & Spinath, 2012; Singh, Granville, & Dika, 2002; Trigwell, Ashwin, & Millan, 2012). In order to investigate and evaluate the effect of any factor on achievement, it is important to determine the level of students' motivation and attitude.

If there is asynchrony between circadian rhythm of students and face-to-face instruction schedule, students' academic performance may be affected negatively (Escribano et al., 2012; Önder, Horzum, & Beşoluk, 2012). Several studies indicated that eveningness and academic achievement are inversely related whereas morningness and indicators of academic achievement are positively related due to this asynchrony (Beşoluk, Önder, & Deveci, 2011; Preckel, Lipnevich, Schneider et al, 2011). Although one of the possible solutions to this asynchrony problem is to implement educational programs that start at different times of the day, it is very difficult to actualize this situation.

1.2. Online learning as a solution to asynchrony problem

A feasible and applicable solution to the asynchrony problem is to use Information and Communication Technologies (ICT) either to support face-to-face education or in distance education. Although supporting face-to-face education with ICT may be a solution to the problem, distance education provides more flexible solutions. The internet is one of the technologies that increase flexibility and it is widely used in an incremental trend. One of the most widely used applications of the internet is online learning (Ally, 2008).

Online learning delivers some form of instruction to learner(s) who are separated by time, distance or both, via the internet. Online learning may occur among people scattered around the world or among people in small facility (Dempsey & Van Eck, 2002). Meanwhile, online learning provides individuals with access to learning resources, anywhere, anytime and at their own pace (Holmes & Gardner, 2006; Lynch, 2002). In online learning, individuals can set the schedule and learning time and can get the best instruction available for their individual differences (Horton, 2000; Moore & Kearsley, 2012; Simonson, Smaldino, Albright, & Zvacek, 2006). Therefore, online learning may diminish the asynchrony problem by providing an opportunity for students to access learning resources when their cognitive performance is at an optimal level.

In the literature, there are few studies that relate chronotype and distance education. Jovanovski and Bassili (2007) investigated the relationship between circadian preference and choice of students' to attend lectures or watch them online and whether circadian rhythm is related to course performance. They found that evening type students were more likely to choose to watch lectures online, and no relationship was found between circadian preference and course performance. Önder et al. (2012) investigated whether students' academic achievement differs with respect to their chronotype and time/type of instruction, one of which was blended learning. The authors emphasized the importance of enhancing synchrony between teaching time and circadian preference. However, neither of these studies is fully related to online learning, and they do not investigate the effect of circadian preference on online learning students' academic achievement. Luo, Pan, Choi, Mellish, and Strobel (2011) investigated whether circadian preference is related to perceived level of control, independence and satisfaction, and whether choice of learning time for online classes changes with circadian preference. They reported no relationship between the three factors and circadian preference, but found significant results when comparing choice of learning time for online classes and circadian preference of students. However, the relationship between circadian preference and academic achievement was not investigated in the study.

1.3. Aim of the current study

The current study was conducted to determine whether academic achievement of online learning students differed with respect to their circadian preference when sex, age, academic motivation and attitude towards web-based instruction were controlled. In addition, it also investigated whether students' attitude towards web-based instruction and academic motivation differs with circadian preference. Sex, age and attitude towards web-based instruction were used as covariates while investigating academic motivation, and sex, age and academic motivation were used as covariates while investigating attitude towards web-based instruction. Finally, the correlations among academic achievement, attitude towards web-based instruction, academic motivation, circadian preference, sleep length and mid-point of sleep were investigated.

2. Methodology

In the study, survey methodology was used. Students completed anonymously and voluntarily four on-line surveys at the end of the 2012 spring semester. The link with data collection instruments was shared by Learning Management System (LMS). Moreover, Cumulative Grade Point Averages (CGPA) of sophomore students who had taken all the courses provided in the curriculum were obtained from the registrar at the end of the fourth semester. A purposive sampling method was followed, since the study was administered to determine the relationship between chronotype and academic achievement among online learning students.

2.1. Participants

The sample consisted of university students who were enrolled in two-year online learning programs. The online learning programs that students were enrolled in contained learning materials, chat, e-mail and forums. Meanwhile, students were able to access the course contents of a whole semester whenever they wished. The sample consisted of 724 university students of Gazi University, Ankara, Turkey. In Turkey, there are over 200 universities, about 14 of which provide online education programs for students, and the sample in this study was selected from one of these universities. Of the participating students, 361 (49.9%) were female and 363 (50.1%) were male. The mean age of the sample was 25.63 years (SD: 6.63) and the sample was aged between 18 and 54.

2.2. Instruments

In the study, demographic questionnaire, Academic Motivation Scale (AMS-C), Attitudes towards Web-Based Instruction (AWBL) and Composite Scale of Morningness (CSM) were used as data collection instruments.

2.2.1. Demographics

A demographic questionnaire was used to gather data on the participants' gender, age, retiring time and rising time.