

Optimal Screen and Study Time for Achievement of High Academic Performance in Adolescents

Ergenlerde Yüksek Akademik Başarı için Optimal Ekran ve Çalışma Süreleri

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ABSTRACT

Objective: The aim of the study was to investigate the influence of screen time and study time to academic performance of adolescents. Optimal screen and study time was tried to be found to achieve best grades at school and at matriculation scores.

Material and Methods: 2104 students aged 11 to 13 from 13 different cities from Turkey enrolled to the study. By conducting a survey, the students' grade-point average and matriculation scores (SBS examination) were compared in respect to the time they spent on screens (television, computer, cinema, mobile phone, video game console) and studying/home working at home. The variables that found to be correlated with academic performance were included in the multiple regression analysis.

Results: Academic performance of adolescents was found to be decreased as their and their parents' time spent in front of a television increased. The highest academic performance was achieved by students who used to study 2-4 hours a day, spending no more than an hour on a computer and going to the cinema at least once a month. Both matriculation scores and grade-point averages altered according to different cities. Boys had more screen time for computers.

Conclusion: Adolescents should be informed of the possible risks and negative effects of excessive screen time on physical health and academic performance. Parents should be reminded of their duties as to setting examples towards television watching habits and encouraging their children towards spending appropriate time on study and going to the cinema at least once a month. With a study schedule of two to four hours a day, best academic performance can be achieved.

Key Words: Academic performance, Adolescent, Screen time

ÖZET

Amaç: Öğrencilerin ders çalışma süreleri ve maruz kaldıkları ekran süreleri ile ders-sınav başarıları arasındaki ilişki araştırılarak, maksimum başarı için gerekli olan ders çalışma ve ekran süresi değerleri bulunmaya çalışıldı.

Gereç ve Yöntemler: M13 farklı şehirde yaşları 11 ile 13 arasında değişen 2104 öğrenciyeye anket yolu ile televizyon, cep telefonu, bilgisayar, oyun konsolu önünde ne kadar vakit geçirdikleri, ayda kaç kez sinemaya gittikleri ve evde ders çalışmak için ayırdıkları süre soruldu. Elde edilen veriler, öğrencilerin ders notu ortalaması ve Seviye Belirleme Sınavı (SBS) puanları ile karşılaştırıldı. İkili korelasyonlarda anlamlı çıkan değişkenler çoklu regresyon analizi ile değerlendirildi.

Bulgular: Hem çocuğun hem de ebeveynlerin televizyon seyretme süresi uzadıkça öğrencinin ders başarısının düştüğü bulundu. Bilgisayar kullanımı 1 saati geçmediğinde ve ayda dördü geçmeyecek şekilde en azından bir kez sinemaya gidildiğinde ders başarısının belirgin oranda arttığı saptandı. En yüksek SBS puanı ortalaması günde 2-4 saat çalışan

öğrencilere aitti. Şehirlere göre hem televizyon seyretme süreleri hem de Seviye Belirleme Sınavı puanları anlamlı olarak birbirinden farklı bulundu. Erkeklerin daha çok bilgisayar karşısında vakit geçirdikleri görüldü.

Sonuç: Ergenler, ekran başında geçirecekleri sürenin beden sağlığı ve okul performansı üzerine olumsuz etkileri olabileceği ve bu ekranları sınırlı sürelerde ve bilinçli bir şekilde kullanmaları gerektiği konusunda bilgilendirilmelidir. Ebeveynlere televizyon seyretme alışkanlığı konusunda örnek davranış gösterme sorumluluğu taşıdıkları hatırlatılmalı, çocuklarını günde 2-4 saat çalışmaya ve ayda dört defayı geçmeyecek şekilde en azından bir kez sinemaya gitmeye teşvik etmeleri önerilmektedir.

Anahtar Sözcükler: Akademik başarı, Adolesan, Ekran süresi

INTRODUCTION

The relation between television, movie viewing and school performance has been a subject of debate (1-3). With the developing technology, children spend a considerable amount of time in front of digital screens such as televisions (TV), computers, mobile phones, video game consoles and cinema (4). Digital screens are indispensable parts of life; on the other hand, they have been stated that there is a relationship between the time spent in front of a screen (screen time) and obesity, lack of attention, decrease in academic success, speech deficiencies, demonstration of violent behavior, substance use, stimulated sexual curiosity and tendency towards risky sexual behaviors (3, 5-8). The detrimental effects of screen time on school performance were attributed to the decrease in homework completion (1-3). However, it is not known how much time a student is required to spend for their homework and studying to reach academic success. This study was performed to determine how students can best manage their time after school in terms of screen time vs. study time to increase the likeliness of their academic success.

MATERIAL and METHODS

The study was conducted between January 2011 and March 2011 in 13 different cities in Turkey. 2104 students ranging from 11 years to 13 years were enrolled to the study. The city and state schools were chosen randomly. Private schools and the schools in which children can only be registered by becoming one of the most successful students according to the national test result have not been included; so that the effect of socio-economic level and high intellectual capacity to the study could be minimized. The study was approved by The Turkish Ministry of Education and Human Subjects Research Institutional Review Board of our university. Both oral and written consents were taken from the participants.

The academic performance of the students was examined by two ways; grade average and matriculation scores. These indicators were investigated in respect to the screen time exposure of the students and the amount of time they spared for studying and homeworking at home. How much time the students spend in different screen times, and their study periods have been compiled through questionnaire method in line with the information received from students.

Students' weights and heights were supplied through the questionnaire. Grade average and matriculation scores were provided by students' schools. Mathematics, literature, physics –chemistry-biology and foreign language grades have been included in the calculation separately; however, since the same results were received in the average grade of these all classes (grade average), only the grade average information has been used.

Those whose body mass index (BMI) value is over 95p have been evaluated as obese and the respondents whose BMI value is between 85-95p have been evaluated as overweight in accordance with their age and gender.

Statistics

Data are presented as mean and standard deviation for continuous variables, and as absolute or relative frequencies and percentage for categorical variables. Pearson correlation was used to investigate the association between numerical variables and Spearman correlation for ordinal variables. Student-T Test was used for comparison of continuous variables, and Chi-Square test was used for comparison of ratios. During multiple comparisons, Bonferroni correction was made. In order to prevent the inaccuracy that can emerge from gender difference, two-way variance analysis (Two-way ANOVA, co-factor: Gender) was used for the relationship between screen times and matriculation score and grade average. After having established that the differences put forth are independent from gender, the data and graphics in the study are presented together. The variables that were found to be correlated with the screen time were evaluated by multiple regression analysis. A p value below <0.05 was considered significant based on two-tailed tests. Descriptive analysis of data and analysis of variance were undertaken with SPSS 15.0 for Windows (SPSS, Chicago, IL).

RESULTS

Baseline characteristics of the students are shown in Table I. Participant numbers, matriculation scores, grade averages and BMI averages of the cities are shown in Table II. Matriculation score and grade average for female students, excluding Istanbul, were found to be higher than male students (Table I, respectively p:0.025, p<0.001). BMI values of male students have been determined to be higher than female students'

Table I: Baseline characteristics of the participants.

	Age (mean±SD)	n	%	6. grade	7. grade	8. grade	SBS score (mean±SD)	Grade Average (mean±SD)	BMI (mean±SD)
Boy	13.3±0.9	935	44.4	266	408	320	355±80	3.5±1.1	19.1±3.0
Girl	13.2±0.9	1125	53.5	286	478	352	365±75	3.8±1.0	18.2±2.8
Unspecified	-	44	21	-	-	-			
Total	13.2	2104	100	546	886	672	p:0.025	p<0.001	p<0.001

n: number, **BMI**: Body mass index (kg/m²), **SBS**: Matriculation score (Seviye belirleme sınavı), **SD**: standart deviation, Student T-Test was used to compare the means of SBS, grade average and BMI between boys and girls.

Table II: Body mass index (BMI), matriculation (SBS) and grade average scores of the students according to cities.

	Number of students (%)	Matriculation (SBS) Score (%95 CI)	Grade Average (%95 CI)	BMI (%95 CI)	TV time >2 hours (%)
Ankara	145 (6.9)	448 (439-456)*	4.7 (4.6-4.8)*	19.7 (19.1-20.3)**	8.9***
Antalya	191 (9.1)	365 (352-378)	3.7 (3.5-3.9)	18.6 (18.2-19.1)	28.1
Bitlis	49 (2.3)	305 (286-325)	3.7 (3.4-4.0)	18.8 (18.1-19.6)	15.4
Gaziantep	189 (9.0)	315 (304-326)	3.4 (3.2-3.6)	18.6 (18.2-19.1)	24.0
Hatay	23 (1.1)	377 (357-397)	3.5 (3.1-4.0)	19.0 (17.8-20.2)	21.7
Isparta	96 (4.6)	357 (343-371)	3.9 (3.7-4.1)	18.1 (17.5-18.7)	22.7
İstanbul	89 (4.2)	334 (316-352)	3.3 (3.0-3.6)	18.4 (17.7-19.1)	26.3
Karaman	431 (20.5)	388 (379-398)	4.1 (4.0-4.2)	18.9 (18.6-19.3)	19.8
Kars	132 (6.8)	327 (309-344)	3.8 (3.6-4.0)	18.2 (17.4-19.0)	19.8
Konya	488 (23.2)	364 (356-372)	3.6 (3.5-3.7)	19.1 (18.7-19.5)	30.0
Nevşehir	48 (2.3)	312 (263-361)	3.0 (2.2-3.7)	18.9 (17.7-20.1)	25.0
Yalova	101 (4.8)	329 (306-353)	3.3 (3.0-3.5)	18.0 (17.3-18.7)	43.5
Van	122 (5.8)	320 (304-336)	3.7 (3.5-4.0)	18.5 (17.7-19.2)	18.1
Total	2104 (100)	363 (358-367)	3.8 (3.7-3.9)	18.8 (18.6-18.9)	24.2

BMI: body mass index, **SBS**: matriculation score (Seviye belirleme sınavı), **CI**: confidence interval, **TV**: television.

*Matriculation scores and grade average of the students in Ankara were significantly higher than all of the students in other cities (One-Way ANOVA post hoc LSD p<0.001)

**Body mass index values of the students in Ankara were significantly higher than all of the students in other cities except Hatay, Bitlis, Konya and Nevşehir (One-Way ANOVA post hoc LSD p<0.001)

***Ratio of students who watch television more than two hours a day was lesser in Ankara than any other city in the study. (Pearson Chi-kare p<0.001).

(p<0.001). Matriculation scores and grade average of students in Ankara were found to be higher than they were in other cities, on the other hand, students of Ankara had the highest BMI average in the study (Table II).

Screen times and time expenditure for study/homework of students are shown in Figure 1 (5). Screen time differs between girls and boys in accordance with the screen type. Boys spend more time in front of a computer p<0.001. Very few students use game consoles (%17.7 boys, %4.4 girls, p<0.001). No difference was found between the intensity of watching TV, mobile phone usage and frequency of cinema visits between boys and girls.

A high correlation was found between matriculation scores and grades (r:0.81 p<0.001). Both matriculation scores and

grade averages were associated with TV viewing, computer usage, parents' TV viewing and the frequency of cinema visits in a month (Figure 2). No relationship between mobile phones, game consoles and school success was found.

It was established that the more the period of home working increases; the more matriculation scores and grade averages rise (r:0.18 and r:0.29 respectively, both p<0,001). The highest matriculation scores belonged to the students who studied 2-4 hours a day. When studying period exceeds more than 4 hours, lesson success does not increase, in fact, quite the reverse happens, it slightly decreases. Matriculation scores of students who work more than 4 hours a day found to be significantly lesser than the scores of those who studied between 2-4 hours a day (p<0,001) (Figure 2).

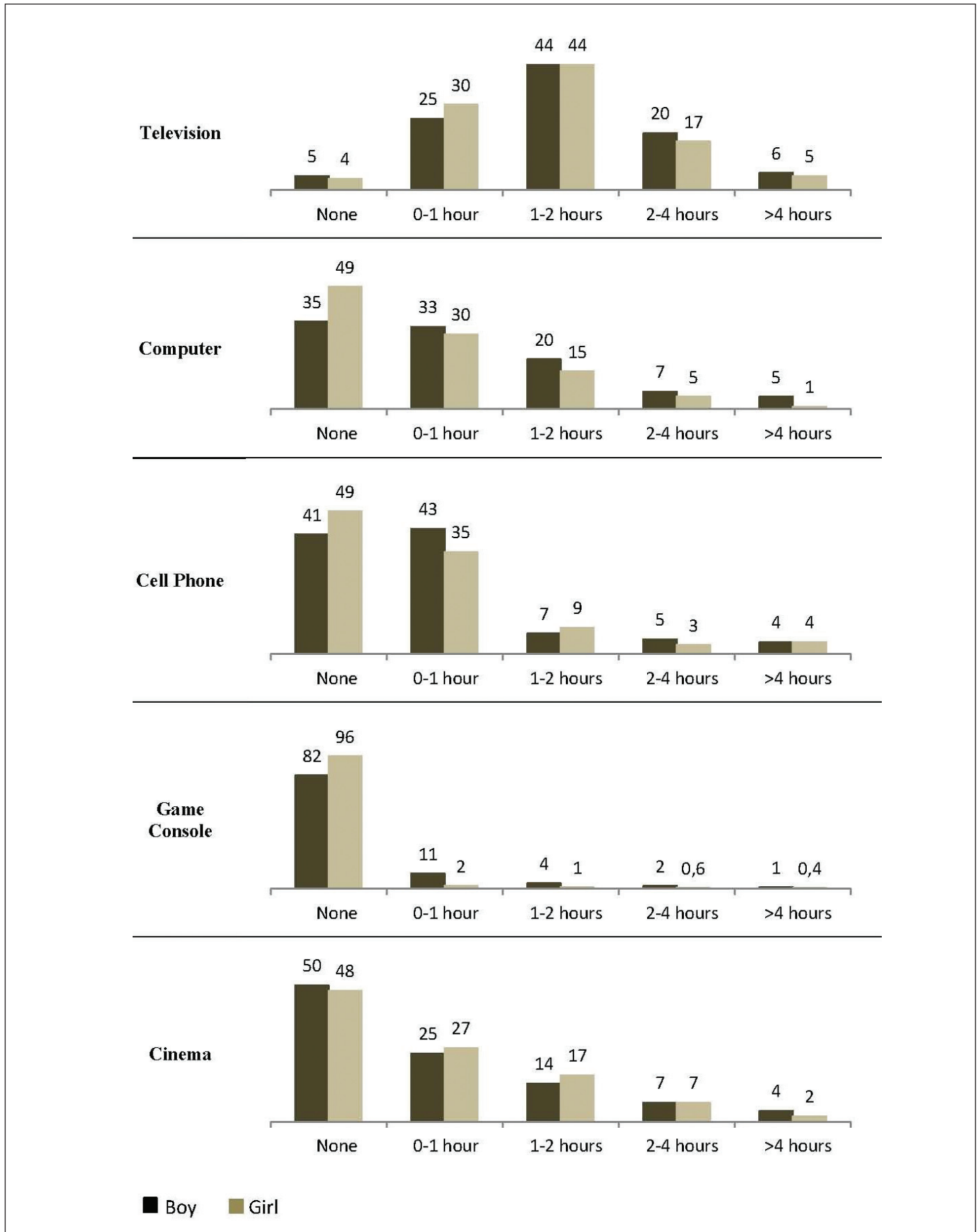


Figure 1: Frequency of screen times according to gender.

Table III: Matriculation and grade average according to indirect socioeconomic indicators.

Having		Does not have	Have at least one	T-Test
Cell Phone	Matriculation (SBS)	358.6 ± 77.6	370.5 ± 77.3	p: 0.011
	Grade Average	3.8 ± 1.0	3.7 ± 1.1	p: 0.16
Computer	Matriculation (SBS)	349 ± 78.0	368.3 ± 75.4	p <0.001
	Grade Average	3.7 ± 1.0	3.7 ± 1.0	p: 0.20
Game Console	Matriculation (SBS)	360.4 ± 76.8	359.2 ± 81.5	p: 0.86
	Grade Average	3.7 ± 1.1	3.7 ± 1.0	p: 0.92
Television	Matriculation (SBS)	387.2 ± 87.1	365.3 ± 76.1	p: 0.14
	Grade Average	3.8 ± 1.0	3.8 ± 1.0	p: 0.87
		None	> one a month	
Cinema*	Matriculation (SBS)	338.9 ± 73.7	384.1 ± 72.4	p<0.001
	Grade Average	3.5 ± 1.0	4.0 ± 1.0	p<0.001

Data are shown as mean ± SD, * going to cinema at least once a month.

It was observed that as TV viewing increased, Matriculation scores and grade averages of students decreased ($r:-0.13$ and $r:-0.19$ respectively, both $p<0.001$). A relationship between TV viewing habits of the parents and those of their children was found ($r:0.36$, $p<0.001$). Matriculation scores and grade averages of students whose parents watch TV more than two hours a day had lower matriculation scores and grade averages from the students whose parents watch TV less than two hours a day (Figure 2). Students watch more TV as they grow up ($r:0.095$, $p<0.001$).

Matriculation scores of students who go to the cinema 2-3 times a month were statistically higher than those who go to the cinema less than once or more than 4 times ($p=0.001$ and $p=0.033$ respectively) a month (Figure 2).

When the amount of time spent in front of a computer was between zero and one hour, both matriculation scores and grade averages are statistically higher than the rest of the students ($p<0,001$) (Figure 2). However, children who do not use a computer at all had also lower scores.

A weak relationship was found between BMI and matriculation scores ($r: 0.08$, $p=0.008$); no relationship was found between BMI and grade averages. Again, no relationship was found between BMI, TV viewing and time in front of a computer. According to BMI values, it was found that 11% of the students are overweight and 3% of them were obese.

Having a mobile phone, computer and going to the cinema at least once a week were accepted to be the indicators of a good economic situation. The students who possess the indicators of a good economic situation were found to have higher matriculation scores and grade averages (Table III).

The factors, which correlated significantly with matriculation score, were evaluated by multi linear regression analysis. Homework-study period ($p<0.001$), frequency of attending to the cinema ($p<0.001$), both children's and their parents' TV

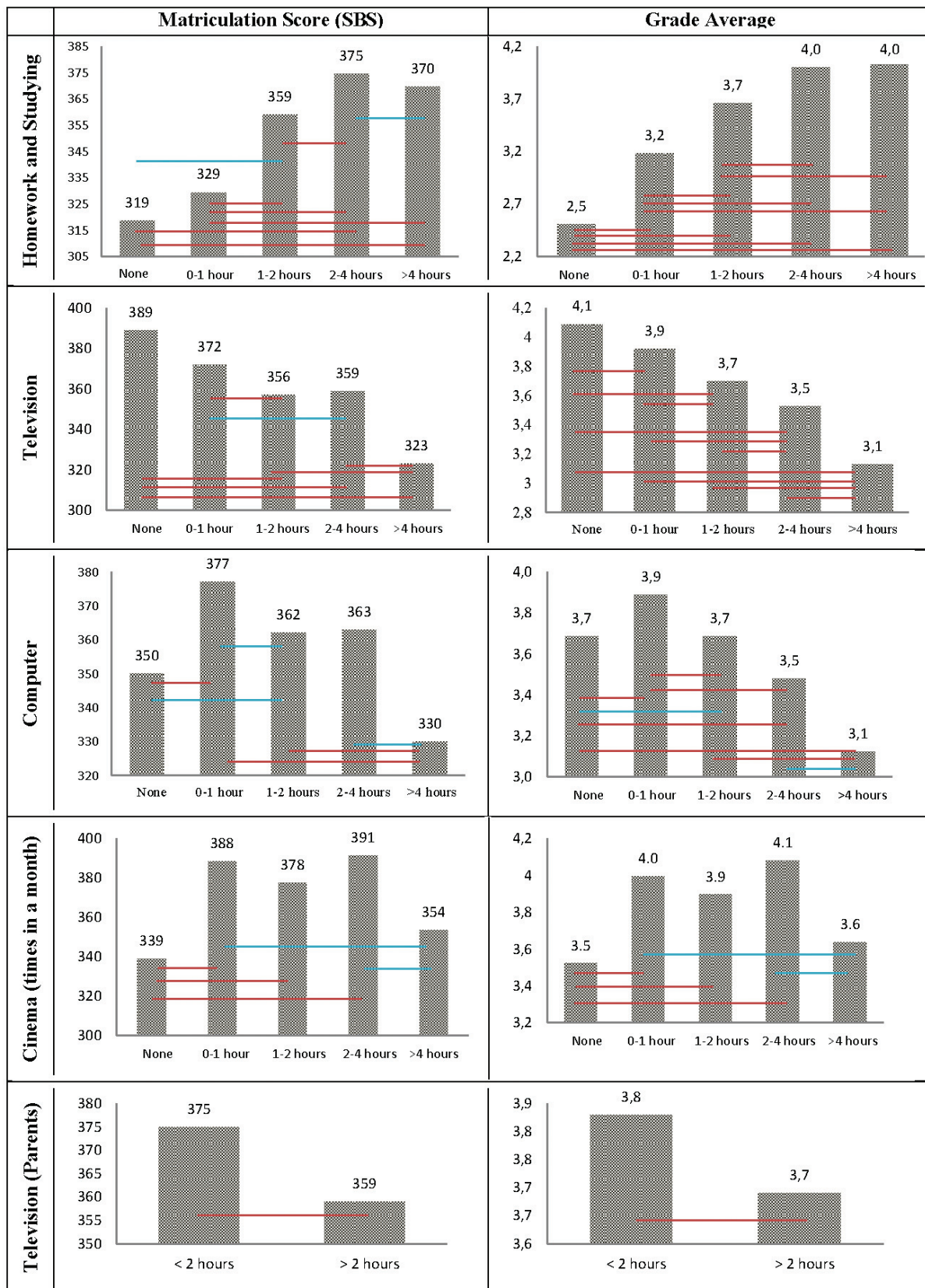
viewing duration ($p=0.012$ and $p=0.019$, respectively) were found to be statistically important determinants of matriculation score ($R^2:0.20$ $p<0.001$). Among them the duration of study/homework time and the frequency of going to the cinema have the highest predictor importance (0.30 and 0.21 respectively).

DISCUSSION

American Academy of Pediatrics (AAP) and Canadian Pediatric Community (CPC) suggest that children younger than 2 years old should not watch TV at all and the ones who are older than 2 years old should only watch the programs suitable for their age and no more than 1-2 hours a day (10, 11). The majority of the students in our study (male 74%, female 78%) watch TV less than 2 hours a day, which was pretty lower than the American data (9).

In previous studies, it was revealed that watching TV more than two hours a day has harmful effects on academic performance and reading scores (10). In studies conducted on similar age groups, it was seen that when screen time increases, students experienced a decrease in school success, lack of attention, problems in learning and difficulties in completing their homework (1-3). The decrease in school success was also worsened if the children have limited participation in activities with their family such as reading, learning, playing games; thus, it is not just because of the decrease in the homework period (11). In addition, longer screen time may be related with an increase in search of risky activities, substance abuse and aggressive behavior at school (12).

There is also an analogy between the TV viewing habits of parents and that of their children. This relationship was also demonstrated by other studies (13). Besides, TV time of a child decreases if parents watch TV less frequently (2). This relationship may result from the fact that children take their parents as role models.



SBS: Matriculation Score (Seviye Belirleme Sınavı)

One Way ANOVA, post hoc LSD — = $p < 0.01$, — = $p < 0.05$

Figure 2: Effect of different screen times on Matriculation Score and Grade Average of the students.

No relationship was determined between BMI and TV viewing time in our study. This situation may have resulted from the fact that the obesity rates determined in our study are lower than the Turkey and Europe averages (%7.7-9.6) (14). In the study conducted by Ercan et al (14), in Ankara where the obesity rate is one of the highest in Turkey, a relationship between obesity and TV viewing time was found. Since people spend their time inactively in front of the TV, even those who have a normal BMI, long screen time may result in bad health issues (15). It has been suggested that the screen time should be decreased as much as possible in order to protect ourselves from an immobile life and obesity (16, 17).

Contrary to the TV time, going to the cinema a couple of times in a month increases grade average and matriculation score. To watch a movie, the teenagers usually go the cinema together with their peers and increased social interaction may make a positive contribution to their mental health. In the study conducted by Knifsend et al. (18), teenagers who participated in the extracurricular social activities such as art and sports, experienced an increase in their academic performance. Adolescents may be encouraged to participate in social activities like going to the cinema with their peers or sport/art groups. In our study, the content of the movie to be watched in the cinema has not been examined, but it should be recommended not to watch movies, containing violence, sexuality and racism (19).

We did not find a significant effect of computer usage on both matriculation score and grade average. On the other hand, students who do not use a computer in a day have lower grades and matriculation scores. This may be due to the beneficial effects of computers on school performance, but it also may result from the socio-economic differences between families who cannot afford to buy a computer. In our study, we did not investigate what kind of activities do children attend in front of computer, however, the more the ratio of playing computer games increases the lower school success gets, and the occurrence of depressive behaviors increase (3,6). We may recommend parents to limit their children's computer use to one hour a day and limit their access to the detrimental websites.

While there is a good correlation between homework/study time and grade average- matriculation score was found, studying more than 4 hours a day did not cause an extra increase in the level of success of students. It was shown that attending private study courses after school enhances the depressive symptoms of students; similarly, not being able to spare some personal time because of studying too much may decrease class and exam success in the long run (20).

In previously studies, a positive relationship between homework/study time and school success was found (20,21). Generally, parents may be recommended to encourage their children to study at least 2 hours a day, but also be warned to not force their children to study more than 4 hours a day.

The results of this study are highly representative of Turkey since the data were received from 2104 students in 13 cities of different geographical regions of Turkey. Screen times were acquired by the help of the questionnaire so it may be subjective, but the matriculation scores and grade averages were objective and trustworthy for all students. On the other hand, socio-economic level was not investigated sufficiently, and in fact, was tried to be eliminated as much as possible to find the absolute effect of screen time and study duration on school success. The difference in matriculation scores and grade averages of children living in different cities may be due to the socio-economical reasons in general. In previous studies, a correlation was shown between the families' socio-economic status and children's screen time and academic success (22, 23).

CONCLUSION

The most important factors that affect matriculation score and grade average were TV time of the children and their parents, study/homework time and the frequency of going to the cinema every month. It may be recommended to students to study between 1 and 4 hours, limit computer time to 1 hour a day and go to the cinema a couple of times a month. Adolescents and their families should be emphasized that TV time has negative effects not only on their physical health, but also on their school performance. Health officials and school educators should share this responsibility and work together since it may have an immense contribution in protecting and preserving the health of adolescents. Parents should be reminded that just like in every matter, they hold the responsibility of being role models with exemplary behavior to their children.

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