Diminishing the Undesirable Effects of the Computer Games with the Kinect Sensors

Bilgisayar Oyunlarının İstenmeyen Etkilerinin Kinect Sensörleri ile Azaltılması

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Abstract

The popularity of the computer games are increasing every day. Spending time in front of the computers with almost no physical activity causes many health related problems. Recent technologies such as Kinect sensors may have the potential to reduce the physical side effects of the computer games. Nevertheless, the physical and emotional effects of playing computer games with the Kinect on users are still not clear. The effects of playing computer games with and without Kinect were compared in the study with 21 prospective teachers studying at the Education Faculty located in Zonguldak, Turkey in 2014. The mixed method research design was used to explore the research questions. The game playing motivation scale, self-reported muscular activity figure and structured interview questions were used to collect data. Besides t-test, descriptive analyses of the qualitative and quantitative data were conducted for analysis. Findings revealed that using the games with Kinect sensors improved users' motivation and muscular activity. Also the Kinect has changed game players' opinions on games. Further research should investigate the correlation between the motivation and emotional effects of the Kinect use on computer game players.

Keywords: *Kinect, computer games, motivation scale, physical activity*

Öz

Her geçen gün bilgisayar oyunlarının popülaritesi artmaktadır. Bilgisayarın önünde hiçbir fiziksel hareket yapmadan oturmak birçok sağlık problemine neden olmaktadır. Son teknolojiler örneğin Kinect sensörler bilgisayar oyunlarının yan etkilerini azaltacak potansiyele sahiptir. Ne var ki, bilgisayar oyunlarını Kinect sensör ile uygulamanın fiziksel ve duygusal etkileri hala netlik kazanmamıştır. Bu araştırmada 2014 yılında Zonguldak, Türkiye'de bulunan Ereğli Eğitim Fakültesinde okumakta olan 21 öğretmen adayının Kinect sensörü kullanarak ve Kinect sensör kullanmadan bilgisayar oyunlarını oynamalarının etkileri karşılaştırılmıştır. Araştırma sorularını cevaplamak için karma araştırma deseni kullanılmıştır. Oyun motivasyon ölçeği, bireysel kas aktivite bildirim şekli ve yapılandırılmış görüşme soruları veri toplama aracı olarak kullanılmıştır. t-testin yanında, nitel ve nicel verilerin betimsel değerlendirmeleri yapılmıştır. Elde edilen bulgulara Kinect sensör ile oyun oynamanın bireylerin motivasyonunu ve kas aktivitesini artırdığını ortaya koymuştur. Ayrıca, Kinect sensörü ile oyun oynayan bireylerin oyunlara karşı fikirleri değişmiştir. İleride yapılacak olan araştırmalar Kinect sensör kullanımının bilgisayar oyunlarını oynayanların üzerindeki motivasyon ve duygusal etkilerinin korelasyonunu incelemelidir.

Anahtar Sözcükler: *Kinect, bilgisayar oyunları, motivasyon ölçeği, fiziksel aktivite*

Introduction

The popularity of the computer games are increasing every day. Individuals from various age groups use computer games for entertainment purposes. It is not unusual to encounter with young, middle age or elderly individuals playing computer games at home, work, school etc. for hours. Vast use of the computer games has several physical and emotional side effects. A poor academic performance, social isolation, addiction or computer game dependency, gender stereotyping, vision and other physical health problems can be counted as some of possible detrimental effects resulted from general game playing (Lee & Peng, 2006). Besides, aggressive affects, behaviors, thoughts, physiological arousal, and other social and psychological variables are known as behavioral side effects resulted from playing violent games (Lee & Peng, 2006).

Spending time in front of the computers with almost no physical activity causes many health related problems. Several studies (Cook & Kothiyal, 1998; Cook, Limerick & Chang, 2000; Fernström & Ericson, 1997) pointed out that the large number of computer users in developed countries are suffer from musculoskeletal disorders caused by the computer use. According to the literature, up to 80% of keyboard users had musculoskeletal symptoms (Cook & Kothiyal, 1998). Another study results showed that the use of mouse as an input device caused upper limb musculoskeletal disorders (Fernström & Ericson, 1997). The position of the mouse away from the midline of the body results in computer users working with the arm unsupported during playing game or using computer that cause several arm and wrist health problems (Cook, Limerick & Chang, 2000). In the several studies, the researchers investigated the influence of mouse position on muscular activity in the neck, shoulder and arm on computer users. The findings of the study revealed that mouse users could be at risk of developing musculoskeletal disorders of the neck and shoulder due to the work postures adopted during mouse use (Aaras, Fostervold, Thoresen & Larsen, 1997; Cook and Kothiyal, 1998; Cook, Limerick & Chang, 2000; Cooper and Straker, 1998; Fernstrom and Ericson, 1997; Franzblau, Flaschner, Albers, Blitz, Werner & Armstrong, 1993; Harvey and Peper, 1997). In another study investigating the association between children's computer use and musculoskeletal discomfort, Cook, Burgess-Limerick, & Chang (2000) found that more than half of the children reported some musculoskeletal discomfort within the last year. Also the study revealed that there was a significant relationship between hours spends on the computer and overall musculoskeletal discomfort. In different study conducted in Nigeria to investigate the musculoskeletal pain associated with the use of computer systems, it was reported that users complained about the low back pain, neck pain and upper limbs disorders (Adedoyin, Idowu, Adagunodo, Owoyomi & Idowu, 2005). The study also revealed that these pains may be caused by the bad ergonomics of the computer peripherals which may be attributed to the bad ergonomics among the users. In another study where grades 1-12 were interviewed on the cumulative trauma disorder "physical injury resulting from the cumulative effects of repetitive stressful movements or postures" risk for children using computer product revealed that use of the computer products was associated with self-reported physical discomfort including (but not limited to) wrist pain and back pain (Burke & Peper, 2002).

Furthermore; computer game playing is considered as a significant contributor of the sedentary life-style (Lee & Peng, 2006) which causes physical and developmental health problems on game players. Adolescent obesity is one of the well-known results of the sedentary life-style (Wack & Tantleff-Dunn, 2009). Playing computer games affects children life style. Instead of going outside to play with friends, children stay in the house the computer and spent time playing with computer games. Computer games also substitute outdoor activities (Lee & Peng, 2006).

Computer technology has altered the landscape (Akdemir, 2008). Although the introduction of the touchscreen technologies integrated to the computers and mobile devices has added relatively little physical activity to the computer game adventure, it is still insufficient physical exercise compared to the traditional games. Although computer games have many proved side effects, they are still inevitable part of many individuals. What can be done to eliminate the side effects of computer games? Technology has brought the problem but who has the solution? Could the technology have the solution to diminish the side effects of the computer games? Recent technologies known as Kinect sensors may have the potential to reduce the physical side effects of the computer games.

The Kinect sensor lets the computer directly sense the dimension of the players and environment, and makes it possible to do the tasks much easier. The Kinect sensor has also several sensitive motion sensors such as a depth sensor, a color camera, 3D motion capture, facial recognition, voice recognition, hand gesture recognition etc. incorporated in hardware (Han, Shao, Xu, Shotton, 2013; Zhang, 2012). Utilizing sophisticated sensors, the Kinect recognizes when users talk, knows who they are when they act in front of it and can interpret their movements. It also can translate recorded motion into a format that makes possible to build new experiences (Zhang, 2012).

Kinect sensors have created many opportunities for the game lovers who would like to interact with the games with their body in a natural way. Moreover, due to its wide availability and inexpensive price, many game producers and researchers in computer science are working on the sensing technology to develop the new kinds of games or software allowing users to interact with computers and smart platforms. These machines allow individuals to play games with body movements as well as assist medical doctors to assist handicapped people and/or people with autism. Instead of using a mouse or keyboard, the Kinect sensors support human interaction with a computer or a smart platform using voice, body movement or hand gesture recognition (Lee & Oh, 2014). Users stay a few meters in front of the Kinect device to interact with the systems and use the registered voice commands and hand movement to control the systems.

The availability of the Kinect has opened a new avenue for the computer users. However the physical and emotional effects of playing computer games with the Kinect on users are still not clear. The purpose of this research is to compare the effects of playing computer games with Kinect sensor to the effects of playing games without Kinect sensor on prospective teachers. Following research questions were developed to investigate the problem.

1. How does playing computer games with and without Kinect sensors affect prospective teachers' game playing motivation?
2. What are the effects of playing computer games with and without Kinect sensors on prospective teachers' muscular activities?

3. What are the opinions of Kinect and non-Kinect prospective teachers' on played computer games?
4. What do prospective teachers feel about playing computer games with and without Kinect sensors?

Method

Context

The study was conducted at the Ereğli Education Faculty located in Zonguldak, Turkey. The school of education has approximately more than two thousands students. Graduates of the education faculty are eligible to work at the private and public schools as teachers. Therefore prospective teachers are well-motivated to graduate and have a goal to work as teacher in their future life. All prospective teachers are required to take two compulsory computer courses in their first year at the college. These classes equip students with the basic information and communication technology knowledge and skills. Therefore all students of the school of education are capable of using the information and communication technology devices. The study was conducted in a computer laboratory in which computers, a projector, a smart board, a sound system and the Kinect were present.

Participants

Typical sampling, one type of purposeful sampling, was used in the study. The study participants were selected from voluntary students studying at the school of education and completed the compulsory computer courses during their first year at the college. 21 prospective teachers participated in the study. The age of the students ranged between 17 and 21. When the distribution of the participants by gender was reviewed, 71 % of the participants were female and 29 % of the participants were male.

Research Design

The mixed method research design was used in the study to explore the research questions. The qualitative and quantitative data were gathered simultaneously. Three computer games were selected for the study (Figure 1,2,3). Initially participants were asked to play three games on the computers without Kinect sensors as part of the first treatment. The mouse and keyboard were used as input devices. Having completed the games without using the Kinect, which was the first treatment; participants were asked to fill the data collection instrument measuring participants' game motivation. Also participants were asked to report their muscular activities on the human body figure. Lastly participants' opinions about the played games and their opinions about playing the games without the Kinect were gathered with structured interviews.

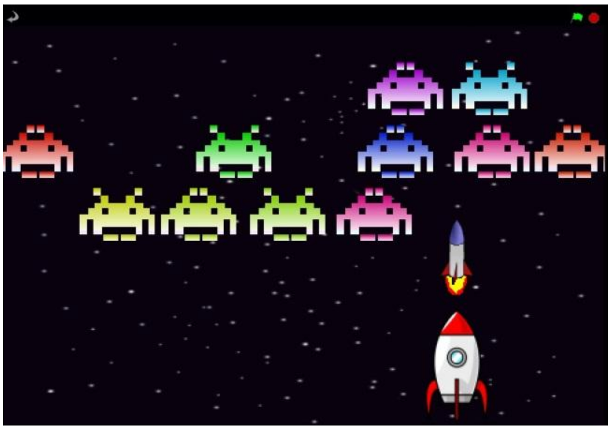

Figure 1. Computer Game I

Figure 2. Computer Game II

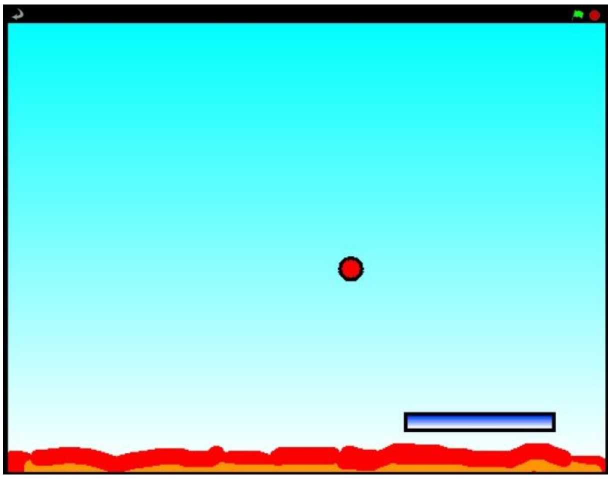

Figure 3. Computer Game III

The second treatment was initiated by placing the each user in front of the Kinect (Figure 4). Users' body movements were monitored on the screen in order to set up their position for the games. Before the second treatment, the instruction was given to users on how to play the games with the Kinect. Then all participants were asked to play the same three games with the Kinect. The use of the games with the Kinect was the second treatment in the study. Participants' game motivation, self-reported muscular activities, their opinions on played games and playing the games with and without the Kinect were collected.

Figure 4. Position of the user in front of the Kinect

Data Collection Instruments

Three instruments were used to gather the data for the study. The first instrument was used to collect the game playing motivation of users. Comprehensive literature review was conducted on technology related motivation studies (Chang & Zhang, 2008; Chumbley & Griffiths, 2006; Olson, 2010; Pasch, Bianchi-Berthouze, Dijk & Nijholt, 2009; Yee, 2006). As a result of the review, 28 items were identified that can possibly have effect on the students' motivation for the computer games. Determined 28 items were added to the item pool in order to measure students' level of computer game motivation. Having constructed the item pool, the explanatory factor analysis (EFA) was initiated. The data for the factor analysis were gathered from 211 students enrolling at teaching programs of Ereğli Education Faculty.

Consistency of data set to conduct EFA

In the EFA process, the correlation between items form a matrix called R-matrix. Availability of conducting factor analysis purely related to that matrix. There were several criteria for making decision about that matrix to conduct the factor analysis. KMO and Bartlett's test of sphericity are two of them which indicate the suitability of the data for structure detection. In this study, KMO value of 20 items was found .897 which was close to the perfect range (Field, 2005). The next criteria Bartlett's test of sphericity was found significant so that the original correlation matrix was not an identity matrix (Field, 2005). Alternative criteria for determining factorability of data set were determinant of R-matrix and correlation values of the items. Field (2005) indicated that if any R-matrix which had determinant value below the .00001 value demonstrates a multi-colinearity problem. For this study determinant of R-matrix was found .00148 which was above the .00001. Therefore the correlation matrix did not show any multi-colinearity problem. Also in correlation matrix, none of the values was greater than .900 so that there was not a problem of singularity (Field, 2005). These findings revealed that data set could be used to conduct the EFA.

Factor Analysis Process

In this phase, the normality values of the items were checked to determine the factor extraction method. According to Kolmogorov-Smirnov test results, items in the instrument violated the normality distribution. Fabrigar, Wegener, MacCallum ve Strahan (1999) suggested that if items violated normality, researchers had to use Principal Axis Factoring

(PAF) extraction method. Therefore, PAF was selected to conduct factor analysis. In addition, varimax rotation strategy was selected to interpret factor loadings.

Table1.

Communality values and factor loadings of variables

	Items in the	Initial*	Extraction*	Factor Loadings**
Factor 1	1-It allows me to socialize	.557	.558	**.663**
	2-It increases my willingness to teamwork	.604	.583	**.623**
	3-It increases my willingness to explore	.619	.623	**.619**
	4-It increases my willingness to play a role	.601	.646	**.644**
	5-It increases my willingness to grant my own status	.481	.531	**.545**
Factor2	6-It increases my willingness to progress	.585	.600	.586
	7-It causes me to anger	.379	.361	.584
	8-It excites me	.677	.737	.761
	9-It makes me aggressive	.270	.332	.455
	10-It increases my willingness to play	.609	.661	.619
	11-It causes me to spend more time playing games	.432	.393	.537
Factor	12-It makes me comfort	.585	.711	**.751**
	13-It makes me calm	.485	.568	**.729**
	14-Spiritualy it makes me feel good	.684	.715	**.634**
Factor	15-It allows me to engage in mental activity	.610	.598	.608
	16-It improve my brain-muscle coordination	.697	.879	.826
	17-It increases my attention	.567	.567	.574
Factor	18-Physically it makes me feel better	.573	.657	**.608**
	19-It provides me to make bodily movements	.502	.482	**.672**
	20-It provides me to spend energy	.416	.478	**.412**

* Communality values of variables before and after extraction

**Rotation Sums of Squared Loadings

Communality of items which indicate the variance in each item explained by the extracted factors before and after extraction, initial and extraction values were presented at the Table1. As seen from the results each item explains minimum %30 of the variance for the retained factors.

Table2.

Distribution of items in the factors

Factors	Items	Eigenvalue	Variance explained by factors %	Reliability Scores of factors
1- Social Well-Being	1,2,3,4,5	8.113	38.65	0.853
2- Game Aggression	6,7,8,9,10,11	1.897	7.31	0.801
3- Mood Regulation	12,13,14	1.465	5.26	0.822
4-Cognitive and Psychomotor Abilities	15,16,17	1.198	4.16	0.851
5- Physical Activities	18,19,20	1.064	3.02	0.728
Total			58.40	0.918

According to PAF extraction method results, 20 item convene in 5 factors. Items related to factors and variances explained by these factors are shown at the Table2. The total of 20 items explained %58 of the variance with a .918 reliability (Table 2). The Game Aggression factor explained relatively large amounts of variance (%40.5), whereas other sub-factors explained only small amount of variance. Rotation sums of squared loadings of items are shown at the Table 1. According to these results, Social Well-Being sub-factor item loadings varied between .545 and .663. The next sub-factor Game Aggression varied between .455 and .761. The third sub-factor Mood Regulation varied between .634 and .751. The fourth factor Cognitive and Psychomotor Abilities varied between .574 and .876. The last sub-factor Physical Activities varied between .412 and .672. Also the reliability scores of total items and sub-factors are above the .700 which was in an accepted range (Field, 2005). The last version of the instrument used to measure participants' game motivation had 20 items distributed to 5 factors (See Table 1).

The second data collection instrument was used to measure participants' self-reported muscular activities. The figure showing the fundamental muscles on the human body (Figure 5) was used as a second instrument. The fundamental muscles on the human body were divided into 10 sections for the study. Participants reported the muscles used during the game play on the figure.

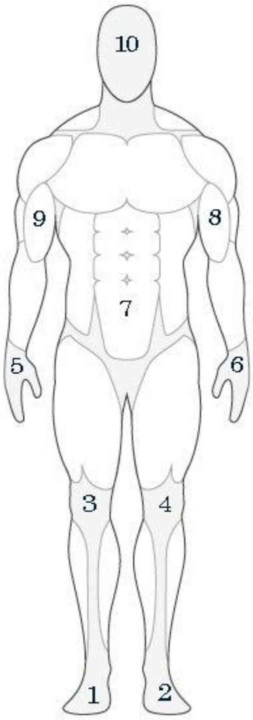

Figure 5. Fundamental muscles on the human body

The last instrument was used to collect the participants' opinions on played games and their feelings about playing the games with and without the Kinect. There were two open-ended questions in the last instrument. Participants' opinions on games and what they felt physically and emotionally when playing the games were asked at the last instrument.

Data Analysis

Having calculated the reliability and validity of the instrument, the Kolmogorov-Smirnov normality test and the Skewness-Kurtosis indices were used to check the normality of variables. The paired sample t-test was performed to compare the playing computer games with and without the Kinect on users' game playing motivation. All the statistical analysis were conducted with a significant level of .05. The descriptive analysis was used to compare the muscular activities of the users when playing the games with and without the Kinect. The descriptive analysis was also used to analyze the qualitative data. The accuracy of the qualitative findings was checked using the triangulation. Participants' responses were checked with quantitative findings for the accuracy.

Findings

The data were investigated for the normality distribution in terms of the Kolmogorov-Smirnov test and Skewness-Kurtosis indices. Results are shown in the Table 3.

Table3.
Normality indicators of variables

Variables	N	Skewness	Std.	Kurtosis	Std.	Z score*	Sig.
Social well-being (with kinect)	21	1.195		.210		1.363	.05
Social well-being (without kinect)	21	.726		-.127		.669	.76
Game Aggression (with kinect)	21	.807		-.370		.941	.34
Game Aggression (without kinect)	21	.093		-1.466		.765	.60
Mood Regulation (with kinect)	21	.632		-.854		.851	.46
Mood Regulation (without kinect)	21	-.146		-1.063		.536	.94
Cognitive and Psychomotor Abilities (with kinect)	21	-,587	.501	-,610	.972	,662	,77
Cognitive and Psychomotor Abilities (without kinect)	21	-,326		-1,023		,566	,91
Physical Activities (with kinect)	21	-1,424		2,023		1,197	,11
Physical Activities (without kinect)	21	-2,636		7,811		1,418	,04
Total-20 item (with kinect)	21	,667		-,815		,788	,56
Total-20 item (without kinect)	21	-,767		-,255		,657	,78

* Kolmogorov-Smirnov Z score

Comparison of the game playing motivation between the kinect and non-kinect users

The first research question investigated the effects of playing computer games with and without kinect sensors on users' game playing motivation. The game motivation of the users was measured after playing the games with and without kinect sensors. The t-test was used to compare the effects of playing online games in two conditions. The game motivation of the users playing the computer games with kinect sensor and without kinect sensor were presented at the Table 4. Results revealed that users' game playing motivation is different in two treatments. Findings indicated that the game motivation of the users playing the computer games with kinect sensors (M=5.02) is significantly higher than the game motivation of the users playing the computer games without kinect sensors (M=2.93) ($t= 6.536$, $p < 0.05$). The analysis of the users' game playing motivation revealed that using the computer games with kinect sensors improves the motivation of the users.

Table 4.
Comparison between the game motivation scores of kinect and non-kinect users

		N	M	Std	t	df	sig
Social Well – Being	Without kinect	21	2,35	1,62469	-5,031	20	,00*
	With kinect		4,07	1,61410			
Game Aggression	Without kinect	21	3,36	1,68266	-4,126	20	,00*
	With kinect		4,81	,99150			
Mood Regulation	Without kinect	21	2,10	1,17446	-5,362	20	,00*
	With kinect		4,65	1,80578			
Cognitive and Psychomotor Abilities	Without kinect	21	3,98	2,27175	-4,515	20	,00*
	With kinect		6,06	1,18612			
Physical Activities	Without kinect	21	2,83	1,73724	-8,275	20	,00*
	With kinect		6,33	1,12546			
Total (20 items)	Without kinect	21	2,93	1,49654	-6,536	20	,00*
	With kinect		5,02	1,11316			

P<.05

Comparison of users' Social Well – Being Factor Scores between kinect and non-kinect users

The social well–being scores of the users were compared between the users playing the computer games with kinect sensor and without kinect sensor. The results of the comparison were presented at the Table 4. Well–being scores of the users' motivation is different in two treatment conditions. Findings indicated that the social well–being scores of users playing the computer games with kinect sensors (M=4.07) is significantly higher than the social well–being scores of users playing the computer games without kinect sensors (M=2.35) (t= -5.031, $p < 0.05$). Playing the computer games with kinect improved the social well-being of users.

Comparison of users' Game Aggression Factor Scores between kinect and non-kinect users

The game aggression factor scores of users were compared for the kinect and non-kinect users. The difference between kinect and non-kinect users' scores on *Game Aggression* is presented at the Table 4. Finding revealed that the game aggression scores of users playing the computer games with kinect sensors (M=4.81) is higher than the game aggression scores of users playing the computer games without kinect sensors (M=3.36) (t= -4.126, $p < 0.05$). Results show that students' emotional reactions such as getting angry, desire to play game etc. increased after playing computer games with kinect sensor.

Comparison of users' mood regulation factor scores between kinect and non-kinect users

The Mood Regulation Factor scores of users were compared for the kinect and non-kinect users and *t*he difference between kinect and non-kinect users' scores on *Mood Regulation* is presented at the Table 4. Results revealed that the mood regulation scores of users playing the computer games with kinect sensors (M=4.65) is higher than the game aggression scores of users playing the computer games without kinect sensors (M=2.10) ($t=-5.362$, $p < 0.05$). This indicates that students' emotional readiness such as feeling relax and feeling calm increased after playing games with Kinect sensor.

Comparison of users' Cognitive and Psychomotor Abilities Factor Scores between kinect and non-kinect users

The Cognitive and Psychomotor Abilities Factor Scores of users were compared for the kinect and non-kinect users. The difference between kinect and non-kinect users' scores on Cognitive and Psychomotor Abilities is presented at the Table4. Finding revealed that the Cognitive and Psychomotor Abilities scores of users playing the computer games with kinect sensors (M=6.06) is higher than the game aggression scores of users playing the computer games without kinect sensors (M=3.98) ($t=-4,515$, $p < 0.05$). This shows that playing games with kinect sensor have positive effects on students' cognitive and psychomotor abilities such as coordinating muscle and brain systems together and gaining attention.

Comparison of users' Physical Activities Factor Scores between kinect and non-kinect users

The Physical Activities Factor scores of users were compared for the kinect and non-kinect users. The Table 4 shows the difference between kinect and non-kinect users' scores on Physical Activities. Findings revealed that the Physical Activities scores of users playing the computer games with kinect sensors (M=6.33) is higher than the game aggression scores of users playing the computer games without kinect sensors (M=2.83) ($t=-8,275$, $p < 0.05$). Playing computer games with kinect sensor increased students' tendency for the action.

The effects of playing computer games on the kinect and non-kinect users' muscular activities

The second research question investigated the effects of playing computer games on the kinect and non-kinect users' muscular activities. Participating users were given a figure showing the fundamental muscles on the human body and were asked to indicate muscles that they used during the game playing with and without kinect sensors. The fundamental muscles on the human body were divided into 10 sections for the study. Users' responses were added for each muscle on the human body quantitatively. The sum of responses for each muscle used during the game play was ranged from 0 to 21 which was the total number of participants. The distribution of the users' responses was presented at the Table 5.

Table 5. Frequencies of responses for each muscle used during the game play

Parts of the Body	Non-kinect (f)	Kinect (f)
Left foot (1)	1	13
Right foot (2)	2	15
Left leg (3)	0	16
Right leg (4)	0	18
Left hand (5)	4	8
Right hand (6)	13	9
Left arm (9)	8	18
Right arm (8)	2	15
Ventral (7)	0	9
Head (10)	10	10
Total	40	131

The color code was used to indicate the muscular activities for each identified muscle. The frequencies for each muscle used while playing the game were colored: White for 0, blue for 1-5, green for 6- 10, yellow for 11-15 and red for 16-21. The muscles used by the participants playing the computer games with and without kinect sensors were presented at the Figure 6 and Figure 7.

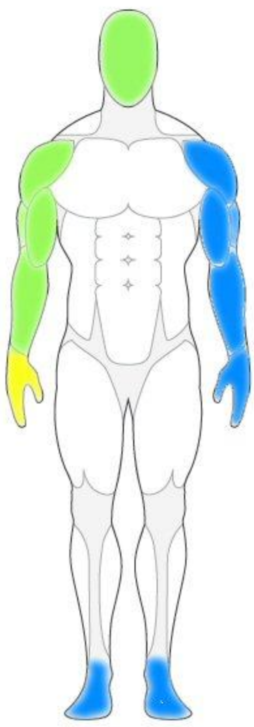

Figure 6. The muscular use of the non-Kinect users

These results illustrate that users of computer game players with kinect sensor use more muscles than those using the computer game without kinect sensor. Besides the number of muscles used while playing computer games, the use of kinect sensor on computer games also have positively effects frequency of the muscle use. The use of the kinect sensor on computer games significantly increases the muscular activity as compared to the game playing without kinect sensors.

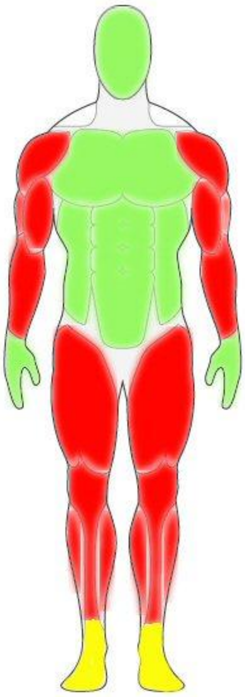

Figure 7. The muscular use of the Kinect users

The opinions of kinect and non-kinect users on played games

The third research question investigated the opinions of kinect and non-kinect users on played games. Having completed the computer games with and without using the kinect sensors, participants were asked about their opinions on played games. The responses of participating users on open-ended questions were qualitatively analyzed for kinect and non-kinect computer game players.

The majority of users playing the computer games without kinect sensors mostly found the games simple and boring. One user indicated that "*The most boring games ever developed. Considering the available games at present, no one can even look at these games to play"*. Non-kinect users also found the games appropriate for kindergarten students but not for their age group. One participant said that *"These games can be used for kids below 6 years old. However they do not satisfy upper age groups".* On the other hand, same users playing the computer games using kinect sensors found same games enjoyable and entertaining when played with kinect sensor. Findings also revealed that users found the physical activity part of the game enjoyable. One user indicated that "*Computer games become more entertaining as the rate of physical activity increases. Games definitely now more entertaining and respond to the expectation of my age group."* Another user said that *"I found the games entertaining since I can use my body to play them".*

The opinions of the computer users changed dramatically between the use of computer games with and without kinect sensors. Users, who found computer games boring and simple, changing their opinions indicated that same game are more entertaining when used with kinect sensors. Kinect sensors allowed users to play the games with body movement rather than using the mouse and keyboard as input devices to play the games. As the physical activity become compulsory part of the computer games even the ones that had found the games simple and boring, increased physical activity has changed users' opinions about the games.

Users' feelings about playing computer games with and without kinect sensors

The last research question investigated users' feelings about playing computer games with and without kinect sensors. While collecting the findings for the third research question, participants were asked about their feelings about playing computer games with and with kinect sensors. Participants' feelings on played games were analyzed using the descriptive analysis.

The users playing the computer games indicated that games were boring and did not require physical activity to complete. One participant said that *"I did not feel anything more than using my finger physically. Emotionally I was not attracted since games were not appropriate for my age. Therefore I was bored."* On the other hand, users' responses playing the games with kinect sensors were different. Most of the users found the games entertaining. Also users indicated that playing the games required physical activity. One user said that *"I became physically active and made many physical activities. Games became entertaining even playing* *them is difficult. Emotionally playing the games are challenging. Challenging part of the games is pleasurable. Nice games. Body and mind are working together.”*

Dramatic changes on users’ feeling were reported. Users playing the game without kinect found the games boring reported the same games as challenging when played with kinect sensors. While emotionally these changes happing on users’ feelings, users reported that computer games could be played by just using the hand but playing the games with kinect sensors requires all body parts to move in order to succeed at the game. The use of kinect sensors requires users’ active participation physically. Increased physical activity does not only have positive influence on users’ emotion but also have positive impact on users’ physical involvement.

Discussion

This study has four significant findings. Findings revealed that using the games with Kinect sensors improved users’ motivation. As defined in the study motivation has five sub factors namely social well-being, game aggression, mood regulation, cognitive and psychomotor ability and physical activity. All sub-factors of the motivation have been affected positively when the Kinect sensors were used to play the games. Another important finding of the study was that the Kinect users’ muscular activity level was higher than the non-Kinect players while playing the games. Also results indicated that the use of Kinect to play the games changed users’ opinions positively on played games formerly described as boring. Finally users’ emotion and physical involvement have been influenced positively when games played with Kinect sensors.

Lee & Peng (2006) pointed out the physical health problems as a result of computer game playing. The kinesthetic interaction enabled by Kinect requires players to actively use their muscles where non-Kinect users usually are bound by keyboard and mouse. Therefore increased muscular activity eliminates the risks of sedentary life-style which is frequently observed among computer game players (Lee & Peng, 2006). Obesity of adolescents is the well-known result of the sedentary life-style (Wack & Tantleff-Dunn, 2009). Everyday new players are joining the computer game play adventure and there is less to do to reduce this trend. Kinect is a dream tool that had not been imagined a decade ago to enhance game play experience by adding body movement. The use of Kinect provides tremendous advantages to reduce the risk for the obesity and other health related problems (Cook, Limerick & Chang, 2000; Cook & Kothiyal, 1998; Fernström & Ericson, 1997) associated with the game play.

Does playing games only have positive effects on physical health of game players? The answer is probably not because motivation of the Kinect users increased in the study as well. Interactivity facilitated by Kinect is the most outshining benefits of the Kinect. It seems that physical engagements of the game player also improve the motivation of the participants. Kinect as a motion sensing device improve the motivation. Games used in the study were simple and old-fashion. It was astonishing that game players' opinions reflected this fact after playing the games without Kinect. However involvement of the Kinect has chanced game players' opinions on games. Game players found the games entertaining and challenging. Games were the same so kinesthetic interaction seems to change the opinions of game players on games and on the game play as well.

Conclusion

The world is changing faster than ever before. The effects of changes can be observed in all aspects of individuals' life. The change is unavoidable but the primary question is how to reduce the undesirable effects of such changes? Kinesthetic features of Kinect add body movement and interactivity to the game play adventure which draws the attention of researchers concerning the undeniable effects of computer games. Although many questions are still waiting answers for the computer games, findings of this study recommends the use of Kinect to play computer games in order to diminish the health and motivation related problems on game players. Kinect certainly draws the attention of researchers. Within the limits of this study four research questions were investigated. However further research should investigate the correlation between the motivation and emotional effects of the Kinect use on computer game players. Physical and motivational aspects of the Kinect use investigated in the study. Cognitive and emotional effects of playing educational games should be investigate in further research.

References

Aaras, A., Fostervold, K., Ro, O., Thoresen, M., & Larsen, S. (1997). Postural load during VDU work: A comparison between various work postures. *Ergonomics, 40* (11), 1255-1268.

Adedoyin, R. A., Idowu, B. O., Adagunodo, R. E., Owoyomi, A. A., & Idowu, P. A. (2005). Musculoskeletal pain associated with the use of computer systems in Nigeria. *Technology and Health Care*, *13*(2), 125-130.

Akdemir, O. (2008). Teaching in online courses: experiences of instructional technology faculty members, *The Turkish Online Journal of Distance Education*, *9*(2), 97-108.

Burke, A., & Peper, E. (2002). Cumulative trauma disorder risk for children using computer products: results of a pilot investigation with a student convenience sample. *Public Health Reports*, *117*(4), 350-357.

Chang, J., & Hongxia, Z. (2008). Analyzing online game players: from materialism and motivation to attitude. *CyberPsychology & Behavior*, *11*(6), 711-713.

Chumbley, J., & Griffiths, M. (2006). Affect and the computer game player: The effect of gender, personality, and game reinforcement structure on affective responses to computer game-play. *Cyberpsychology & Behavior, 9*(3), 308-316.

Cook, C., & Kothiyal, K. (1998). Influence of mouse position on muscular activity in the neck, shoulder and arm in computer users. *Applied Ergonomics, 29*(6), 439-443.

Cook, C., Burgess-Limerick, R., & Chang, S. (2000). The prevalence of neck and upper extremity musculoskeletal symptoms in computer mouse users. *International Journal of Industrial Ergonomics, 26*(3), 347-356.

Cooper, A., & Straker, L. (1988). Mouse versus keyboard use a comparison of shoulder muscle load. *International Journal of Industrial Ergonomics, 22(4-5),* 351-357.

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods, 4*(3), 272-299.

Field, A. (2005). *Discovering statistics using SPSS (2nd ed.)*. London: Sage.

Franzblau, A., Flaschner, D., Albers, J.W., Blitz, S., Werner, R., & Armstrong, T. (1993). Medical screening of office workers for upper extremity cumulative trauma disorders. *Archives of Environmental Health, 48*(3), 164-170.

Fernström, E., & Ericson, M. O. (1997). Computer effects on mouse or Trackpoint-muscular load and operator experience. *Applied Ergonomics, 28*(5-6), 347-354.

Han, J., Shao, L., Xu, D., & Shotton, J. (2013). Enhanced computer vision with Microsoft kinect sensor: A review. *IEEE Transactions on Cybernetics, 43*(5), 1318-1334.

Harvey, R., & Peper, E. (1997). Surface electromyography and mouse use position. *Ergonomics, 4*(8), 781-789.

Lee, K. M., & Peng, W. (2006).What do we know about social and psychological effects of computer games? A comprehensive review of the current literature. In P. Vorderer & Jennings, B. (Eds.), *Playing video games: Motives, responses, and consequences* (pp.327-345). Mahwah, NJ: Lawrence Erlbaum Associates.

Lee, S., & Oh, S. (2014). A kinect sensor based windows control interface. *International Journal of Control and Automation, 7*(3), 113-124: http://dx.doi.org/10.14257/ijca.2014.7.3.12.

Olson, C. K. (2010). Childrens's motivations for video game play in the context of normal development. *Review of General Psychology, 14*(2), 180-187.

Pasch, M., Bianchi-Berthouze, N., Dijk, B. V., & Nijholt, A. (2009). Movement-based sport video games: Investigating motivation and gaming experience. *Entartainment Computing, 1*(2), 49-61.

Wack, E., & Tantleff-Dunn, S. (2009). Relationship between electronic game play, obesity, and psychosocial functioning in young men. *CyberPsychology & Behavior, 12*(2), 241-244. doi: 10.1089/cpb.2008.0151.

Yee, N. (2006). Motivations for play in online games. *CyberPsychology & Behavior, 9*(6), 772-773.

Zhang, Z. (2012). Microsoft kinect sensor and its effect. *MultiMedia, IEEE, 19*(2), 4-10.

Genişletilmiş Öz

Her geçen gün bilgisayar oyunlarının popülerliği artmaktadır. Değişik yaş grubundaki bireyler bilgisayar başında hareketsiz bir şekilde eğlence amaçlı zaman geçirerek bilgisayar oyunları oynamaktadır. Günümüzde evde, işyerinde ve okulda saatlerce bilgisayar karşısında oyunlar oynayan genç, orta yaşlı ve ileri yaşlardaki bireyleri görmek sıradan bir olaymış gibi algılanmaktadır. Fakat bilgisayar oyunlarının fazla kullanımının bireylerde çeşitli fiziksel ve duygusal istenmeyen yan etkiler ortaya çıkardığı bilinmektedir. Bu rahatsızlıkların çoğuna bilgisayar karşısında saatlerce hareketsiz kalmanın neden olduğu düşünülmektedir.

Son dönem teknolojilerinden olan kinect sensörün, bilgisayar oyunu oynamanın yol açtığı fiziksel yan etkileri azaltabilecek bir potansiyele sahip olduğu söylenebilir. Kinect sensör kullanımı bilgisayar oyunları oynayanlara bu bakımdan yeni bir bakış açısı getirse de, bilgisayarda oyun oynamanın fiziksel ve duygusal etkileri yeteri kadar araştırılmış bir konu değildir.

Bu çalışmanın amacı da, Kinect ile ve Kinect sensör olmadan oyun oynamanın olası etkilerini karşılaştırmaktır. Araştırmanın amacına ulaşmak için aşağıdaki araştırma problemleri oluşturulmuştur.

1- Öğretmen adaylarının oyun oynama motivasyonlarını Kinect sensör ile ve Kinect sensörsüz oyun oynama nasıl etkilemektedir?
2- Kinect sensör ile ve Kinect sensörsüz oyun oynamanın öğretmen adaylarının kas aktiviteleri üzerine olan etkileri nelerdir?
3- Oynan oyunlara ilişkin Kinect sensör ve Kinect sensörsüz oyun oynayan öğretmen adaylarının görüşleri nelerdir?
4- Bilgisayar oyunlarını Kinect sensör ile ve Kinect sensörsüz oynamaya ilişkin öğretmen adaylarının hissettikleri nelerdir?

Araştırma problemlerine yanıt bulabilmek için karma araştırma deseni kullanılmıştır. Araştırma kapsamında elde edilen nicel ve nitel veriler aynı zamanda toplanmıştır. Araştırma 2014 yılında Zonguldak ilinde bulunan bir devlet üniversitesinin Ereğli Eğitim Fakültesinde gerçekleştirilmiştir. Üç farklı ölçme aracı ile nitel ve nicel veriler toplanmıştır. Çalışmaya 21 öğretmen adayı katılmıştır. Ölçme araçlarından ilki; birinci araştırma problemine cevap verebilmek için öğretmen adaylarının oyun oynama motivasyonlarını belirleyebilmek amacıyla araştırmacılar tarafından geliştirilmiştir. Nicel verilerin toplanması için geliştirilen 28 maddeli ölçek eğitim fakültesinde öğrenim gören ve uygulamaya dâhil olmayan 211 öğrenci tarafından cevaplanmıştır. Yapılan faktör analizi sonucunda 20 maddeden oluşan 5 faktörlü yapıya ulaşılmıştır.

İkinci veri toplama aracı ise araştırmanın ikinci problemine yanıt verebilmek için katılımcıların kas faaliyetlerini işaretleyebildiği on bölümden oluşan insan anatomisi resmidir. Katılımcılar oynadıkları oyunlar sonrasında insan anatomisi resmi üzerinde oyunlar sırasında kullandıkları vücut bölümlerini işaretlemektedirler. Son veri toplama aracı ise araştırmanın üçüncü ve dördüncü araştırma problemine yanıt verebilmek için katılımcıların oynadıkları oyunlar ile ilgili görüşleri ve duygularını belirlemek amacıyla açık uçlu sorulardan oluşmaktadır.

Araştırmanın uygulama boyutuna dâhil olan 21 gönüllü öğretmen adayının yaşları 17 ile 21 arasında değişmektedir. Öğretmen adaylarının %29'u erkek, %71'i kadındır. Ayrıca, bu öğretmen adaylarını seçmede birinci sınıf öğrencilerine iki dönem boyunca verilen Bilgisayar dersine katılmış olmaları ön şart olarak aranmıştır. Bu nedenle her katılımcının bilgi ve iletişim teknolojilerine yönelik araçları kullanabilecek düzeydedir. Çalışmada yapılan uygulamalar Ereğli Eğitim Fakültesinin bilgisayar laboratuvarında gerçekleştirilmiştir. Bu bilgisayar laboratuvarında bilgisayarlar, projektör, akıllı tahta, ses sistemi ve kinect sensör bulunmaktadır.

Çalışmada ilk olarak katılımcılardan bilgisayar oyunlarını kinect sensör olmadan oynamaları istenmiştir. Oyun oynama süreci sonunda katılımcılardan üç farklı veri toplama aracı ile veriler toplanmıştır. Daha sonra aynı katılımcılardan aynı bilgisayar oyunlarını kinect sensör kullanarak oynamaları istenmiş ve oyunların sonunda üç farklı veri toplama aracı ile tekrar veriler toplanmıştır.

Araştırmanın birinci problemi doğrultusunda elde edilen bulgulara göre öğretmen adaylarının kinect sensör ile oyun oynama motivasyonlarının kinect **s**ensör olmadan oyun oynama motivasyonlarına göre daha yüksek olduğu saptanmıştır. Kincet sensör ile oyun oynamak öğretmen adaylarının motivasyonlarını arttırmıştır. İkinci araştırma problemi doğrultusunda elde edilen bulgulara göre öğretmen adaylarının kinect sensörü ile oyun oynarken daha çok kas kullandıkları yönünde görüş verdiği saptanmıştır. Bu durum beraberinde öğretmen adaylarının kas sistemlerini daha yüksek düzeyde kullanmalarını sağlamıştır. Üçüncü ve dördüncü araştırma problemleri doğrultusunda elde edilen bulgulara göre **kinect** sensör ile oyun oynamak öğretmen adaylarının oynadıkları oyunlar ve bu oyunları oynarken hissettiği duyguları olumlu yönde etkilediği yönündedir. Kinect sensör ile oyun oynamak kullanıcıların daha önce sıkıcı bulduğu oyunlara yönelik görüşlerinin olumlu yönde değiştirmiştir. Ayrıca, **kinect** sensör ile oyun oynamak öğretmen adaylarının daha önceki fiziksel ve duygusal durumlarını pozitif yönde etkilemiştir.

Özetle, kinect sensörün en önemli faydası öğretmen adaylarının daha fazla etkileşime girmelerine yardımcı olmasıdır. Bu etkileşim aynı zamanda öğretmen adaylarının oyunlara fiziksel olarak katılımlarını sağlamıştır. Bu durumda beraberinde öğretmen adaylarının motivasyonlarını pozitif yönde etkilemiştir.

Dünya her zamankinden daha hızlı değişmektedir. Değişimin bireylerin farklı özellikleri üzerindeki etkileri gözlenmelidir. Değişim kaçınılmazdır fakat buradaki temel soru değişimin oluşturduğu arzulanmayan etkileri nasıl aza indirileceğidir? Kinect sensörün sunduğu hareket ve etkileşim fırsatı bu açıdan birçok araştırmacının bilgisayar oyunlarının oluşturduğu olumsuz etkileri azaltmada bir çözüm önerisi olarak dikkat çekmektedir. Ne var ki, bu konuda cevaplamayı bekleyen bir çok soru olsa da, bu çalışma ile birlikte kinect sensör ile oyun oynamanın bireylerin motivasyon ve sağlık problemlerini azaltacağı işaret edilmektedir.

İleride yapılacak olan araştırmalarda, kinect sensör ile oyun oynayan bireylerin motivasyon ve duygusal etkileri arasındaki ilişki incelenmelidir. Ayrıca eğitsel oyunların kinect sensör ile oynanması da farklı araştırmalarda araştırılmalıdır.