Effect of technology on the lives of 9-year old children

Nazir S. Hawi, Maya Samaha

Department of Computer Science, Notre Dame University-Louaize, Lebanon

Abstract: *With the advancement of technology, researchers are more and more concerned about its impact on individuals, organizations, and society. In particular, the side effects of screen time have been a mounting large issue not only for researchers but for parents and educators. Although there have been several attempts to understand the phenomenon, but none focusing on a specific age. For this key reason, this study was conducted as a head start investigation in the Arab world. The target population was the cohort of 9-year children enrolled in private schools. The study sought to determine whether screen time is a predictor of participants' academic performance, physical activity time, and other behaviors. Exactly 1175 families participated by completing a paper survey questionnaire by offering information about lived experiences with technology that is taking hold of their children's minds and possibly shaping their lives. Unexpectedly, the results revealed that screen time variables contributed a substantively small, but statistically significant amount of explained variance to physical activity, academic performance, aggressive behavior, and sleep deprivation. Thus, there is strong empirical basis for where side effects of screen time occur, they are not detrimental to children's lives in particular and culture in general. The computer science community should be aware of this reality and push forward for the design of technologies that enhance children's overall wellbeing towards building better societies.*

Keywords:*Technology, screen time, academic performance, physical activity, social behavior, children, Arab world*

1. Introduction

Times have changed. Nowadays children worldwide, including in the Arab world are spending more and more time glued to their electronic devices[1]. It is becoming their favorite hobby and leisure time scarifying their academic performance, their family value times, their other activities and their sleeping time. It has been reported that 68% of toddlers use technology[2]and youth are spending an average of 7 hours a day on screen media [3]. Previous studies have shown the different negative impacts of excessive use of screen devices and addiction to technology on academic performance[4-6], on aggressive behaviors and social reclusion[7, 8], on psychological well-being such as stress [9, 10], on self-esteem and life satisfaction [11-13]. The sedentary time and the lack of physical activity due to the addiction to technology also have very adverse effects on the physical health[14, 15] including obesity [16], diabetes [17], heart diseases [18], high blood

pressure[19], high BMI . Our schools are experiencing students coming to classes with lack of nice sleep time due to excessive use of technology which is also affecting sleep quality and has been associated with anxiety and depression [20-23]. Nevertheless parents play a major role in their children amount of screen time especially when technology is being used as a discipline tool to reward and punish the children [24, 25].The aim of the current study is to address the following questions related to children's excessive technology usage:

RQ1: Is there a relationship between children's technology use and their academic performance?

RQ2: Is there a relationship between children's technology use and their physical activity?

RQ3: Is there a relationship between children's technology use and aggressive behavior?

RQ4: Is there a relationship between children's technology use and sleep deprivation?

RQ5: Is there a relationship between children's technology use and their development of behavioral problems?

2. Method

2.1. Sampling and procedures

The study's target population was all third-grade students in Lebanon. In April 2016, 20 private schools were randomly selected from regions geographically distributed across Lebanon. Each school's sample size was proportional to the school's population of third graders with respect to the aggregate of all selected schools. This sampling method was performed to achieve a representative sample of target population. Survey questionnaires were distributed in open peel and seal envelopes to third graders, requesting to have each completed either a parent or a guardian. About 1800 survey questionnaires were distributed. A total of 1200families responded, 66.6% response rate. After removing cases with missing values, the final sample size was 1175.

2.2 Ethical issues

The research instrument and an informed consent form that summarized the research including its purpose, methodology, and related ethical issues for the school and the parents were presented to school administrators. Ethical measures kept participating schools, respondents, and children anonymous and collected data confidentially. Administrators requested the questionnaire to be distributed in the school's preferred language of communication with parents, either Arabic, English or French.

2.3. Measures

The data collection instrument's major objective was to obtain data about the child's screen time and related important issues at home. It was a short paper survey questionnaire in the form of a brochure. The first item was factual about the respondent's relationship to the child whether father, mother, or guardian. The next three items collected demographic data on the child's age, gender, and the most recent school average. Item five relied on a table to collect data about the screen devices used at home. Item six included a table that simplified the collection of the average time a child daily spends using screen devices by type from Monday to Friday and on weekends. Some questions were binary, Yes/No questions, others had response alternatives with either 3 or 4 mutually exclusive categories.

2.4. Pilot Study

A pilot study was conducted that included 50 participants. A preliminary version of the self-administered survey was pilot-tested. The main focus was on the wording, order, and adequacy of the items. Feedback showed that it was direct to the point, many questions were informative that made parents eager to

complete it, and it needed on the average 10 minutes to be completed. The scale had a very good internal consistency of Cronbach's alpha = 0.800.

2.5. Statistical Techniques

The analysis of the collected data was be carried out using IBM SPSS 20. Descriptive techniques as well logistic regression analysis were used.

3. Results

There were 1175 respondents (52% males). Table 1 summarizes different characteristics related to use of technology by a 9-years old child.The most commonly owned devices were laptop/computer (98.4%), TV (96.7%), and Ipad (71.4%).

Table1. Characteristics of 9-Years Old

Screen devicesownership	
Television	96.7%
Ipod	43.7%
Play Station	43.4%
Computer	38.3%
Ipad	71.4%
Nintendo DS	40.1%
Laptop	60.1%
Wii	31.4%
Smartphone	28.6%
Xbox	12.6%
Other devices	7.1%
Average screen time	
Monday to Friday on TV	1.2hrs/day
Monday to Friday on screen devices other than TV	.6 hrs/day
Week-end on TV	2.5 hrs/day
Week-end on screen devices other than TV	2.2 hrs/day
Parents awareness of screen devices' content	
Not aware	2.2%
Some awareness	18.6%
Full awareness	79.3%
Non-screen reading	
None	26.6%
5 min to < 30 min	48.4%
30 min to 1 hour	21.2%
More than one hour	3.9%
Non-screen social games (or non-electronic play)	
None	29.1%
5 min to < 30 min	41.7%
30 min to 1 hour	24.8%
More than one hour	4.3%
Tendency to finish homework quickly to use screen devices	
No	50.9%
Sometimes	36.1%
Yes	13.0%
Academic performance is declining	
A lot	1.4%
A little	16.2%
No	77.8%
Don't know	4.6%
Less physical activity	
A lot	4.8%
A little	34.8%
No	58.3%
Don't know	2.1%
Sleep deprivation	
Yes	7.3%
Sometimes	26.4%
No	66.4%
Child reaction to withdrawal (consequences of removing screen privileges)	
Aggressive	9.3%
Non-aggressive	62.5%
None	28.2%
Worsening behavior due to usage of screen devices	
Yes	5.6%
Sometimes	21.0%
No	73.4%

It is noteworthy too that out of 1175 9-year old students, 336 owned a smartphone. Roughly one-in-four 9-year olds owned a smartphone. Given the ownership percentages of other screen devices such as IPod, PlayStation, Nintendo DS, and the like, 9-year children at the time of the study seem to be inundated with screen devices.

The regression analysis presented in Table 2 shows a highly significant negative association between technology use and academic performance, physical activity. Also, our results show that children who use

technology more sleep less, experience withdrawal, sleep deprivation, and develop more behavioral problems.The worst impact of heavy technology usage was that of sleep deprivation. In fact, Table 2 shows that falling into the habit of longer durations of technology usage leads to sleep deprivation.

Table 2.Regression analysis of technology use on physical activity decline, deteriorating academic performance, sleep duration, withdrawal, and behavioral problems.

	R^2	*F*	*B*
Academic Performance	2.3	22.1	-.151***
Physical Activity	3.9	39.1	-.198***
Withdrawal	1.1	10.5	-.104**
Sleep Duration	8.6	90.3	-.293***
Behavior	2.1	20.4	-.145***

Note.N = 1175.

4. Discussion

Research questions *RQ1, RQ2, RQ3, RQ4and RQ5* were addressed with linear regression to assess the ability of the independent variables 'technology use' to predict a selection of dependent variables.

Regarding *RQ1*, 1% of variance in children's decline in academic performance can be explained by children'saverage daily amount of time spent using technology.

Regarding *RQ2*, 3.9% of variance in children's decline in physical activity can be explained by the average daily amount of time spent using technology.

Regarding *RQ3*, 1.1% of variance in the average daily amount of time spent using technology can be explained by the childrenwhen the technology is taken away from them. Children whose technology was taken away from them spent daily on the average 43 minutes more than children who didn't.

Regarding *RQ4*, 8.6% of variance in children's tendency to stay up late and become deprived of sleep can be explained by the average daily amount of time spent using technology. Children who were 9-year oldand stayed up late spent a daily average of 30 minutes using technology more than children who didn't.

Regarding *RQ5*, 2.1% of variance in children's tendency to develop behavioral problems can be explained by theaverage daily amount of time spent using technology.

Hopefully,our results will contribute towards the unification of screen time criteria that should be endorsed in identifying the side effects that could lead to child impairments. Also, it should motivate researchers in the Middle East and the world to make comparisons across different demographic groups and different cultures.

5. Conclusion

Results of this study showed a negative association between excessive use of technology in 9-years old children and academic performance, physical activity, and a positive association with increased aggression and sleep deprivation. As computer scientists, we should be aware of the profound effect of technology use and therefore focus more research on the design and development of technologies that take into consideration the various negative impacts of technology especially on our children and technologies that contribute to the overall enhancement of our society.

Acknowledgements

This research was supported by a grant from the National Council for Scientific Research – Lebanon (CNRS-L) (grant 3540/S).

References

[1] N. S. Hawi, "Internet addiction among adolescents in Lebanon," *Computers in Human Behavior,* vol. 28, no. 3, pp. 1044-1053, 2012.

[2] H. Duch, E. M. Fisher, I. Ensari, and A. Harrington, "Screen time use in children under 3 years old: a systematic review of correlates," *International journal of behavioral nutrition and physical activity,* vol. 10, no. 1, pp. 1, 2013.

[3] V. J. Rideout, U. G. Foehr, and D. F. Roberts, "Generation M [superscript 2]: Media in the Lives of 8-to 18-Year-Olds," *Henry J. Kaiser Family Foundation*, 2010.

[4] N. S. Hawi, and M. Samaha, "To excel or not to excel: Strong evidence on the adverse effect of smartphone addiction on academic performance," *Computers & Education,* vol. 98, no. July pp. 81-89, 2016.

[5] D.-Y. Yeh, and C.-H. Cheng, "Relationships among Taiwanese children's computer game use, academic achievement and parental governing approach," *Research in Education,* vol. 95, no. 1, pp. 44-60, 2016.

[6] D. K. Wentworth, and J. H. Middleton, "Technology use and academic performance," *Computers & Education,* vol. 78, pp. 306-311, 2014.

[7] D. A. Gentile, S. Coyne, and D. A. Walsh, "Media violence, physical aggression, and relational aggression in school age children: a short-term longitudinal study," *Aggressive behavior,* vol. 37, no. 2, pp. 193-206, 2011.

[8] B. Veenhof, B. Wellman, C. Quell, and B. Hogan, *How Canadians' use of the Internet affects social life and civic participation*: Statistics Canada Ottawa, 2008.

[9] M. Samaha, and N. S. Hawi, "Relationships among smartphone addiction, stress, academic performance, and satisfaction with life," *Computers in Human Behavior,* vol. 57, pp. 321-325, 4//, 2016.

[10] J.-L. Wang, H.-Z. Wang, J. Gaskin, and L.-H. Wang, "The role of stress and motivation in problematic smartphone use among college students," *Computers in Human Behavior,* vol. 53, pp. 181-188, 2015.

[11] N. S. Hawi, and M. Samaha, "The Relations Among Social Media Addiction, Self-Esteem, and Life Satisfaction in University Students," *Social Science Computer Review*, pp. DOI 10.1177/0894439316660340, 2016.

[12] M. Faraon, and M. Kaipainen, "Much more to it: The relation between Facebook usage and self-esteem." pp. 87-92.

[13] A. Lepp, J. E. Barkley, and A. C. Karpinski, "The relationship between cell phone use, academic performance, anxiety, and satisfaction with life in college students," *Computers in Human Behavior,* vol. 31, pp. 343-350, 2014.

[14] R. C. Colley, D. Garriguet, I. Janssen, S. L. Wong, T. J. Saunders, V. Carson, and M. S. Tremblay, "The association between accelerometer-measured patterns of sedentary time and health risk in children and youth: results from the Canadian Health Measures Survey," *BMC public health,* vol. 13, no. 1, pp. 200, 2013.

[15] J. A. Serrano-Sanchez, S. Martí-Trujillo, A. Lera-Navarro, C. Dorado-García, J. J. González-Henríquez, and J. Sanchís-Moysi, "Associations between screen time and physical activity among Spanish adolescents," *PloS one,* vol. 6, no. 9, pp. e24453, 2011.

[16] A. J. Atkin, S. J. Sharp, K. Corder, and E. M. F. van Sluijs, "Prevalence and Correlates of Screen Time in Youth," *American Journal of Preventive Medicine,* vol. 47, no. 6, pp. 803-807, 2014.

[17] G. S. Goldfield, T. J. Saunders, G. P. Kenny, S. Hadjiyannakis, P. Phillips, A. S. Alberga, M. S. Tremblay, and R. J. Sigal, "Screen viewing and diabetes risk factors in overweight and obese adolescents," *American journal of preventive medicine,* vol. 44, no. 4, pp. S364-S370, 2013.

[18] T. M. Altenburg, G. H. Hofsteenge, P. J. Weijs, H. A. Delemarre-van de Waal, and M. J. Chinapaw, "Self-reported screen time and cardiometabolic risk in obese dutch adolescents," *PloS one,* vol. 7, no. 12, pp. e53333, 2012.

[19] D. Martinez-Gomez, J. Tucker, K. A. Heelan, G. J. Welk, and J. C. Eisenmann, "Associations between sedentary behavior and blood pressure in young children," *Archives of*

pediatrics & adolescent medicine, vol. 163, no. 8, pp. 724-730, 2009.

[20] T. Arora, E. Broglia, G. N. Thomas, and S. Taheri, "Associations between specific technologies and adolescent sleep quantity, sleep quality, and parasomnias," *Sleep medicine,* vol. 15, no. 2, pp. 240-247, 2014.

[21] K. Demirci, M. Akgönül, and A. Akpinar, "Relationship of smartphone use severity with sleep quality, depression, and anxiety in university students," *Journal of behavioral addictions,* vol. 4, no. 2, pp. 85-92, 2015.

[22] J. H. Ha, S. Y. Kim, S. C. Bae, S. Bae, H. Kim, M. Sim, I. K. Lyoo, and S. C. Cho, "Depression and Internet addiction in adolescents," *Psychopathology,* vol. 40, no. 6, pp. 424-430, 2007.

[23] C.-F. Yen, W.-J. Chou, T.-L. Liu, P. Yang, and H.-F. Hu, "The association of Internet addiction symptoms with anxiety, depression and self-esteem among adolescents with attention-deficit/hyperactivity disorder," *Comprehensive psychiatry,* vol. 55, no. 7, pp. 1601-1608, 2014.

[24] N. S. Hawi, and M. S. Rupert, "Impact of e-Discipline on children's screen time," *Cyberpsychology, Behavior, and Social Networking,* vol. 18, no. 6, pp. 337-342, 2015.

[25] M. Samaha, and N. S. Hawi, "Associations between screen media parenting practices and children's screen time in Lebanon," *Telematics and Informatics,* vol. 34, no. 1, pp. 351-358, 2017.