Examining the Relationship between Adolescence Problems and Computer (Computer, Internet, Game) Addiction with Canonic Correlation Analysis in Turkish Generation K Adolescents: Ordu Province Center (Altinordu) Example

Türk K Kuşağı Ergenlerinde Ergenlik Sorunları ile Bilgisayar (Bilgisayar, İnternet, Oyun) Bağımlılığı Arasındaki İlişkinin Kanonik Korelasyon Analizi ile İncelenmesi: Ordu İl Merkez (Altınordu) Örneği

Nevin GÜNAYDIN[1] , **Yeliz KAŞKO ARICI[2]**

[1]Ordu University, Faculty of Health Sciences, Department of Psychiatric Nursing, Ordu, Turkey
[2]Ordu University, Faculty of Medicine, Department of Biostatistics and Medical Informatics, Ordu, Turkey

ORCID ID: Nevin Günaydın 0000-0002-5382-6354, Yeliz Kaşko Arıcı 0000-0001-6820-0381

Corresponding Author
Nevin Günaydın

E-mail
nevin_altintas@yahoo.com.tr

ABSTRACT

Aim: This study was conducted to examine the relationship between computer addiction (computer, internet, game addiction) and adolescent problems in Turkish generation K adolescents with correlation analysis.

Material and Methods: This study is a cross-sectional study. This research was carried out in three high schools in the city center of a city selected according to their success ranking in the high school entrance exam. In the study, a total of 665 students who received parental and student permission were included. Adolescents' Computer (computer/internet/game) Addiction Scale and Adolescence Problems Scanning List were used to gathering data. In the study, subscales of computer addiction scale for adolescence (computer, internet, game) were determined as Set 1, and subscales of adolescence problems scanning list (physical, social, relationship with the opposite sex and sexual information, psychological, future expectations) were determined as Set 2. Expected relationships between these Set 1 and Set 2 explained in an efficient manner by canonical weights and loadings.

Results: Three canonical variate pairs were ranging from 0.688 to 0.150. It was observed that the first and the second pairs were significant (p<0.001). In the Adolescents' Computer Addiction Scale, computer game addiction was the most significant parameter (1.064). In order to obtain high value for U1 canonical variate, while game addiction should be increased because of positively correlated, CA should be shrunk because of negatively correlated. Therefore, when the game addiction subscale is high and the computer and internet addiction subscales are low, it is expected that the psychological and social problems subscales will take high values. In the adolescence problems scanning list, psychological development problems were the most significant parameters (0.702). The value for V1 canonical variate increases with the increase of psychological development problems and social development problems. In contrast, the increase in the physical development problems reduces the value of the V1 canonical variable.

Conclusion: Present data revealed that there were positive and moderate correlations between computer addiction and adolescence problems of generation K. Canonical correlation analysis showed

that the adolescence problems had a significant variance in explaining the adolescent's computer (computer/internet/game) addiction, while the adolescent's computer addiction had significant variance in explaining the adolescence problems.

Keywords: Computer addiction, Internet addiction, Game addiction, Adolescence problems, Canonical correlation analysis

ÖZ

Amaç: Bu çalışma, Türk K kuşağı ergenlerinde bilgisayar bağımlılığı (bilgisayar, internet, oyun bağımlılığı) ile ergen sorunları arasındaki ilişkiyi korelasyon analizi ile incelemek amacıyla yapılmıştır.

Gereç ve Yöntemler: Bu çalışma kesitsel bir çalışmadır. Bu araştırma, lise giriş sınavı başarı sıralamasına göre seçilen bir il merkezindeki üç lisede gerçekleştirilmiştir. Araştırmada veli ve öğrenci izni alınan toplam 665 öğrenci çalışmaya dahil edilmiştir. Veri toplamak için Ergen Bilgisayar (bilgisayar/internet/oyun) Bağımlılığı Ölçeği ve Ergenlik Sorunları Tarama Listesi kullanılmıştır. Çalışmada ergenler için bilgisayar bağımlılığı ölçeğinin alt ölçekleri (bilgisayar, internet, oyun) Set 1 olarak belirlenmiş ve ergenlik sorunları tarama listesi (fiziksel, sosyal, karşı cinsle ilişki ve cinsel bilgiler, psikolojik, gelecek beklentileri) alt ölçekleri Set 2 olarak belirlenmiştir. Bu Set 1 ve Set 2 arasındaki beklenen ilişkiler kanonik ağırlıklar ve yüklemeler ile etkin bir şekilde açıklanmıştır.

Bulgular: Çalışmada, 0,688 ile 0,150 arasında değişen üç kanonik değişken çifti vardı. Birinci ve ikinci çiftlerin anlamlı olduğu gözlendi (p<0,001). Ergenlerin Bilgisayar Bağımlılığı Ölçeğinde bilgisayar oyunu bağımlılığı en önemli parametredir (1,064). U1 kanonik değişkeninin yüksek değer elde etmesi için pozitif korelasyon nedeniyle oyun bağımlılığının arttırılması, negatif korelasyon nedeniyle CA'nın küçültülmesi gerekmektedir. Dolayısıyla, oyun bağımlılığı alt ölçeği yüksek olduğunda, bilgisayar ve internet bağımlılığı alt ölçekleri ise düşük olduğunda psikolojik ve sosyal problemler alt ölçeklerinin yüksek değerler alması beklenmektedir. Ergenlik sorunları tarama listesinde psikolojik gelişim sorunları, en önemli parametre (0,702) idi. V1 kanonik değişkeninin değeri, psikolojik gelişim sorunları ve sosyal gelişim sorunları arttıkça artmaktadır. Buna karşılık fiziksel gelişim problemlerindeki artış V1 kanonik değişkeninin değerini düşürmektedir.

Sonuç: Mevcut veriler, bilgisayar bağımlılığı ile K kuşağı ergenlerinin ergenlik sorunları arasında pozitif ve orta düzeyde ilişki olduğunu ortaya koymuştur. Kanonik korelasyon analizi, ergenlik sorunlarının ergenin bilgisayar (bilgisayar/internet/oyun) bağımlılığını açıklamada önemli bir varyansa sahip olduğunu, ergenin bilgisayar bağımlılığının ise ergenlik sorunlarını açıklamada önemli bir varyansa sahip olduğunu göstermiştir.

Anahtar Sözcükler: Bilgisayar bağımlılığı, İnternet bağımlılığı, Oyun bağımlılığı, Ergenlik sorunları, Kanonik korelasyon analizi

INTRODUCTION

Internet and computer addiction is emerging as children and young adults increase their time on the internet (1). In the last 20 years, internet use and playing computer games by adolescents (including generation Z and K) has become a notable topic (2,3). Internet, computer, and game addiction were not included in DSM-4 (Diagnostic and Statistical Manual of Mental Disorders Version) as a separate diagnosis. In 2013, DSM-5 created a separate and temporary heading for internet addiction under the heading of "Internet Gaming Disorder" (4).

Intensive studies in this field have shown that the most important risk group in terms of addictions related to computers and the internet are adolescents as they have not yet reached sufficient psychological maturity (5,6). According to the World Health Organization, adolescence is between the ages of 10 and 19, when many physical, social, cognitive, and emotional changes are experienced, especially long-term goals and individual desires. It is the life cycle in which it is organized (7). Globally there are 1.2 billion adolescents aged from 10-19 years and they comprise 16% of the population of the whole world. More than half of all adolescents globally live in Asia (8). In the world in general, the majority of the prevalence of internet addictions comes from Asian countries. Internet use rates among adolescents are 21.2% in Vietnam, 6.2% in Japan, and 50% in Korea

(9,10). It is also stated that the excessive internet use level among young people in OECD countries is 26% (more than 6 hours a day) (11). When Turkey's statistical agency of the 2020 data was evaluated according to age groups in terms of internet usage rates, it is seen that the highest usage level is between the ages of 16-24 (2.33% to 14%) (12, 13). In another source, the adolescent internet addiction rate in Turkey is reported to vary between 7.1 to 16% (14). It is reported that differences in the prevalence of internet-based technologies are due to differences in sampling, screening tests, and research designs (15).

When research conducted in recent years is examined, the use of internet-based devices seems to be emphasized that the cognitive development of children contributes to the development of memory, metacognition, and exploration and that today's young people are more connected than ever (11,16). Some studies on game addiction report that digital games improve the visual, attention skills of adolescents. Also, it promotes social connection and increases self-esteem (17,18). It can be said that this changing point of view also facilitates the orientation to computer and internet-based uses.

The most notable group among this more connected young generation is the "generation K adolescents". The generation born in the years from 1995-to 2002 is also named "Generation K" (19,20). Generation K partly includes Generation Z. This generation is also called "the generation of

producers, creators, and innovators" (21). This generation is anxious, pessimistic, and lack self-confidence due to encountering many negative events in the world through the internet, but are also reported to be quicker, more creative, more autonomous, more cautious, and more practical; in short, this is a generation of contradictions (19,20,22,23). Noreean Hertz stated that one of the three forces shaping generation K was technology, that technology was a must-have tool in the lives of this generation, and that this generation was "super social" and could "multi-scan and multi-task" (19,20,24). Young people in this age range had similar characteristics in every region of the world and were associated with the concepts of "technology, collapse, and danger".

The use of computer and internet-based technologies has turned into harm or an opportunity for adolescents, but by considering computer usage types together and multi-dimensionally; it is possible by gaining more information and awareness of its physical, cognitive, and psychosocial consequences. In the literature, it is seen that there are two basic perspectives explaining the concept of computer/internet addiction. The first of them considers computer and internet addiction together and deals with the characteristics of these two concepts with a common approach, and thinks that both of them emerge with the same characteristics (use time, tolerance…). The second opinion, based on the view that the activities done on the internet during the process, are gradually different, thinks that they should be handled separately since many different activities can be done (25). In the literature, no study evaluates computer/internet/game addiction and adolescence problems from a holistic perspective and together. Therefore in this study, to reveal the relational patterns between components of computer addiction (computer/internet/game addiction) and developmental problem areas in adolescents, the correlations between these two data sets were not dealt with in a one-to-one fashion but in multiple and holistically. Also, the aim was to investigate the correlations between these two datasets in depth using CCA. When investigating the correlations between scales with subdimensions, it is important to use CAA to reveal the true correlations (26). The aim of this research is to examine the relationship between puberty problems and computer (computer, internet, game) addiction in Turkish K generation adolescents by canonical correlation analysis and to determine which problem areas of adolescents contribute to explain computer addiction (computer, internet, games) of Turkish K generation adolescents.

MATERIAL and METHODS

Study Design

This descriptive and cross-sectional study was conducted to examine the relationship between computer addiction and adolescent problems in Turkish generation K adolescents holistically. The study was conducted in a city (Ordu) located in North Turkey. According to the information obtained from a Provincial Directorate of National Education, the high schools were classified based on three success levels (high, middle, and low). By drawing method, one high school from each success class was included in the study (Figure 1). The study was conducted in three high schools determined. The data were collected between 20 April and 2 June 2015 of the 2014-2015 academic year. Inclusion criteria; 1) Being born between 1996-2000, being a high school adolescent, 2) Not having any auditory or visual problems, 3) Volunteer to participate in the study

Sampling and Recruitment Procedures

According to the high school entrance exam results, schools are divided into 3 levels lower middle, and upper in terms of success level, and 1 high school from each success level was determined. A total of 2308 students, including 576 students from the high school determined for the lower achievement level, 1265 students from the high school determined for the medium success level, and 467 students from the high school determined for the upper success level, constituted the population of the study 2014 (Figure 1).

In the study, the power analysis was conducted (G*Power 3.1.9.2) and the number of students needed to be included in the study was determined as 651 with an effect size of 0.14, a significance level of .05, and a power of 0.90. Also, the sample width was estimated as 516 for $\alpha = 1\%$ and $\pm$ 5 deviations, but for the power test, it was determined as 10% of the population width, ie 660 (27). For this reason, the sample of the project consisted of 665 students from the 9th, 10th, 11th, and 12th-grade students of these high schools, with a minimum of 25 students from each grade, using the simple random sampling method. The flow chart of the study is given in Figure 2.

In CCA, the sample size should be 10 times greater than the number of variables for reliable estimation of canonical loadings (28). The present sample size was already complying with this criterion (included almost 80 times greater than the number of variables).

Data Collection Tools

In this study, "Participation Information Form", "Adolescent's Computer Addiction Scale", and "Adolescence Problems Scanning List (APSL)" were used for measuring.

Dependent variables; Adolescence Problems Scanning List, Adolescent's Computer Addiction Scale (ACAS)

Independent variables: Sociodemographic characteristics

Participation Information Form: This form includes questions about age, gender, class, grade point average, parental education status, free time assessment, and computer and internet usage.
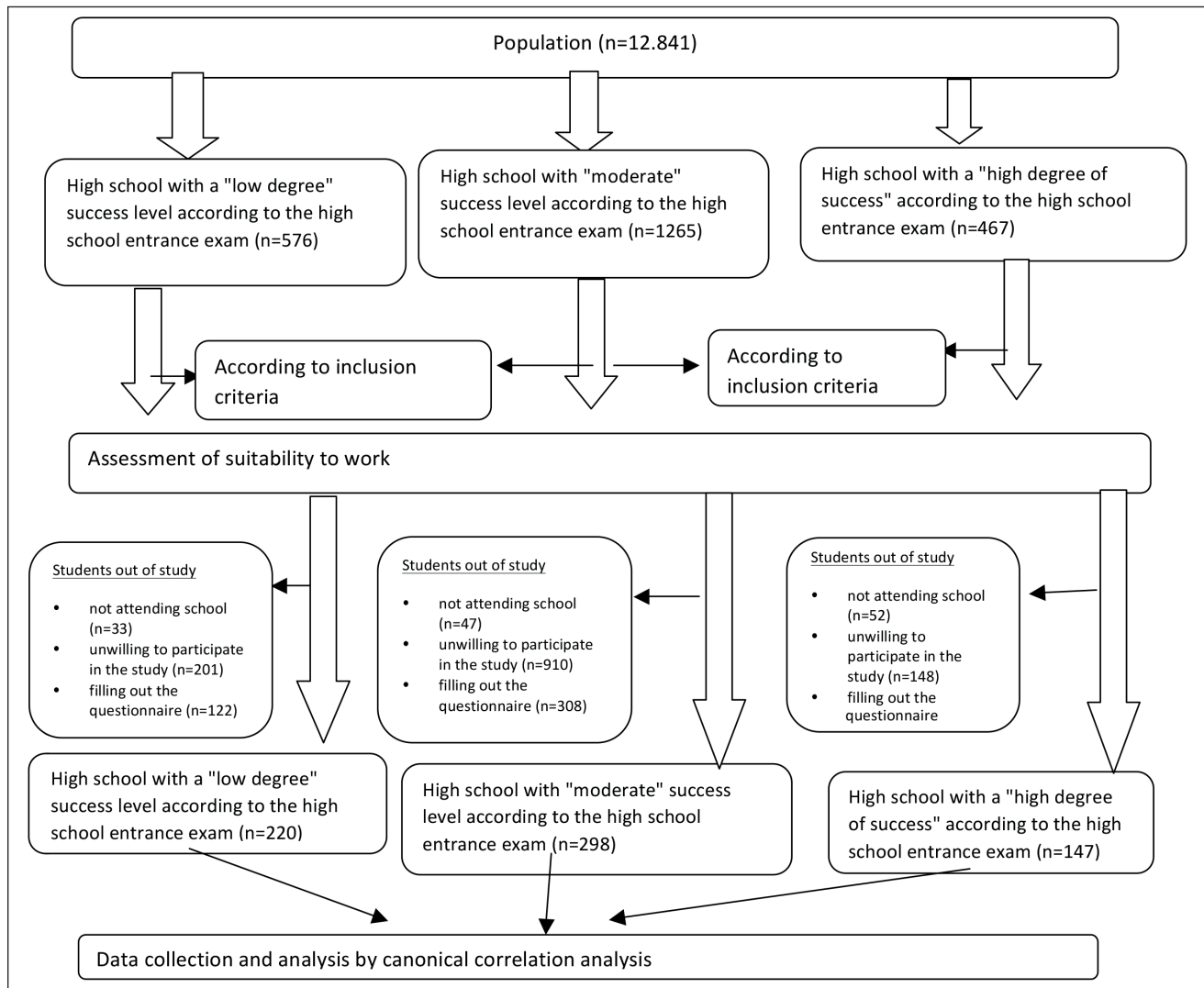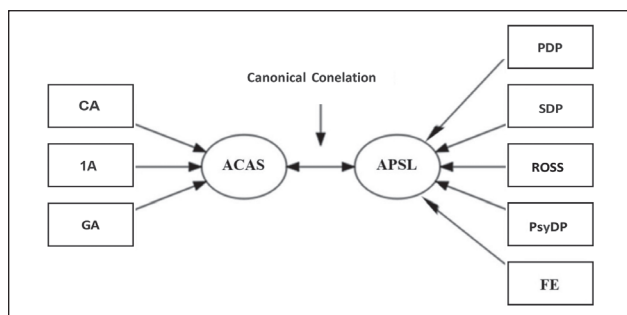
Figure 1: Research process chart

Figure 2: Graphical representation of a CCA of Set 1 and Set 2 constructs.

ACAS: Adolescent computer addiction, **CA:** Computer addiction, **IA:** Internet addiction, **GA:** Game addiction, **APSL:** Adolescent problem scanning list, **PDP:** Physical development problems, **SDP:** Social development problems, **ROSS:** Relationship with the opposite sex and sexual information, **PsyDP:** Phychological development Problems, **FE:** Future expectations.

Adolescent's Computer Addiction Scale (ACAS): The research used the subdimensions (computer/internet/game addiction) of the "Adolescent's Computer Addiction Scale" developed by Ayas, Çakır, and Horzum (2011) to determine computer, internet, and game addiction (29). As points on the scale increase, addiction related to the relevant area increases. With a three-factor structure, the scale includes a 24-item computer addiction, a 28-item internet addiction, and a 26-item game addiction subscale. However, validity and reliability studies determined that the two-factor structure of the 28-item internet addiction and 26-item game addiction subscales were valid and reliable. In samples providing validity, the researchers who developed the scale showed the computer addiction (CA) subscale could be used; in fact, all subdimensions could be independently and separately used. As a result, the Cronbach alpha values for the CA, internet addiction (IA), and game addiction

(GA) subdimensions were calculated and found to be 0.950, 0.937, and 0.974, respectively, so the subdimensions of the scale can be used.

Adolescence Problems Scanning List (APSL): The Adolescence Problems Screening List includes subsections about five problem areas of unique bodily development, social development, relations to the opposite gender and sexual information, psychological development, and future expectations in the adolescent period. Comprising a total of 55 items and it was prepared by Yılgör Tekelioğlu in 1993. The cumulative total for each subsection is obtained and divided by the number of items in the subsection to calculate the subsection points. Sections with high points are accepted as being more problematic areas (30,31). APSL has 5 subsections. These subsections are PDP (Physical Development Problems), SDP (Social Development Problems), ROSS (Relationship with the opposite sex and sexual information), PsyDP (Psychological Development Problems), and FE (Future Expectations).

Data Collection Process

A few days before starting the study, a "parent consent form" was distributed to the students in an envelope. Written consent from the parents and permission of the school administrators were obtained. The students were informed about the study and informed consent was obtained from the students. The questionnaires were then distributed and collected after an average of 10-12 minutes.

Statistical Analyses

Canonical correlation analysis (CCA) was used to identify the relationship between variables sets. Statistical calculations were performed with the SPSS v28 (IBM Inc., Chicago, IL, USA). Statistical significance was defined at $p<0.05$.

Canonical Correlation Analysis (CCA): In the bivariate correlation analysis, which determines the direction and degree of the relationship between two variables, it is assumed that the variables examined do not have sub-dimensions. However, if these variables have sets of sub-variables within them, CAA should be used instead of correlation analysis to determine the relationships between the sets of variables. In CCA, the relations between sub-dimensional variables, each variable set belonging to two variables are considered as a "latent variable" based on the measurement of indicator variables. In CCA, which is optimized by maximizing the linear correlation between two latent variables, there is more than one linear relationship with two variable sets and how many dimensions are required to explain this relationship is determined (32). For this reason, it is important to use CAA when examining the relationships between sub-dimensional scales in terms of revealing real relationships.

CCA, a multivariate statistical analysis method, is designed to determine the relationships between two groups of variables. It focuses on finding linear combinations of variables in these clusters that exhibit correlations. The pair of linear combinations with the strongest correlation forms the first canonical variable. The second canonical variable is a linear combination unrelated to the first canonical variable. Generally, the first couple is used to measure relationships (33,34).

Tools for the interpretation of CCA results are standardized canonical coefficients, canonical loads, and canonical cross-loadings. The canonical function can be interpreted by the sign and magnitude of the standardized canonical coefficients assigned to each variable in its respective canonical variable. Variables with larger coefficients contribute more to canonical variables, but these coefficients can be inflated due to the multicollinearity between variables. To explain the underlying structures, canonical loads are more appropriate than standardized canonical coefficients. Canonical cross-loads determine the relationship between the original variables and their opposites (35).

Let Set 1 (X) and Set 2 (Y) be two sets of variables containing p variables in set X: (X1, X2, X3, …., Xp) and set q variables in set Y: (Y1, Y2, Y3, …., Yq) where p≤q. A series of linear combinations called U and V are defined; where U and V correspond to the set of linear combinations from X and Y, respectively (26). There were two sets of variables for the Adolescent's Computer Addiction Scale (X) and Adolescence Problems Scanning List (Y). Adolescents' Computer Addiction Scale included the subscales of ACAS (CA, IA, GA) and Adolescence Problems Scanning List included the subsections of APSL (DP, SDP, ROSS, PsyDP, FE). A graphical representation of a CCA with an Adolescent's Computer Addiction Scale and Adolescence Problems Scanning List is presented in Figure 2.

RESULTS

Of cases who participated in the study, 59.2% were female, 19.7% were in the 9th grade, 13.7% were in the 10th grade, 33.7% were in the 11th grade and 30.8% were in the 12th grade of them. While 28.1% of the students stated that they had the power-on password for their home computer. Similarly, 40.8% of the students stated that their computers had filter programs (Table 1).

It was calculated that the students spent 8.26 hours on the computer/internet on weekdays, 7.00 hours on weekends, and 14.57 hours in total, 40% of them had complaints from their families about spending too much time on the internet.

The descriptive statistics for the variables of the Adolescent's Computer Addiction Scale and Adolescence Problems Scanning List are provided in Table 2 and Pearson

correlation coefficients between the variables are provided in Table 3. As seen in Table 3, the highest correlation coefficient was between IA and CA (r=0.585, p<0.001). The CA variable has a significant degree of negative correlation with PsyDP (r=-0.216, p<0.001) and FE (r=-0.177, p<0.001). The IA variable has a significant degree of negative correlation with PsyDP (r=-0.186, p<0.001), SDP (r=-0.167, p<0.001), PDP (r=-0.149, p<0.01) and FE (r=-0.123, p<0.01). GA showed a significant degree of negative correlation with PDP (r=-0.246, p<0.001), ROSS (r=-0.181, p<0.001) and FE (r=-0.102, p<0.05). The other correlations between subscales and subsections of the ACAS and APSL were not found to be significant (p>0.05). The correlations between the Adolescent's Computer Addiction Scale formed of all

Table 1: Principle characteristics of the study group

Sociodemographic characteristics*		Findings
Gender	Female	393 (59.2)
	Male	271 (40.8)
Class	9th grade	224 (19.7)
	10th grade	91 (13.7)
	11th grade	131 (33.7)
	12th grade	205 (30.8)
Level of income	Less than minimum wage	46 (7.2)
	1000-2000TL	143 (22.4)
	>2000TL	450 (70.4)
Mother education status	Illiterate	28 (4.2)
	Literate	27 (4.1)
	Primary Education	252 (38.2)
	High School	119 (18.1)
	University	233 (35.4)
Father education status	Illiterate	16 (2.4)
	Literate	17 (2.6)
	Primary Education	156 (23.7)
	High School	145 (22.0)
	University	324 (49.2)

*Data are given as n (%)

Table 2: Descriptive statistics of the variables in Set 1 and Set 2

Scales*		Values
ACAS (Set 1)	CA	39.30± 17.72 (24.0-120.0)
	IA	41.55± 17.51 (28.0-120.0)
	GA	42.25± 24.43 (26.0-130.0)
APSL (Set 2)	PDP	7.38± 2.45 (0.0-10.0)
	SDP	5.25± 1.77 (0.0-8.0)
	ROSS	7.24± 1.70 (0.0-9.0)
	PsyDP	13.39± 3.82 (0.0-19.0)
	FE	4.80± 2.28 (0.0-9.0)

*Data are shown as mean ± standart deviation and minimum and maximum values. **ACAS:** Adolescent Computer Addiction Scale, **CA:** Computer Addiction, **IA:** Internet addiction, **GA:** Game addiction, **APSL:** Adolescent problem scanning list, **PDP:** Physical development problems, **SDP:** Social development problems, **ROSS:** Relationship with the opposite sex and sexual information, **PsyDP:** Phychological development problems, **FE:** Future expectations

Table 3: Pearson correlation coefficient matrix of the variables in Set 1 and Set 2

		CA	IA	GA	PDP	PDP	ROSS	PsyDP
IA	r	0.585						
	p	**<0.001**						
GA	r	0.461	0.383					
	p	**<0.001**	**<0.001**					
PDP	r	-0.043	-0.186	-0.246				
	p	0.343	**<0.001**	**<0.001**				
SDP	r	-0.046	-0.167	0.071	0.341			
	p	0.299	**<0.001**	0.104	**<0.001**			
ROSS	r	-0.069	-0.015	-0.181	0.436	0.480		
	p	0.130	0.752	**<0.001**	**<0.001**	**<0.001**		
PsyDP	r	-0.216	-0.149	0.029	0.382	0.562	0.422	
	p	**<0.001**	**0.001**	0.515	**<0.001**	**<0.001**	**<0.001**	
FE	r	-0.177	-0.123	-0.102	0.438	0.371	0.219	0.477
	p	**<0.001**	**0.007**	**0.020**	**<0.001**	**<0.001**	**<0.001**	**<0.001**

CA: Computer addiction, **IA:** Internet addiction, **GA:** Game addiction, **PDP:** Physical development problems, **SDP:** Social development problems, **ROSS:** Relationship with the opposite sex and sexual information, **PsyDP:** Phychological development problems, **FE:** Future expectations

subdimensions of ACAS were positive and statistically significant (p<0.001). Similarly, the correlations between the Adolescence Problems Scanning List formed of all subdimensions of APSL were positive and statistically significant (p<0.001).

There were three different canonical variable pairs (U_iV_i) and canonical correlation coefficients between them. U and V canonical variate pairs varied between 0.688 - 0.150 in Table 4. Wilk's λ value revealed that the first canonical correlation (rU_1V_1=68.8%) between the first canonical variable pair was significant (p<0.001). The second canonical correlation (rU_2V_2=45.3%) of the second variable pair was also significant (p<0.001). Wilk's Lambda" shows the common variance amount shared by canonical variables and may be interpreted by R^2 in regression analysis (36). As a result, the shared common variance between the first canonical variable pair for ACAS (Adolescent's Computer Addiction Scale) and APSL (Adolescence Problems Scanning List) was 51% (1-0.490).

As can be seen in Table 5, in the final equations for U_1 and V_1, GA (1.064) of Adolescent's Computer Addiction Scale and PDP (0.702) of Adolescence Problems Scanning List had the greatest positive effect on canonical variates. For the Adolescents' Computer Addiction Scale, GA was the most important (1.064) parameter and it was respectively followed by CA (-0.830) and IA (-0.130). Except for IA, these parameters had great contributions. For a high U_1 canonical variate, GA should be raised because of positive correlations and CA should be reduced because of negative correlations. For Adolescence Problems Scanning List, PsyDP was the most significant parameter (0.702) and it was respectively followed by PDP (-0.653) and SDP (0.423). Loadings of PsyDP and SDP were positive. Thus, increasing V_1 canonical variate values were observed with increasing PsyDP and SDP. Contrarily, decreasing V_1 canonical variable values were observed with increasing PDP.

In Table 6, it is given what percentage of variability both Set1 and Set 2 explained in their own and other sets. In the first canonical variable pair, approximately 6.8% of the variance in the Set 1 was explained by the variables in the set 2. Approx 6.8% of the variance in Set 2 variables was also explained by Set 1.

Table 4: Canonical correlation coefficients

Canonical Variable	Canonical Correlation	Eigen Value	Wilk's Lambda	F	df	p
U_1V_1	0.688	0.586	0.490	18.127	15	**<0.001**
U_2V_2	0.453	0.259	0.777	11.369	8	**<0.001**
U_3V_3	0.150	0.023	0.977	2.601	3	0.052

Table 5: Standardized canonical coefficients and canonical loadings for Set 1 and Set 2

Scale	Subscales	Standardized Canonical Coefficients	Canonical Loadings	Cross Loadings
ACAS (Set 1)	CA	-0.830	-0.408	-0.248
	IA	-0.130	-0.037	-0.023
	GA	1.064	0.617	0.375
APSL (Set 2)	PDP	-0.653	-0.483	-0.294
	SDP	0.423	0.562	0.342
	ROSS	-0.293	-0.088	-0.054
	PsyDP	0.702	0.603	0.367
	FE	-0.066	0.033	0.020

ACAS: Adolescent Computer Addiction Scale, **CA:** Computer Addiction, **IA:** Internet Addiction, **GA:** Game Addiction, **APSL:** Adolescent Problem Scanning List, **PDP:** Physical Development Problems, **SDP:** Social Development Problems, **ROSS:** Relationship with the opposite sex and sexual information, **PsyDP:** Phychological Development Problems, **FE:** Future Expectations

Table 6: Proportion of variance explained

Canonical Variable	Set 1 by Self	Set 1 by Set 2	Set 2 by Self	Set 2 by Set 1
U_1V_1	0.183	0.068	0.184	0.068
U_2V_2	0.158	0.032	0.155	0.032
U_3V_3	0.659	0.015	0.313	0.007

DISCUSSION

This is the first study that examines the relationship between computer addiction and adolescent problems and sub-sections in adolescents of generation K with canonical correlation analysis. Previous research on the relationship between other factors and internet or computer addiction yielded conflicting findings. Canonical correlation analysis was used to examine the similarity between the two personality trait measures and conscientiousness and agreeableness, personality, in a study to see if personality traits can reliably predict excessive computer and internet use consistently, regardless of the personality trait measure. It has been discovered that these traits are crucial for comprehending the behaviors of technological addiction (37)

Since the average value of all five factors is above 0.50 in the adolescent problem screening list, it is observed that K generation adolescents have problems in these five areas. Again, the most problematic area was the relationships with the opposite sex (0.80±0.18), followed by physical (0.73±0.24) and psychological (0.70±0.20) problems, the least problematic area was the area of thoughts and expectations (0.53±0.25) determined. Again, in the computer, internet, game addiction scale (ACAS), it is seen that the highest average belongs to game addiction (42.25±24.45) (Table 2). In a study, friend problems were mostly found in the 9th grade (2.84±0.95), teacher problems in the 10th grade (3.04±1.01), and career choice problems in the 10th grade (2.89±0.95), and it was determined that students in the 9th grade (2.81±0.69) experience the problems of adolescence the most (38).

One of the aims of the study was to identify which of the subcomponents of the ACAS concept associated with APSL in adolescence predicted these concepts. The results of the analysis with this aim observed that the leading subdimension was GA. Gentile et al. state that we cannot explain pathological gameplay (game addiction) only with playing time. Griffiths et al. supported this view, in addition, they pointed out the need to lose control while playing the game and to examine negative psychological and physical consequences (39,40). In a study conducted with 154 children that examined the relationship between computer game addiction level and behavioral problems in children, a positive correlation is found between computer game addiction level and external behavioral problems, aggression, social problems, cautiousness problems, thought problems; and a negative correlation was found between the computer game addiction level and children's school competence (p<0.05) (41). In another study conducted with 221 students in Germany, it was determined that 6.3% of the students met the diagnostic criteria for behavioral addiction (game addiction), these adolescents showed limited cognitive flexibility, and used computer games as a mood management strategy (42). Results

obtained related to GA confirm these characteristics of generation K who cannot view computer technologies from the outside and want computers to be part of all activities.

Another aim of the study was to determine which development problem areas of generation K adolescents contribute to explaining ACAS. In this context, high GA and IA in generation K adolescents were linked to PsyPD and SDP, while CA was linked to PDP. A study investigating the psychosocial variables predicting internet addiction in adolescents found variables like loneliness and perceived social support from a family affected internet addiction in adolescents and explained 7.3% of the total variance among variables affecting internet addiction (43). Another study using the "Brief Symptom Inventory" for psychological symptoms associated with internet addiction, found a moderate level positive significant correlation between internet addiction and psychological symptoms (p<0.05) (44). In a study of 1928 Norwegian adolescents aged 13-17 years, video game addiction is associated with depression, low academic achievement, and behavioral problems. (45). In a study conducted with 383 middle school students, it was determined that there is a low level of relationship between digital game addiction and gambling (games involving physical activity) scores and a high level of a positive significant relationship between aggression scores (p<0.05) (46). In another study on the subject, a highly significant positive correlation was found between social phobia and IGD (internet game disorder) (p<0.001) (18). A study by Dalbudak et.al. reported students may use the internet to cope by distancing themselves from negative emotions (47). In a study using canonical correlation analysis, it was discovered that perceived values (consumption values) were significantly correlated with mobile game addiction behavior. This study examined the relationship between mobile game addiction behaviors and perceived game value (benefit) of university students. Addiction to mobile games and behavior are closely related. This study offered some evidence that the perceived value (benefit) of a game may affect the behavior of mobile gaming addicts (48). These results show that GA is mainly associated with psychological and social problems.

In this study, the second prominent area of the APSL in the explanation of ACAS was SDP and it was observed to have a positive correlation. In a study on the subject, it was stated that the social development of children with high levels of computer game use slowed down, their self-confidence decreased, and their social anxiety levels and aggressive behaviors increased (49). Hertz reported that generation K especially conducted social relationships through social networks and as a result, many problems such as health, psychological and social relationship problems would be observed together (50). According to another study about social media use, young people spend more time using the internet and social media which negatively affects real-life

relationships and other areas (51). The cognitive-behavioral model of PIU suggests that certain online thoughts and behaviors are related to social anxiety. Therefore, it is imperative to look into the relationship between social anxiety and PIU. Additionally, there is a lack of research that considers the multidimensional character of PIU and social anxiety. Only the first of the canonical correlation functions calculated for men was found to be significant (Rc=0.43, =0.78, 29=64.7, p<0.001) and the overlapped variance was 19% in this study, which examined the relationships between social anxiety and PIU using canonical correlation analysis. Similarly, only the first canonical function—which accounted for 13% of the overlapping variance for females—was significant (Rc=0.36, =0.87, 29=33.9, p<0.001) (52). The findings obtained from the study and the literature confirm the relationship between computer addiction and problems in social relations.

In our study, one of the APSL contributing less to the explanation of ACAS was found to be PDP. Whereas some studies have reported high correlations between physical factors (sleep, nutrition, joints, eyes ...) and internet-based addictions (53). Studies have stated that excessive computer/internet use is reported to negatively affect eating habits and physical activity and cause excessive weight gain, eye disorders, exposure to radiation, and stance and skeletal structure disorders (54). In a study examining the relationship between BMI and sedentary life with 450 students, it was found that non-obese participants spent significantly less time using computers on weekends (p =0.04) and weekdays (p =0.025) than overweight/obese participants. As a result of logistic regression analysis, it was seen that those who use computers more than 4 hours a day on weekdays are probably overweight/obese (odds ratio: 5.79; p <0.003). (55).

Finally, the predictive role of adolescence problem areas (APSL) for the occurrence of or processes after the occurrence of computer addiction (ACAS) was analyzed and as a result of the analysis, it was determined that APSL played an explanatory role in the prediction of ACAS in generation K adolescents. Among the subdimensions of the ACAS for adolescents, it appeared there was a negative correlation between GA and CA, and IA. As a result, as GA increased, there was a fall determined in CA and IA. These results show that the subscales of ACAS interact with each other and change each other's points. In other words, the use of these subscales together for adolescent computer addiction explains higher rates than their separate use. In the literatüre, some experts in the literature consider that computer/internet-based behavior addiction should be dealt with together under the heading of computer addiction and is a psychophysiological disorder, while some stated that as different types of activities can be performed in internet environments, they should be dealt with separately (24,56,57).

Computer/internet/game addiction has effects on every individual, especially the K generation adolescents, who are today's adolescents. This study shows that the use of ACAS subscales together for adolescent computer addiction explains higher rates than their separate use. In other words, this study also shows that computer, internet, and game addiction interacts with all developmental problems of adolescents and this addiction should be handled not only with the psychological dimension but also with other adolescence problems. In this sense, mental health professionals should be effective in assessing addiction, not only in evaluation and treatment but also in preventative and protective approaches and they should address adolescence problems not only with their psychological dimensions but also with all dimensions.

The study results are limited to the generation K adolescents in the schools included in the study. Since the questionnaires are based on self-report, the answers are limited to the answers given by the students. The study results are limited to the internet addiction and adolescent problems examined in the study.

Author Contributions

Both authors have equal contributions.

Conflicts of Interest

We have no conflict of interest to declare.

Ethical Approval

The Ethics Committee of Ordu University approved the study protocol (ID 2015/10/04, 16 April 2015). Written permission was obtained from the Ordu Provincial Directorate of National Education before the survey started.

Review Process

Extremely peer-reviewed and accepted.

REFERENCES

1. James RJE, Tunney RJ. The relationship between gaming disorder and addiction requires a behavioral analysis. J Behav Addict 2017;6(3):306-309.

2. Costa S, Barberis N, Gugliandolo MC, Liga F, Cuzzocrea F, Verrastro V. Examination of the psychometric characteristics of the Italian version of the game addiction scale for adolescents. Psychol Rep 2020;123(4):1365-1381.

3. Ho RC, Zhang MW, Tsang TY, Toh AH, Pan F, Lu Y, Cheng C, Yip PS, Lam LT, Lai CM, Watanabe H, Mak KK. The association between internet addiction and psychiatric co-morbidity: A meta-analysis. BMC Psychiatry 2014;14:183.

4. American Psychiatric Association (APA). Diagnostic and Statistical Manual of Mental Disorders (DSM-5). Washington, DC: American Psychiatric Association; 2013.

5. Nadir Aykın, S, Caylan A. Adolescent, and young health monitoring. Türkiye Klinikleri J Fam Med-Special Topics 2013;4(5):70-77.

6. Onur B. Developmental psychology. İmge Bookstore Publications, Ankara, 2010

7. World Health Organization. (2017). Global accelerated action for the health of adolescents (AA-HA!): Guidance to support country implementation. https://apps.who.int/iris/bitstream/handle/10665/255415/9789241512343-eng.pdf

8. UNICEF, 2019. Adolescent Demographics. Accessed: https://data.unicef.org/topic/adolescents/demographics/ Accessed date: 20.12.2021

9. Li W, Garland EJ, Howard MO. Family factors in Internet addiction among Chinese youth: A review of English and Chinese-language studies. Comput Hum Behav 2014;31:393-411.

10. Tran BX, Huong LT, Hinh ND, Nguyen LH, Le BN, Nong VM, Thuc VT, Tho TD, Latkin C, Zhang MW, Ho RC. A study on the influence of internet addiction and online interpersonal influences on health-related quality of life in young Vietnamese. BMC Public Health 2017;17(1):138.

11. OECD 2019. Children, Technology and Teaching. Helping our youngest to learn and grow: policies for early learning. https://www.oecd-ilibrary.org/education/helping-our-youngest-to-learn-and-grow_f21353a9-en Accessed date: 15.10.2021

12. IWS (Internet World State) (2020). Top 20 countries in internet users rest of the world-June 30 2019 https://www.internetworldstats.com/top20.htm Accessed date: 02.04.2022

13. Ektiricioğlu C, Arslantaş H, Yüksel R. The disorder of the Era in adolescents: Technology addiction. Arch Med Rev J 2020;29 (1):51-64.

14. Özparlak A, Karakaya D. Familial factors associated with internet addiction in adolescents and nursing care. Turkiye Klinikleri J Nurs Sci 2020;12(2):291-299.

15. Otsuka Y, Kaneita Y, Itani O, Tokiya M. Relationship between internet addiction and poor mental health among Japanese adolescents. Iran J Public Health 2020;49(11):2069-2077.

16. Danovitch JH. Growing up with Google: How children's understanding and use of internet-based devices relates to cognitive development. Hum Behav Emerg Technologies 2019;1:81-90.

17. Green CS, Bavelier D. Action video game modifies visual selective attention. Nature 2003;423(6939):534-537.

18. Sioni SR, Burleson MHM, Bekerian DA. Internet gaming disorder: Social phobia and identifying with your virtual self. Comput Hum Behav 2017;71:11-15.

19. Hertz N. Generation K: Who are they and what do we know about them?. 2015a https://womenintheworld.com/2015/04/21/generation-k-who-are-they-and-what-do-we-know-about-them/ Accessed date: 10.11.2020

20. Hertz N What it means to be a teen?. 2015b. https://www.ft.com/content/1642f9d2-e3ac-11e4-9a82-00144feab7de Accessed date: 10.11.2020

21. Heilpern W. Here's what you should know about 'Generation K' — the teens shaped by terrorism, technology, and anxiety. Business Insider. 2016 https://www.businessinsider.com/what-you-need-to-know-about-generation-k-2016. Accessed date: 19.11.2021

22. Gray J. PLSA AC 18: How to engage "Generation K". 2018. Available at: http://www.pensionsage.com/pa/PLSA-AC-18-How-to-engage-Generation-K.php. Accessed: 07.11.2020

23. Shandwick W. Generation-K. 2019 http://webershandwick.co.uk/wp-content/uploads/2014/01/GenK_Sellsheet_Talent.pdf Accessed: 08.11.2020.

24. Taylor R. Raising Generation K. 2016 https://blog.rakkoon.com/raising-generation-k/ Accessed: 08.11.2020

25. Király O, Griffiths MD, Urbán R, Farkas J, Kökönyei G, Elekes Z, Tamás D, Demetrovics Z. Problematic internet use and problematic online gaming are not the same: Findings from a large nationally representative adolescent sample. Cyberpsychol Behav Soc Netw 2014;17(12):749-754.

26. Pal B, Seal B. Multivariate relationships between physiologic and anthropometric variables: A data-based analysis. Int J Stat Probab 2014;3(2),30-45.

27. Sokal RR, Rohlf FJ. Biometry: The principles and practice of statistics in biological research. 3rd ed, San Francisco: WH Freeman;1995.

28. Hair JF, Anderson RE, Tatham RL, Black WC. Multivariate Data Analysis, 5th edition. Englewood Cliffs, NJ: Prentice-Hall,1998.

29. Ayas T, Çakır Ö, Horzum MB. Computer addiction scale for adolescents. Kastamonu Educ J 2011;19(2):439-448.

30. Tekelioğlu FY. The Comparison of Adolescence Problems of Youth of the Same Age and the 13-17 Age Group Students Living in Orphanage and Their Families Living and Studying with Their Families. Master Thesis, Marmara University, Istanbul; 1993.

31. Birinci M, Ersoy Quadir S, Yaylacı Y, Özdemir CÇ, Şahan G. Investigation of social and psychological problems of adolescents in orphanage. J Soc Hum Sci 2020;12 (1):34-50.

32. Weiss DJ. Canonical correlation analysis in counseling psychology research. J Couns Psychol 1972;19(3):241-252.

33. Sharma S. Applied multivariate techniques. Willey, Canada. 1996:493.

34. Sheskin DJ. Handbook of Parametric and Nonparametric Statistical Procedures. Chapman&Hall/CRC, 2007.

35. Hardoon DR, Szedmak S, Shawe-Taylor J. Canonical correlation analysis: An overview with application to learning methods. Neural Comput 2004;16(12):2639-2664.

36. Tabachnick BG, Fidell LS. Using multivariate statistics. Boston: Pearson, 2015.

37. Tsigilis N. Personality traits and excessive computer and internet usage: A Robust Relation? Int J Soc Sci Res 2019;7(2):1-13.

38. Haşimoğlu A, Aslandoğan A. Adolescent problems and emotion of high school students examining the relationship between regulatory strategıis. ARHUSS 2018;1(2):71-83.

39. Gentile D, Choo H, Liau A, Sim T, Li D, Fung D, Khoo A. Pathological video game use among youths: A two-year longitudinal study. Pediatrics 2011;127(2):319-329.

40. Griffiths MD, Kuss DJ, Demetrovics Z. Social networking addiction: An overview of preliminary findings. Rosenberg K, Feder L (editor), Behavioral addictions: Criteria, evidence, and treatment. Elsevier Academic Press, 2014: 119-141.

41. Sallayıcı Z, Yöndem ZD. The Relationship between level of computer game addiction and behavioral problems in children. J Depend 2020;21(1):13-12.

42. Wölfling K, Thalemann R, Grüsser-Sinopoli SM. Comput-erspielsucht: ein psychopathologischer symptomkomplex im jugendalter [Computer game addiction: a psychopatho-logical symptom complex in adolescence]. Psychiatr Prax 2008;35(5):226-232.

43. Esen E, Siyez DM. An investigation of psychosocial variables that predict internet addiction in adolescents. Tur J Psychol Couns Guidance 2011;4(36):127-138.

44. Taş İ. The examination of internet addiction and psychological symptoms among adolescents according to various variables. Journal of Social Sciences of Mus Alparslan University 2018;6(1):31-41.

45. Brunborg GS, Mentzoni RA, Frøyland LR. Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems? J Behav Addict 2014;3(1):27-32.

46. Hazar Z, Hazar K, Gökyürek B, Hazar M, Çelikbilek S. Investigation of the relationship between playfulness, digital game addiction and aggression levels of secondary school students in terms of various variables. J Hum Sci 2017;14(4):4320-4332.

47. Dalbudak E, Evren C, Aldemir S, Evren B. The severity of Internet addiction risk and its relationship with the severity of borderline personality features, childhood traumas, dissociative experiences, depression, and anxiety symptoms among Turkish university students. Psychiatry Res 2014;219(3):577-582.

48. Yıldırım S. Examining perceived value influence mobile game addiction: A case of Turkish young adults. In Leveraging Consumer Behavior and Psychology in the Digital Economy, IGI Global, 2020:133-152.

49. Kök Eren H, Örsal Ö. Computer game addiction and loneliness in children. J Public Health 2018;47(10):1504-1510.

50. Duygulu S. The effect of new media technologies on the communication of generation k with parents. TRT Acad 2018;3(6):632-653.

51. Andreassen CS, Pallesen S. Social network site addiction-An overview. Curr Pharm Des 2014;20(25):4053-4061.

52. Baloğlu M, Özteke Kozan Hİ, Kesici Ş. Gender differences in and the relationships between social anxiety and problematic internet use: Canonical analysis. J Med Internet Res 2018;20(1):e33.

53. Kawabe K, Horiuchi F, Oka Y, Ueno SI. Association between sleep habits and problems and internet addiction in adolescents. Psychiatry Invest 2019;16(8):581-587.

54. Muslu B, Bolışık B. Using the internet in children and adolescents. TAF Prev Med Bull 2009;8(5):445-450.

55. Mota J, Ribeiro J, Santos MP, Gomes H. Obesity, physical activity, computer use, and TV viewing in Portuguese adolescents. Pediatr Exerc Sci 2006;17:113-112.

56. Taşpınar M, Gümüş Ç. Environment and user profile of internet cafes in Turkey: evaluation of ınformation society. J Electron Soc Sci 2005;4(14):80-93.

57. Fradelo EC, Kourakos M, Velentza O, Polykandriotis T, Papathanasiou IV. Internet addiction in children and adolescents: Etiology, signs of recognition and implications in mental health nursing practice. Medrech 2016;264-272.