Research Article

Digital Childhood: the Impact of Using Digital Technology on Children's Health

Nehad Ahmed Ibrahim Zahra[1]*, Ahuad Abdulrazaq Alanazi[2]

[1]*Assistance Professor, Department of Medical Sciences, Community College, University of Tabuk, KSA*
[2]*Instructor, Department of Medical Sciences, Community College, University of Tabuk, KSA.*

*Corresponding Author Email: Nehad.zahra @ gmail.com

ABSTRACT

Background and Objective: Digital media can be considered as an important element of life for today's children and adolescents since they spend a lot of time using it. This increased use of digital media is associated with poor behavior and health status. Society in general and practitioners in public health in particular should promote digital media use strategies through health education. This study is aimed at evaluating the impact of using digital technology on children physical, social and behavior health. Methodology: This is a descriptive study which was conducted at the primary health care centers of Tabuk. Through purposive sampling, 300 people were included in the study. A questionnaire and a checklist were used as the tools for data collection. Results: There was a significant relationship between the attachment to technology and both physical and psychological health of the studied children. There was also a significant difference between the awareness of mothers regarding both negative and positive effects of technology and total effects of technology at the pre and post-intervention stages. Conclusion: Using technology had an impact on both physical and psychological health of children, and there was an improvement in mothers' awareness in this regard. This reflects the key role of health education on improving the awareness of mothers about the effects of using technology on the health of their children.

Key words: *Technology, children, health, awareness, parents.*

INTRODUCTION

More than 20 years ago, kids used to play all day outside, ride bicycles, play sports, and build forts. They were masters of imaginary games, and developed their own type of play which did not require expensive machinery or oversight by parents. In fact, they used to shift a lot, and their sensory world was simple and based on nature. [1]

Today's children are different since media from television to the new forms of it (including cell phones, iPads, and social media) is a dominant force in their life. According, they grow up in a media-saturated world with almost universal television access. Media and technology remain here and are nearly guaranteed to play an ever-increasing role in everyday life. [2]

Technology is often considered to pose threats and dangers to children, but it also offers new opportunities for creativity and self-determination. Although technologies can break down the barriers between parents and children, the other side of technology almost creates a family gap. Most of the technology that we use today have been altered in our life from the view of just a "want" to a "need". [3]

Media shapes children's value and learn behaviors. The newer forms of media have not been adequately studied. The rapidly increasing technology use has an impact on children's health causing their physical, psychological and behavior disorders that the health and education systems are just beginning to detect. Obesity, diabetes, autism, coordination disorder, developmental abnormalities, speech, learning difficulties, sensory disorder, anxiety, depression, and sleep disorders are linked with the overuse of technology, and are increasing at an alarming rate. [4]

While no one in the world can argue about the advantages of the sophisticated technology, attachment to these machines may lead to a disconnection from what society should value most, kids. Parents are increasingly resorting to provide their kids with more TV, video games and the recent iPads and cell phone devices, rather than hugging, playing, etc. [5]

As parents, teachers and therapists, it is vital to come together to help society wake up and see the adverse impacts of technology not only on our children's physical, psychological and mental health, but also on their capacity to learn and maintain private and family relationships. Parents can direct children to enjoy life by weighing the technological advantages and disadvantages. [6] Even schools are realizing the negative impacts of overuse of technology and taking children out of the classroom to give them a chance to interact with the nature. [7]

Aim of the study:

The study is aimed at evaluating the impact of using digital technology on children's health which will be done through:

1- Assessing the impact of using digital technology on children's physical health
2- Assessing the impact of using digital technology on children's emotional and social health
3- Increasing the parents' awareness about the negative impact of digital technology on their children's physical, emotional, social, and intellectual development

Hypotheses:

1- Using digital technology negatively affects children's physical health.
2- Using digital technology negatively affects children's emotional and social health.
3- The parents' awareness about the negative impact of technology on their children's health can be increased.

Significance of the study:

Entertainment media tends to be useful to kids, though some citizens are worried about the perceived adverse effect of entertainment on attitudes, behavior, and growth. Fewer nationals in 2016 perceived the positive effects of entertainment on children than in 2014. A significant minority thinks that exposure to entertainment media can contribute to poor health and obesity and may result in lack of concentration. There has been evidence of some parental awareness about the role of technology in children's lives, some of the families conclude that they do not perceive it as an alleged threat to the contemporary adolescence. [3]

MATERIALS AND METHODS:

Research Design:

A descriptive cross-sectional design was used to conduct the study.

Setting:

This study was conducted at two primary health care centers of Tabuk (Elnahda and Elsaada centers).

Sample:

Multi-stage cluster random sampling method was used through which, two centers were selected. Purposive sampling method was used to select the population (families). Inclusion criteria include having an active file at the center, having one child or more under six years old and willing to participate in the study. The total number of the mothers attended the mentioned centers were about 3000. Therefore, the expected number of study subjects was calculated by the following formula that 300 was achieved.

$$n = \frac{N}{1 + N(e)^2}$$

Where: n= sample size, N= population, e= margin error (0.05)

Tools of Data Collection:

Two tools were used to collect data. **Tool I**: pre-designed questionnaire: It was developed by the researchers after reviewing the related literature. It was written in Arabic language and composed of close-ended questions and the following parts:

Part I: Socio-demographic characteristics of the selected mothers and children (age, working, numbers of children, availability of technology device, etc.).

Part II: Assessing the mothers' knowledge about the negative and positive effects of using technology on children's health.

Tool II: The assessment checklist: It consists of two parts:

Part I: Assessing the children's physical health (height, weight, etc.)

Part II: Assessing the children's social health and behavior (sleep disturbance, violence, interaction, etc.)

Content validity:

The tools were submitted to a panel of three experts in public health nursing department to evaluate the material's validity.

Pilot study:

A pilot study was carried out on 10% of the sample. The contents, clarity, accuracy and applicability of the tools were randomly evaluated using an interview. Modifications were therefore applied to the research tools in order to be more relevant. It also helped forecast the time it took for data to be collected. After undertaking the pilot survey, it was discovered that the phrases and sentences of the tools were clear and meaningful, but few words were altered according to the pilot study outcomes. The research main sample excluded the female samples who were included in the pilot research.

Field work: Data collection was done since the end of April 2018 to the end of October 2018 by the researcher.

Program Development:

Preparatory phase:

The program was intended in line with the goals and programs mentioned in accordance with the learning requirements. It was also intended according to the pre-test data. Application, content of the program, learning activities, method of teaching and media were developed in an educational plan. The program was created based on the outcomes as well as the literature review. **Contents of the program:** The contents of the program was selected to meet the mothers' needs and to fit into their interest and levels of understanding. Teaching methods used in teaching the program content included lectures/discussion, presentation, group discussion, demonstration, and suitable teaching aids specially prepared for the program application as colour posters, handouts, etc.

Implementation phase of the program: Before implementing the program, field visits to the selected setting was done to explain the nature and purpose of the study to ensure their cooperation. Implementation of the program took 3 months in addition to 2 months for pre-test. The teaching time was 6 hours. The program was carried out in 6 sessions. The sessions were 2-3 days/ week. The handout was distributed to all participants in the first day of starting implementation of the program after explanation of the aim and objectives of the program to all. Each session was started by a summary about the previous session and the objectives of the new one, taking into consideration the use of simple language that matched the participants' level of understanding. At the end of each session, the questions were discussed to correct any misunderstanding. The participants were also informed about the next session's time and place.

Program evaluation phase: Evaluation was applied after the program by using the pre-test formatting, in order to identify the differences in improvement as well as to detect any defects.

Ethical considerations: At the beginning, the purpose of the study and the tools used were approved by the Permanent Local Committee for Research Ethics at the University of Tabuk. All the participants' rights were secured, each of them were informed about the nature of the expected outcomes of the study. They were assured that all data will remain confidential and information will be used for the research purpose only. They were also informed about their right of withdrawal at any time without expressing any reasons and they signed the approval form.

Statistical design: Data entry, presentation, and statistical analysis were done using the Statistical Package for Social Science (SPSS) version 13 on IBM compatible computer. Quantitative data were expressed as means and standard deviations and analyzed using paired student t-test to test the differences between two groups of the same sample of normally distributed variables. The qualitative data were expressed as numbers and percentages (No & %) and analyzed using McNemar test to test the differences between two or more groups of the same sample. Significant results were considered as follows: $P \leq 0.05$ Significant, P $0.05 >$ Not significant, and P $0.001 <$ Highly significant.

RESULTS:

Table 1: Distribution of the demographic characteristics of the studied mothers (n=300)

Personnel characteristics	Frequency	%
Age in years		
20-29	82	27.3
30-39	136	45.3
40-49	82	27.3
Mean ±SD	29.87±8.75	
Educational level		
Secondary education	131	43.7
Technical education	33	11.0
University education	130	43.3
Postgraduate studied	6	2.0
Work		
Yes	180	60.0
No	120	40.0

Table (1) represents the demographic characteristics of the studied mothers. It shows that their mean age was (29.87±8.75) years, and 60 % of them were working women.
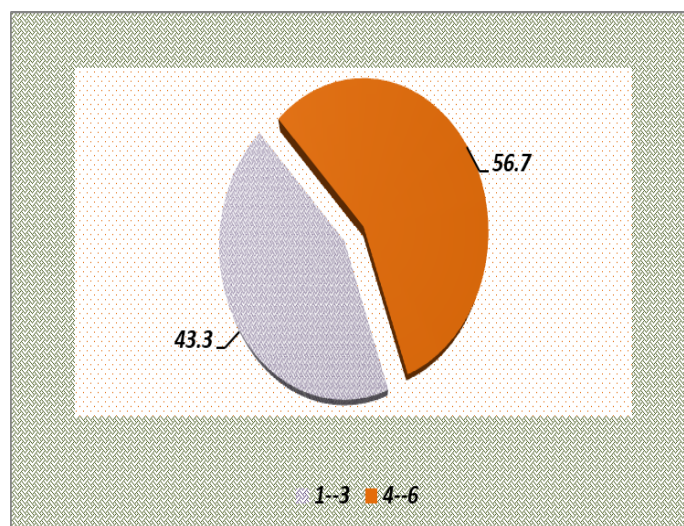

Figure 1: Distribution of the number of children of the studied mothers (n=300)
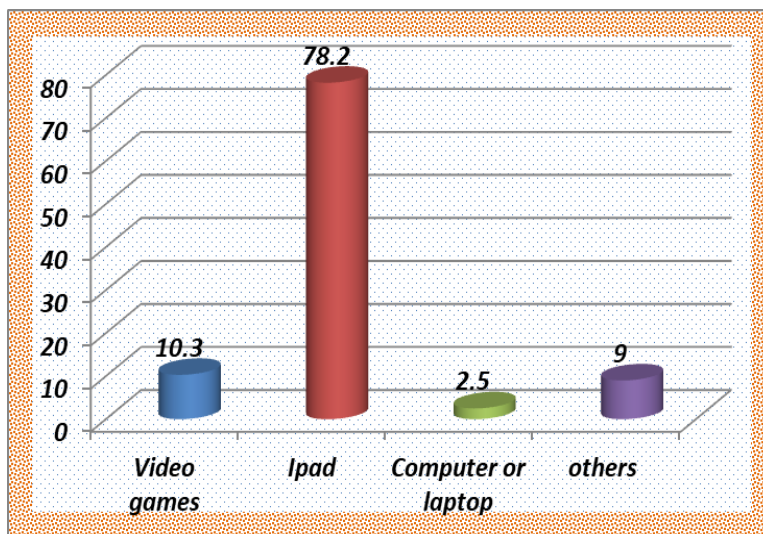
Figure (1) shows that about 56.7 % of the studied women have 4-6 children

Table 2: Distribution of the technology use history of the children (n=300)

Variable	Frequency	%
Child uses advanced technology.		
Yes	180	60.0
No	66	22.0
With others	54	18.0
Child uses advanced technology more than two or three hours.		
Yes	183	61.0
No	48	16.0
Sometimes	69	23.0
Child time with family		
1-3 hours	48	16.0
4-6 hours	99	33.0
>6 hours	153	51.0
Your child has been attached to modern technology.		
Strong	57	19.0

Moderate	153	51.0
Weak	90	30.0
Technical means have influenced your child's educational level.		
Yes	93	31.0
No	126	42.0
To some extent	81	27.0

Table (2) represents the distribution of the children history of using technology. It shows that 60% of the children have advanced technology, and about 61% of them use advanced technology more than two or three hours. Regarding the children's attachment to modern technology, about 51% expressed moderate attachment. Regarding the factor if technology has influenced children's educational level, only 42% of mothers answered no.

Figure 2: The percentage distribution of the types of technology used by the children of the studied mothers (n=234)

Figure (2) explains the types of technology used by children. It shows that about 78.2% of children use ipads followed by video games (10.3%).

Table 3: Distribution of the physical development measures of the studied children (n=300)

Physical development measures	Normal		Abnormal	
	No	%	No	%
Height	279	93.0	21	7.0
Weight	111	37.0	189	63.0
Body mass index	123	41.0	177	59.0

Table 3 shows that about 63.0% of children have abnormal weight and about 59.0% of them have abnormal body mass index.

Table 4: Distribution of the physical health of the studied children (n=300)

Physical health	Usually		To some extent		Never	
	No	%	No	%	No	%
Vision problem	68	22.7	152	50.7	80	26.7
Impaired Hearing	84	28.0	145	48.3	71	23.7
Neck strain	121	40.3	125	41.7	54	18.0
Headache	146	48.7	109	36.3	45	15.0
Less physical activity	57	19.0	153	51.0	90	30.0
Learning disabilities	58	19.3	131	43.7	111	37.0

Table (4) shows that about 73.4% of the studied children usually or to some extent have vision problem, 76.3% of them have impaired hearing, 82% have neck strain, 85% have headache, 70% of them have less physical activity and 63% have learning disabilities.

Table 5: Distribution of the psychological and emotional health of the studied children (n=300)

Psychological & emotional health	Usually		To some extent		Never	
	No	%	No	%	No	%
Distraction	34	11.3	110	36.7	156	52.0
Emotional disturbance	57	19.0	131	43.7	112	37.3
Instant gratification	78	26.0	95	31.7	127	42.3
Cognitive losses	97	32.3	72	24.0	131	43.7
Sleeping disturbance	33	11.0	116	38.7	151	50.3
Narcissism	31	10.3	104	34.7	165	55.0
Neglect of religious duties	36	12.0	114	38.0	150	50.0
Social isolation	131	43.7	93	31.0	76	25.3
Deficit social skills	62	20.7	178	59.3	60	20.0

Table (5) shows that about 48% of the studied children usually or to some extent have distraction, 62.7% of them have emotional disturbance, 56.3% have cognitive loses, 49.7% of them have sleeping disturbance, 74.7% of them have social isolation and 80% have deficit social skills.

Table 6. The effect of children attachment to technology on their health

Variable	Attachment of children to technology			F test	P value
	Strong	Moderate	Weak		
	Mean ±SD	Mean ±SD	Mean ±SD		
Physical health	6.1579±.59129	11.3791±1.25135	15.8333±2.39499	638.77	<0.0001**
Psychological health	16.9649±7.42814	18.9608±3.33617	23.3444±2.79309	45.93	<0.0001**
Total health	23.1228±7.38016	30.3399±3.87666	39.1778±4.95049	187.84	<0.0001**

Table (6) revealed that there is a significant relationship between the attachment to technology and both physical and psychological health of the studied children.

Table 7: Distribution of the awareness of the studied parents regarding the effect of using technology on children (n=300)

Variable	Time of assessment	Low		Moderate		High		X^2	P value
		No	%	No	%	No	%		
Awareness regarding the positive effect of technology	Pre-intervention	162	54.0%	102	34.0%	36	12.0%	144.08	<0.001**
	Post-intervention	43	14.3%	101	33.7%	156	52.0%		
Awareness regarding the negative effect of technology	Pre-intervention	147	49.0%	132	44.0%	21	7.0%	160.54	<0.001**
	Post-intervention	40	13.3%	110	36.7%	150	50.0%		
Awareness regarding the total effect of technology	Pre-intervention	207	69.0%	51	17.0%	42	14.0%	141.97	<0.001**
	Post- intervention	65	21.7%	89	29.7%	146	48.7%		

Table (7) revealed that there is a significant differences between the awareness of mother regarding both negative and positive effects of technology and total effects of technology pre and post-intervention.

DISCUSSION:

The social and emotional growth of the young generation mostly takes place while they rapidly move from one technology to another. Public health practitioners and the community as a whole should improve health education on the use of electronic media. Parents can be of the greatest help if they know the key problems and

have policies to address them. The aim of this study was to evaluate the impact of using digital technology on children's health and increase mothers' awareness towards these impacts.

According to the demographic characteristics of the participants of the study, the mean age was (29.87±8.75) years, 60 % of them were working women, and 56.7 % of them had 4-6 children. Working women spend much time away from their children and do not have enough time to communicate with them on an ongoing basis; so, they usually buy electronic media and subscribe them to the Internet access to provide educational opportunities for their children and prepare them for the information age. Although they are progressively worried about the impact of the web on their kids and are disappointed with some of the Internet activities their children participate in, such as games and browsing the Internet to download the lyrics of famous songs and images, they usually consider digital media to be positive and even disadvantageous for the kids without it. [8]

With regard to the investigation of the children history of using technology, it was shown that more than half of the children had advanced technology media, and more than half of them used advanced technology more than two or three hours. Regarding the children attachment to modern technology, about half of them expressed moderate attachment. And with regard to types of technology used by children, it shows that about more than three quarters of children, use ipads followed by video games. It may be due to portability and high-quality display of ipads making them ideal for use.

A 2010 Kaiser Foundation study indicated that elementary-age kids use entertainment technology on average 7.5 hours a day, 75% of the bedrooms of kids have TVs in, 50% of North American families watch TV all day, and there is always the discussion with the dining room table, replaced by a large screen. [9] An Australian school-based population study by Mathers et al. (2009) [10] revealed that teenagers spent an average of 3 hours and 16 minutes per day using electronic media (television:128 minutes per day, video games:35, computers:19, and cell phone:13 minutes per day). A cross sectional study of teenagers from schools in six towns in Cantabria (Spain, 2005) by Bercedo et al. showed that the average time of adolescents television watching was 3 hours per day. They played games consoles for an average of 48 minutes and used the Internet for an average of 54 minutes per day. Most adolescents had a mobile phone and used it primarily to send emails and surf the net. The boys preferred to surf and download games; whereas, the girls preferred to chat and send emails. There was a video console for nearly two thirds of the teenagers that the boys preferred the video games with shooting, fighting, sporting and driving; while, the girls preferred the video games for adventure. [11]

A longitudinal study from 27 schools in Helsinki region of Finland showed that computer use among school aged children was one hour per day and TV was watched over one hour a day. [12] Nakamura et al. (2012) conducted a school-based population survey (cross-sectional) in primary schools in urban parts of Japan. According to them, using games, television, and personal computers were mutually associated. The playing games time spent was significantly less in the girls than boys (p<0.001). In addition, the children in older grades spent more time using TV and PCs than the children in younger grade. The data for the cross-sectional survey of Patriarca et al. in Italy, 2009, was randomly chosen from a sample of 5 public schools in Campania region including the kids and adolescents aged 11 to 16 years. The general average daily time spent on television viewing (2.8 hours) and watching frequency for at least two hours per day (74.9%) were considerably combined with elderly; while watching TV, they always ate lunch or dinner, and they spent more time playing video games and computers. [13]

With regard to the physical development measures of the studied children, the present study shows that more than three fifths of children have abnormal weight and about three fifths of them have abnormal body mass index. Using computer and playing digital games are mainly low-energy demanding activities. Playing digital games and computers, however, are interactive and may vary from watching television in their impact on energy intake on two accounts: they do not leave hands free to eat, and they do not display food advertisements, which means that there is no trigger to provide oneself with snacks. Several earlier studies have demonstrated that using technology is associated with obesity in childhood and adolescent. Kautiainen et al. (2005) in their cross-sectional survey found that the increased television watching or computer using time spent was positively associated with being overweight. [14] Another previous randomized controlled trial which was conducted by Leonard et al. to evaluate the impacts of decreasing television watching and computer use on the body mass index of kids, showed that there was a statistically significant and sustained decrease in television watching and computer using connected with declines in BMI for the studied kids. [15] However, no relationship was reported both by the cross sectional study conducted by Nakamura et al. (2012*)* studying the influence of media use on health in elementary school children in Japan [16] and in another one conducted by Patriarca et al. in Italy concerning the use of television, videogames, and computer among

children and adolescents. [17] No relationship was found between obesity and media use by a qualitative study carried out by Jordan et al. (2006) on the parents and their kids focusing on reducing TV time for kids. [18]

According to the physical health of children and how using technology affect it, the study shows that about three quarters of the studied children usually or to some extent have vision problem, more than three quarters of them have impaired hearing, the majority of them have neck strain and also majority of them have headache, and slightly less than three quarters of them have less physical activity. In this regard, a survey was conducted to evaluate computer utilization patterns and associated visual issues, among learners in Ajman, United Arab Emirates, and it disclosed that nearly half of the learners included in the research had reported having some computer-related eye issues including headache, eye burning and dry / tire / sore eyes. [19] According to a survey conducted by India Bytes in 2008, the most common health problems associated with technology use were sore muscle, muscle fatigue, back pain, chest pain, pain or numbness in arms, shoulder and feet, neck and shoulder pain, vision problems, headache and obesity. [20]

Also, according to, [21] the daily use of computer over 2-3 h appears to be a threshold for neck-shoulder pain and over 5 h for low back pain in teenagers. In fact, frequent computer-related activities may explain the increase of these symptoms. Another study conducted by Torsheim et al. discovered that computer use, computer gaming and television viewing contributed in a unique way to the forecast of weekly backache and headache among Northern teenagers. The associations noted show that time spent on screen-based activity contributes to youth physical complaints. [22]

With regard to the learning abilities of the studied children, the present study showed that nearly two thirds of them usually or to some extent have learning disabilities, it may be due to spending more time using technology device and ignoring studying may affect the learning abilities of children. Many experimental and panel studies have been conducted for evaluating causal effects of digital games on learning abilities. Some results show positive influence but some suggest negative effects. Games are known to have many appealing characteristics that include enhancing instructional efficiency in learners and kids. Some of these traits include: attractiveness, motivation, active engagement, challenges, data handling capabilities and enabling learning by doing. Playing digital games should be done under parent supervision and with limited time to gain the education benefits and prevent its negative effects. [23]

With regard to the effects on the psychological and emotional health of studied children, the present study shows that nearly half of the studied children usually or to some extent have distraction, nearly two thirds of them have emotional disturbance, slightly more than half have cognitive loses, about half of them have sleeping disturbance, about three quarters of them have social isolation and majority of them have deficit social skills. Technology has a large effect on users' mental as well as physical health. Being overly connected can cause psychological problems such as diversion, narcissism, instant gratification expectation, and even depression in addition to influencing the mental health of consumers. [24]

Many studies explain the effects of technology on the psychological and mental health. [25-29] A study done at Duke University discovered that individuals encountered more behavioural issues and greater ADHD symptoms on the days they used more technology compared to the days when they used less technology. [26] On the other hand, the research also discovered that the same individuals had less depression and anxiety during the days they used more technology. [26] Another research at Michigan University discovered that using Facebook led to a decline in happiness and general satisfaction with life. [25] Another study from the University of Gothenburg in Sweden discovered a connection in youthful and depressive symptoms between high cell phone use. [27] A group of Australian scientists performed two research and discovered that compulsive use of the Internet by teenagers leads to poorer mental health. [28] Swansea University study discovered that the psychological withdrawal symptoms occur when the heavy web users stop using. [29]

Computer use and TV viewing anticipated considerably shorter periods of sleep and later beds. [12] Screen-based media can cause physiological and mental arousal, which makes sleeping difficulties. Furthermore, computer or TV viewing can influence the sleep routine, decrease slow-wave sleep, REM sleep and sleep effectiveness, or the bright light of a TV or computer screen can suppress melatonin secretion, which can in turn delay the onset of sleep. [30] Time spent in front of the computer screens by children and adolescents has risen considerably with the growth of social networks. This has resulted in a further decrease in the intensity of interpersonal communication in both the family and the wider social environment. While social networks allow a person to communicate with a big amount of individuals, these interactions are superficial and cannot adequately replace everyday face-to-face communication. Pantic has stated that the use of technology,

particularly the web can effectively be linked to the growth of mental health condition, such as anxiety and depression in some individuals. As the use of computers and the web becomes a stable program of everyday life, overuse potential is introduced that can lead to addiction. [31] The Internet addiction research has shown consumers can become addicted to it. The Internet addiction shares some of the adverse elements of drug addiction and has been shown to have implications such as college failure, family failure and relationship problem while more research is needed in this area. [32]

With regard to the relationship between technology attachment and physical and psychological health of the studied children, the current research showed that there was a significant relationship between technology attachment and physical and psychological health. For many Americans, life is improved by using technology; about half of American adults said that without their smart phones they can't imagine life. At the same moment, the effects of using technology, including adverse effects on physical and psychological health, have been defined in many research. The American Psychological Association's Stress in America survey has examined how stress impacts the health of American adolescents and how technology and social media relate to stress, relationships and general health and well-being. [33]

With regard to the awareness of the studied parents regarding the effect of using technology on children pre and post-intervention, this study showed significant relationship between mother's awareness of both the adverse and positive impacts of technology and the overall impacts of pre and post-intervention technology. It represents health education's efficiency in raising community awareness of the health impacts of technology. This results is in accordance with another studies which was conducted by Yilmaz et al. [34] to evaluate the efficacy of pre-school intervention to reduce screen time. The research found that intervention could lead to reduced television / video viewing for young kids. Another study's findings are not matched with these results which was conducted by [35] to assess the effect of screen time reduction measures, their systematic evaluation and meta-analysis did not show proof of the efficacy of BMI and screen time reduction measures in kids. However, pre-school age group interventions hold promise. Parents can be of the greatest help if they know the key problems and have strategies to deal with online or offline kids and adolescents. In this field, further research is required to figure out the best techniques of health education that are efficient in enhancing parent awareness.

CONCLUSION

Based on the results of this study, it was discovered that the use of technology adversely affected the children's physical and psychological health. The results underline the need for parents, educators and therapists to come together to help society wake up and see the disastrous impacts of technology not only on the physical, psychological and mental health of our children, but also on their capacity to learn and maintain private and family relationships

Recommendation:

Based on the results of the present study, the following recommendations are suggested:

- Increase health education messages delivered through television and other media as a very efficient technique of health education. Detailed data on the adverse impacts of using technology and beneficial impacts should be included in the message.
- The need for additional public health messaging in different settings for parents, teachers, adolescents and the community
- Experts in public health need to be educated in public health risks. By understanding and encouraging media education, public health professionals can play a basic role in reducing the negative impact of media on children and adolescents. Parents can be most helpful if they be aware of the core issues and have strategies for dealing with their children.

REFERENCES

1. Vandewater, E.A., Rideout, V.J., Wartella, E.A., Huang, X., Lee, J.H. and Shim, M.S., Digital childhood: electronic media and technology use among infants, toddlers, and preschoolers. *Pediatrics*, 2007, 119(5), e1006-e1015.

2. Brown A., Council on Communications and Media. Media use by children younger than 2 years. *Pediatrics*. 2011; 128(5), 1040–1045pmid:22007002.

3. Radesky, J.S., Silverstein, M., Zuckerman, B. and Christakis, D.A., Infant self-regulation and early childhood media exposure. *Pediatrics*, 2014, 133(5),e1172-e1178.

4. Thompson, D.A., Johnson, S.L., Vandewater, E.A., Schmiege, S.J., Boles, R.E., Lev, J. and Tschann, J.M., Parenting and Preschooler TV Viewing in Low-Income Mexican Americans: Development of the Parenting Practices Regarding TV Viewing (PPRTV) Scale. *Journal of developmental and behavioral pediatrics: JDBP*, 2016. 37(6), 465-474. doi: 10.1097/DBP.0000000000000309.

5. Center on Media and Human Development, School of Communication, Northwestern University Parenting in the Age of Digital Technology. A National Survey, 2014.

6. Gavin, B & Alan, F. *Blackwell handbook of infant development,* Blackwell publishers, USA, 2011. p 389.

7. Woo, E.H., White, P. and Lai, C.W. Impact of information and communication technology on child health. *Journal of paediatrics and child health*, 2016, 52(6), 590-594. doi: 10.1111/jpc.13181.

8. Kraut, R., Kiesler, S., Boneva, B., Cummings, J., Helgeson, V. and Crawford, A. Internet paradox revisited. *Journal of social issues*, 2002, 58(1), 49-74.

9. Kaither family foundation. Daily Media Use Among Children and Teens Up Dramatically From Five Years Ago, 2010, available at https://www.kff.org/disparities-policy/press-release/daily-media-use-among-children-and-teens-up-dramatically-from-five-years-ago/   Published: Jan 20, 2010 last accessed January 2019.

10. Mathers M, Canterford L, Olds T, Hesketh K, Ridley K, Wake M. Electronic media use and adolescent health and well-being: cross-sectional community study. *Acad Pediatr,* 2009, 9(5): 307-14.

11. Bercedo, A.S., Redondo, C.F., Pelayo, R.A., Gómez, Z.D.R., Hernández, M.H. and Cadenas, N.G. Mass media consumption in adolescence. *Pediatrics,* 2005, 63(6): 516-25.

12. uutinen, T., Ray, C. and Roos, E. Do computer use, TV viewing, and the presence of the media in the bedroom predict school-aged children's sleep habits in a longitudinal study? *BMC Public Health*, 2013, 13: 684.

13. Patriarca, A., Di Giuseppe, G., Albano, L., Marinelli, P. and Angelillo, I.F. Use of television, videogames, computer among children and adolescents in Italy. *BMC Public Health,* 2009, 9: 139.

14. Kautiainen, S., Koivusilta, L., Lintonen, T., Virtanen, S.M. and Rimpelä, A. Use of information and communication technology and prevalence of overweight and obesity among adolescents. *International journal of obesity*, 2005, 29(8), 925–933

15. Epstein, L.H., Roemmich, J.N., Robinson, J.L., Paluch, R.A., Winiewicz, D.D., Fuerch, J.H. and Robinson, T.N. A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. *Archives of pediatrics & adolescent medicine*, 2008, 162(3), 239-245. doi:10.1001/archpediatrics.2007.45.

16. Nakamura, H., Ohara, K., Kouda, K., Fujita, Y., Mase, T., Miyawaki, C., Okita, Y. and Ishikawa, T. Combined influence of media use on subjective health in elementary school children in Japan: a population-based study. *BMC Public Health*, 2012, 12(1), 432.

17. Patriarca, A., Di Giuseppe, G., Albano, L., Marinelli, P. and Angelillo, I.F. Use of television, videogames, and computer among children and adolescents in Italy. *BMC Public Health*, 2009, 9(1), p.139.

18. Jordan, A.B., Hersey, J.C., McDivitt, J.A. and Heitzler, C.D. Reducing children's television-viewing time: a qualitative study of parents and their children. *Pediatrics*, 2006, 118(5), e1303-e1310.

19. Shantakumari, N., Eldeeb, R., Sreedharan, J. and Gopal, K. Computer use and vision. related problems among university students in Ajman, United Arab Emirate. *Annals of medical and health sciences research*, 2014, 4(2), pp.258-263.

20. Stigliani, J. *The Computer User's Survival Guide: Staying Healthy in a High Tech World*. " O'Reilly Media, Inc." 2014, available at https://www.thehealthsite.com/diseases-conditions/6-worst-health-problems-common-with-computer-use-sh214-117262/

21. Hakala, P.T., Rimpelä, A.H., Saarni, L.A. and Salminen, J.J. Frequent computer-related activities increase the risk of neck–shoulder and low back pain in adolescents. *The European Journal of Public Health*, 2006, 16(5), 536-541.

22. Torsheim, T., Eriksson, L., Schnohr, C.W., Hansen, F., Bjarnason, T. and Välimaa, R. Screen-based activities and physical complaints among adolescents from the Nordic countries. *BMC public health*, 2010, 10(1), p.324.

23. Digital responsibility, 2019: *Taking Control of Your Digital Life*, available at http://www.digitalresponsibility.org/health-and-technology last accessed at March 2019.

24. Alison J., *More Technology Use Linked To Mental Health Issues In At-Risk Adolescents*, Published May 3, 2017 In Global, Academics

25. Kross, E., Verduyn, P., Demiralp, E., Park, J., Lee, D.S., Lin, N., Shablack, H., Jonides, J. and Ybarra, O. Facebook use predicts declines in subjective well-being in young adults. *PloS one*, 2013, 8(8), p.e69841.

26. Volpi, D.. Heavy technology use linked to fatigue, stress and depression in young adults. *Available at:[Accessed 26 April 2013]*, 2012.

27. Romeo V. Can Compulsive Internet Use Affect Adolescent Mental Health? A new study looks at Internet compulsion and mental health in young people. Posted Jan 06, 2016 https://www.psychologytoday.com/us

28. Reed, P., Romano, M., Re, F., Roaro, A., Osborne, L.A., Viganò, C. and Truzoli, R. Differential physiological changes following internet exposure in higher and lower problematic internet users. *PloS one*, 2017, 12(5), p.e0178480. doi: 10.1371/journal.pone.0178480. e Collection 2017.

29. Nuutinen, T., Ray, C. and Roos, E. Do computer use, TV viewing, and the presence of the media in the bedroom predict school-aged children's sleep habits in a longitudinal study?. *BMC public health*, 2013, 13(1), p.684.

30. Gaina, A., Sekine, M., Hamanishi, S., Chen, X., Wang, H., Yamagami, T. and Kagamimori, S. Daytime sleepiness and associated factors in Japanese school children. *The Journal of pediatrics*, 2007, 151(5), 518-522.

31. Pantic, I. Online social networking and mental health. *Cyberpsychology, Behavior, and Social Networking*, 2014, 17(10), 652-657.

32. Ng, B.D. and Wiemer-Hastings, P. Addiction to the internet and online gaming. *Cyberpsychology & behavior*, 2005, 8(2), 110-113. Doi: https://doi.org/10.1089/cpb.2005.8.110.

33. Digital Marketing Researches & Reports. Technology & Social Media: Stress in America 2017 | APA Consumer Insights | USA available at https://www.digitalmarketingcommunity.com/researches/stress-in-america 2017-technology-social-media-american-psychological-association.

34. Yilmaz, G., Demirli Caylan, N. and Karacan, C.D. An intervention to preschool children for reducing screen time: a randomized controlled trial. *Child: care, health and development*, 2015, 41(3), 443-449. doi: 10.1111/cch.12133. Epub 2014 Feb 26.

35. Wahi, G., Parkin, P.C., Beyene, J., Uleryk, E.M. and Birken, C.S. Effectiveness of interventions aimed at reducing screen time in children: a systematic review and meta-analysis of randomized controlled trials. *Archives of pediatrics & adolescent medicine*, 2011, 165(11), 979-986. doi: 10.1001/archpediatrics.2011.122. Epub 2011 Jul 4.