

Do learning styles affect study duration and academic success?

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SUMMARY

Individuals learn in different ways and gain information quite differently. Learning style is not the only agent that causes differences in learning. However, it is accepted as one of the most important components of the learning process. Focusing on different aspects, scholars have developed various learning style inventories. Kolb's Learning Style Inventory (KLSI) was used in this study. Kolb's learning style model, based on the experiential learning theory (ELT), is used extensively throughout the world. The model includes 4 learning styles, which are divergent, assimilative, convergent and accommodative. The present study was carried out among 146 first-year medical students at Akdeniz University. Data were analyzed by using percentage, mean, one-way anova and chi-square. At the end of the analyses, we observed that 45.9% of first-year medical students were assimilators (ASM) and statistically significant differences ($p < 0,05$) were present between the students' learning styles in terms of study duration ($p = 0,015$) and theoretical course score ($p = 0,04$), but no statistically significant differences with gender ($p = 0,913$). Findings support that the learning styles affect study duration and theoretical anatomy course scores. Understanding students' learning styles would benefit to detective of productive study duration for lesson so effective working time on learning style increases academic achievement.

Key words: Learning – Learning styles – Kolb learning styles – Learning style inventory

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INTRODUCTION

Students learn in a variety of ways, preferentially incorporating and processing different types of information in different ways. Successful medical teaching requires teachers to address the variations in learning styles and approaches in order to understand learners' needs (Vaughn and Baker, 2001; Kolb, 2000). So learning styles are the indicators of how a student learns and which learning style prefers. Kolb (1984) defines learning styles as the individually preferred methods of perceiving and processing information (Cox, 1984). Although there are numerous learning style models, Kolb's learning styles model, based on experiential learning theory (ELT), is one of the most widely used ones. Unlike other cognitive learning theories, it focuses on the role of experiences in learning (Cox, 1984). According to the Kolb Learning Style Model, the learning process has two dimensions, which are apprehension and transformation (Cox, 1984; Cassidy, 2004). There are four basic preferences existing on the continuation of these two independent dimensions, which support each other: concrete experience, abstract conceptualization, active experimentation and reflective observation. While concrete experience and abstract conceptualization account for the individual's perception of knowledge, reflective observation and active observation indicate how students processes information. Kolb's model includes a learning cycle that involves four processes that must be present for learning to occur. These are "feeling" in concrete experience, "watching" for reflective observation, "thinking" for abstract conceptualization, and "doing" for active experimentation. According to Kolb's learning style model, individuals perceive information by feeling and thinking, and process it

Submitted: 4 January, 2017. Accepted: 29 March, 2017.

by watching and doing. The learning style of an individual is the combination of these four ways of learning and not determined by a single ability. Determining the learning styles of students may help teachers develop appropriate teaching methods (Cassidy, 2004; Novak et al., 2006; Pask, 1976). There are many studies on the use of Kolb's learning styles in medical education (Baker et al., 1985; Klein et al., 2007; Robinson, 2002; Sadler et al., 1978; Whitney and Caplan, 1978; Wunderlich and Gjerde, 1978). According to the literature, Kolb's learning style inventory (KLSI) is the most commonly used tool to determine the learning styles of medical students and scholars (Adesunloye et al., 2008; Campeau, 1998; Danish and Awan, 2008; Kolb, 1984, 1999, 2000; Plovnick, 1975). Validity and reliability of the KLSI was previously evaluated and proved (Loo, 1996; Mainemelis et al., 2002; Platsidou and Metallidou, 2009). There are also numerous literature studies investigating the efficiency of both traditional and student-centered instruction (Habib and Mansuri, 2006; Kaufman and Holmes, 1996; Khoo et al., 2001; McLean, 2004; O'Neill et al., 2000; Vernon, 1995). Our literature search showed that no studies have been published on KLSI-related anatomy lesson of first-year medical faculty students. The aim of the present study is to determine the relation of study duration and course scores with learning styles and also assessing learning styles of first-year medical students utilising KLSI.

MATERIALS AND METHODS

The Model of the Study and the Study Group

The present sectional study aims at determining the learning styles of the students enrolled in the first year of Akdeniz University Medical School. The study group consists of 146 students enrolled in the first semester of the medical school.

Data Collection Tool

The 12-item Learning Style Inventory developed and revised by Kolb (1976) was used to determine the learning styles of the medical students involved in the study. KLSI (version 3.1) was used to assess individual learning styles. The validity and reliability of the original questionnaire was approved by Kolb and his colleagues (Kolb, 2000). Learning styles inventory developed by Kolb (1984) and translated into Turkish by Askar et al. (1993). Also, the validity and reliability of the Turkish version of the questionnaire had been shown and confirmed in a previous study conducted among Turkish people (Askar, 1993). This tool allows the characterization of learning styles into 4 groups: accommodating, assimilating, diverging and converging. In addition to the 12 basic items of the inventory, gender and the scores received from the theoretical and practical anatomy courses and the time allocated to study for the anatomy course

weekly were also queried. Each learning dimension and the learning styles related with these dimensions can be summarized as follows: the accommodating learning style involves concrete experience and active experimentation. Planning, executing decisions and taking part in new experiences are the main characteristics of this group of learners (feeling and doing). The assimilating learning style involves abstract conceptualization and reflective observation. The main characteristic of assimilators are favoring abstract concepts and ideas, as well as creating conceptual models (thinking and watching). Divergers are oriented toward concrete experience and reflective observation. Thinking deeply about experiences, being aware of values and meaning and combining relationships into a meaningful whole are the main characteristics of this group of learners (feeling and watching). And the last one, the converging learning style, involves abstract conceptualization and active experimentation. Problem-solving, decision-making, logical analysis of ideas and systematic planning are the main characteristics of convergers. Learning by doing is essential for this group of learners (thinking and doing).

The Application Method

KLSI was administered to the students during a practical hour of the anatomy class. After the necessary permissions were obtained from the lecturers attending the anatomy courses, the forms were handed to these students, who were then asked to fill them after the necessary explanations were provided. Surveys with incomplete answers or errors were excluded from the research, so resulting in a total of 146 respondents. KLSI administered to students lasted about 10 minutes during the practical hour of the anatomy. The Turkish version of the questionnaire was distributed to the students and collected by the assistants. There were no differences to start with between male and female students. KLSI consists of 12 items with four responses to choose from. The items are scored on a scale of 1 to 4, where 4 corresponds to the most appropriate choice and 1 corresponds to the least appropriate one. The data collected were placed on a graph that was designed according to the ELT. The graph was assigned into four areas as accommodating, diverging, converging and assimilating. It was used to indicate the distribution of the students according to the 4 learning styles. The theoretical and practical general anatomy exam scores of the students were obtained from the Student Affairs Department. Other responses including the study duration was self-reported by the medical students.

Data Analysis

The data analysis was performed with the SPSS 20 software package. Frequency (f), percentage (p), Chi-square test (χ^2), One-way anova tests

and variance analysis were used for quantitative comparisons.

RESULTS

It was determined that 8.2%, 17.8%, 28.1% and 45.9% of the first-year medical students involved in the study were accommodators (ACM), divergers (DIV), convergers (CON) and assimilators (ASM), respectively (Fig. 1). Although there was no statistically significant difference between the female and male students in terms of study duration and learning styles, it was found that the male students had higher grades in the theoretical course than the female students ($p=0.01$). Statistical differences were not present between gender and learning styles ($p=0,913$) (Table 1). As for the results on study duration, the maximum duration of study for each study course among the ACM, DIV,

CON and ASM were 6-10 hours, 1-5 hours, 6-10 hours and 1-5 hours, respectively ($p=0.015$). So statistical differences were present between study duration and learning style. Most of ACM 75% ($n=9$) and CON 43% ($n=18$) preferred 6-10 hours for studying anatomy. Although DIV 53% ($n=14$) and ASM 52% ($n=35$) most preferred hours 1-5. The least preferred studying duration were 11 hours and above in CON 19% ($n=8$) and ASM 10% ($n=7$). The other side the least preferred study duration changed among the learning styles. The least preferred study duration was 6-10 hours among DIV 19% ($n=5$) and 1-5 hours among ACM 8% ($n=1$) for studying anatomy. While there was no statistically significant relationship between practical anatomy course scores and learning styles, it was observed that the students preferring the converging learning style had higher practical and theoretical course scores than those preferring

Table 1. Study duration and its distribution according to gender.

Gender	ACM		DIV		CON		ASM	
	n	%	n	%	n	%	n	%
Male	5	41,7	14	53,8	21	51,2	28	45,2
Female	7	58,3	12	46,2	20	48,8	39	50,7
$p=0,913$								
Study Duration								
1-5 hours	1	8,3	14	53,8	15	36,6	35	52,2
6-10 hours	9	75,0	5	19,2	18	43,9	25	37,3
11 hours and above	2	16,7	7	26,9	8	19,5	7	10,4
$p=0,015$								

Chi-square test

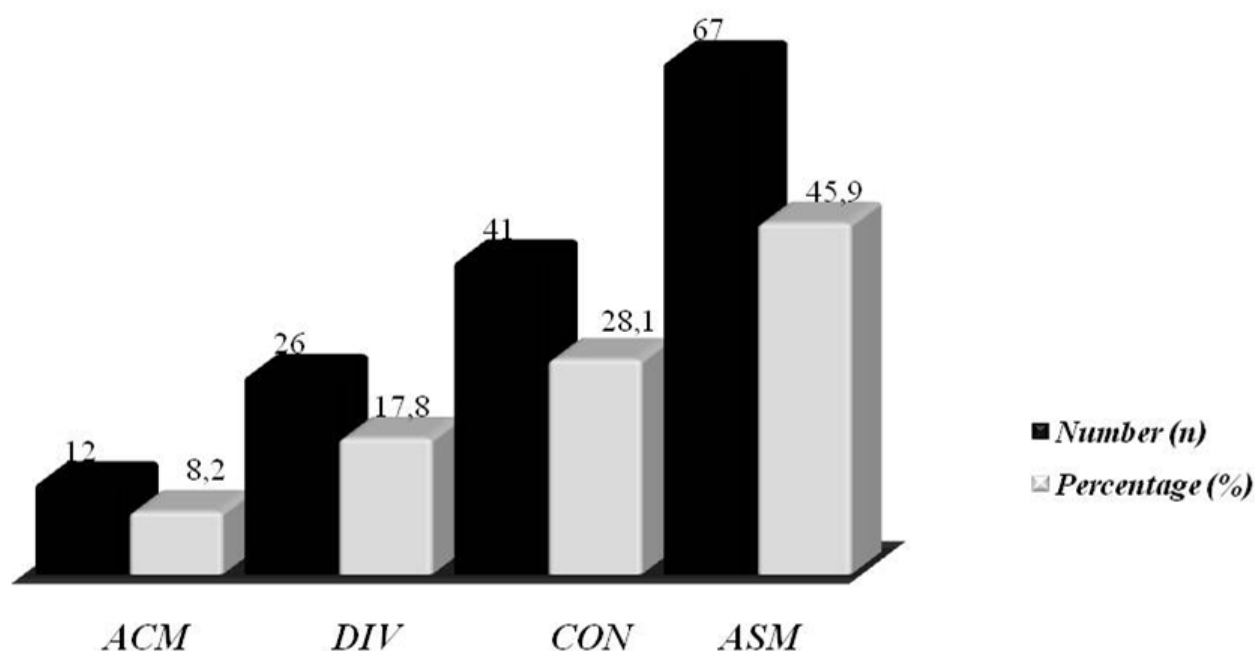


Fig 1. The learning styles of first-year medical students

the remaining styles ($p=0.04$) (Table 2). Following the anatomical notes was the most preferred source for studying anatomy. Than the second one was atlas of anatomy. The other preferred source were anatomical model and cadaver video. Percentage and number of students for preferred anatomy studying source was as follows: 45% ($n=65$), 22% ($n=32$), 14% ($n=21$), 10% ($n=15$), 9% ($n=13$), respectively. The students' most preferred source for studying was the notes taken during the lectures while they preferred working on cadavers the least (Fig. 2).

DISCUSSION

The present study, which investigated the relationship between the learning styles of 146 first-year medical students and their academic achievement in the general anatomy course, revealed that the study duration and the theoretical examination

scores of the students differed significantly according to their learning styles. Our study showed that a great majority of the students were assimilators (ASM). Hosseini et al. (2015) also came up with similar results that were found more students preferred assimilators in their study (Eunkyung et al., 2009; Hosseini et al., 2015). Significant differences were not found between gender and learning styles. The authors showed that gender was not a significant variable with regard to the dominant learning styles of medical students. This result is supported by many similar studies in the literature (Ames, 2003; Alqahtani and Alqahtani, 2014; Hosseini et al., 2015). In light of these results, it can be assumed that gender is not a significant variable in determining learning styles. This may result from the fact that male and female students share the same educational environments. On the other hand, study duration changes in accordance with learning styles. It was seen that DIV and ASM

Table 2. The relationship of learning styles with theoretical (TCS) and practical course scores (PCS).

	ACM mean±sd	DIV mean±sd	CON mean±sd	ASM mean±sd
PCS	15,3±3,2	14,4±2,9	15,4±3,3	15,0±3,1 $p=0,625$
TCS*	17,1±3,8	17,3±3,3	19,1±2,7	17,5±3,1 $p=0,04$

*Anova was carried out by excluding the 4 extreme values that disturbed homogeneity

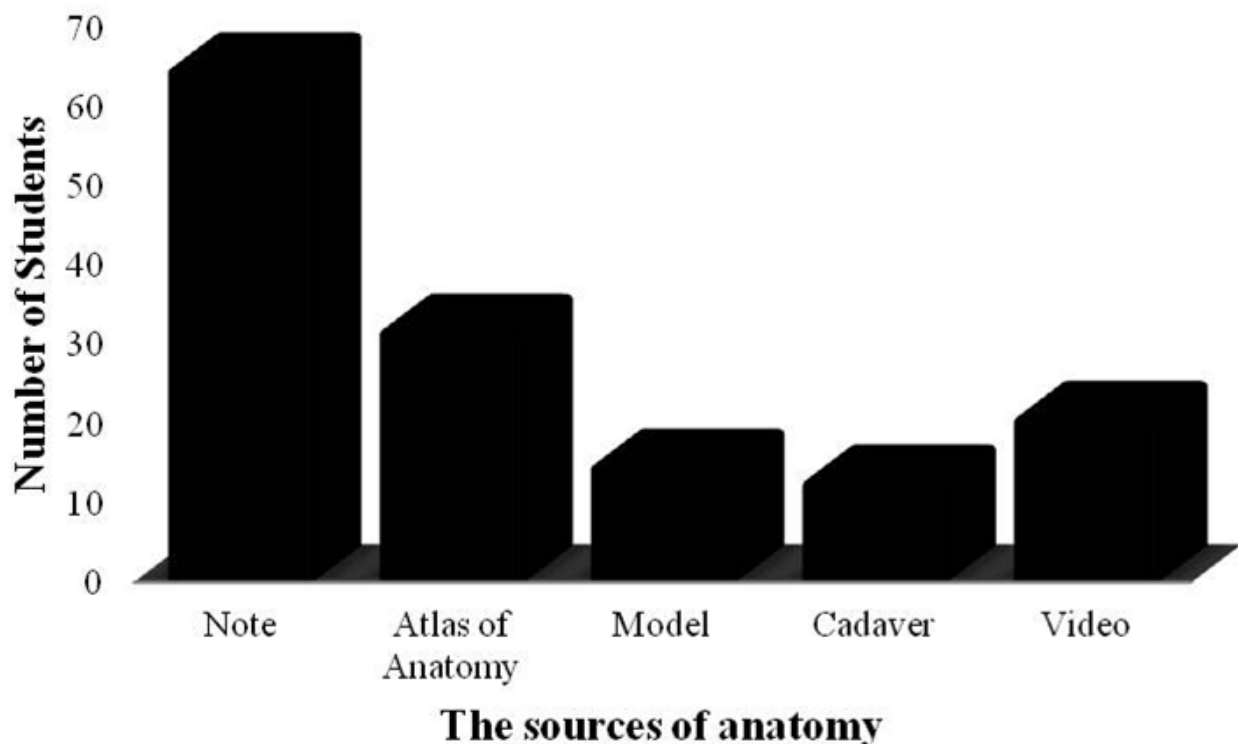


Fig 2. The preferred anatomical sources and relationship with the number of students.

study less than ACM and CON. Our review of the literature reveals studies related to the relationship between study duration and learning styles. According to Kolb's theory, CON attach importance to problem-solving, decision-making, logical analysis of ideas and systematical planning while planning, executing decisions and taking part in new experiences are crucial for ACM. These attributes of the two groups of learners may affect their study duration. There are a limited number of studies investigating the relationship between academic success and the learning styles of students. In our study CON were found to receive significantly higher grades in theoretical examinations than the other groups. Piane et al. (1996) compared the scores received in the public health course, which was tutored traditionally, according to the four learning styles and determined that ASM received higher grades in examinations. The authors attributed this result to the change in the learning of style individuals, which is likely to occur under different learning conditions. Lynch et al. (1998) investigated the relationship between the US medical licensing examinations and learning styles and found a statistically significant relationship between the two, based on the results of United States Medical Licensing Examination step 1 (USMLE1) and multiple-choice surgical subject examination (MCQ). The authors determined that CON and ASM received better scores in both examinations than the other groups of learners. Our results indicate that CON and ASM had the highest scores in multiple-choice examinations are consistent with Kolb's theory. Preferred learning styles would help students recognize the strengths and weaknesses and increasing their learning potential (Alqahtani and Algahtani, 2014; Cox, 1984). DIV and ASM study duration should be planned in accordance with the learning styles and also most preferred anatomical sources for studying should be evaluated in accordance with their learning styles. Planning resources and time for working would be bring academic achievement.

CONCLUSION

Although there are numerous studies on the use of learning styles in medical education, our review of the literature did not reveal any studies investigating the relationship between learning styles and study duration. However, we concluded that learning styles affect study duration and anatomy theoretical course scores. And the present research showed that no studies have been published on the KLSI related general anatomy lesson of first-year medical faculty students. Determining the reasons behind these results through longitudinal and qualitative studies should help educators to create better education programs.

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