

## Technology Use among Middle Adolescent and its Effect on Sleep pattern, Attention Difficulties and Academic Achievement in Assuit city

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### Abstract

The evolution of electronic media has brought profound changes in the ways that adolescents communicate and learn. Strong concerns about potential positive and negative impacts on child and youth well-being. The **aimed** to study the pattern of technology use and identify the effect of technology usage on their sleep patterns, attention difficulties and academic achievement of adolescent's students. **Cross-sectional descriptive research design was used.** It was conducted at (10) secondary schools in Assiut city. The total number was 953 students. **Four tools were used** in collect the data; **Tool 1** self- administrative interview questionnaire **tool 2** Data about student's technology usage and sleep patterns, **tool 3** Attention Difficulties scale and **tool 4** Assessment level of academic achievement. **The result of this study** revealed that the most of the studied students (86.4 %) have computers at home and (94.3%) had their own cell phon. It was found that uses of technology are gender bias, the higher percentage of the technology users were males. **Based on finding it was concluded that** the technology play an important part in the adolescents' lives and the negative influence of the excessive use of technology on middle adolescents students, sleep, their attention abilities and academic achievement. **So the researchers recommended that** educational programs should be directed to the adolescent students about property use of technology.

**Keywords:** *Technology Usage, Adolescents, Sleep Pattern, Attention Difficulties & Academic Achievement.*

### Introduction

The United Nations Population Fund (UNFPA) defines adolescents as being between the ages of 10 and 19, which is similar to the definition to which the World Health Organization adheres. The World Programme of Action for Youth refers to adolescents as “youth” who are between the ages of 15 and 24 (Bhandarkar, 2006). The stages of adolescence can be separated into three: early (10-13 years of age), middle (14-16), and late (17-19). In early adolescence, *physical* changes include physical and sexual maturation (Chetri, 2014).

Adolescence is a time of great change for young people. It is a time when physical changes are happening at an accelerated rate. But adolescence is not just marked by physical changes—young people are also experiencing cognitive, social/emotional and interpersonal changes as well. As they grow and develop, young people are influenced by outside factors such as parents, peers, community, culture, religion, school, world events and the media (Jacquelynne, 2011).

Adolescent are one of the heaviest users of technology as a group. They are invaluable consumers of new forms of communication such as instant messaging, text messaging, social networking,

blogs, photo and video sharing medium technology (Subrahmanyam & Greenfield, 2008).

Technology, its use for everyday purposes is becoming increasingly common, especially among subsequent generations and increasing due to its undeniable benefits, especially of better communication with newer methods of communication and sharing information emerging every day, come the shortcomings of a world inundated with technology (Carr, 2011). Technology includes computers (internet access, online games, and other computer games), cell phones (phone calls and text messages), console video games and television (television shows and movies are shown on television or played on a digital video disc"(VCR) or "digital versatile disc player(DVD). ( Khalil, 2012).

Screen time” refers to the amount of time a person spends in front of any type of technology including a computer or television screen. “Nocturnal technology use” refers to technology usage between the hours of 10pm and 6am. “General technology use” refers to technology usage at any time of the day or night (Dehmler, 2009). Technology also has both positive and negative effects in the area of education. Excessive usage of electronic gadgets is weakening people’s memory. The substantial development of

technology has its positive effects on education as classes have become more dynamic between teachers and students with technology (Simuforosa, 2013).

Television and computer game consumption are a powerful influence in the lives of most children. Previous evidence has supported the notion that media exposure could impair a variety of behavioral characteristics. Excessive television viewing and symptoms, especially emotional and behavioral symptoms, somatic complaints, attention problems such as hyperactivity, and family interaction problems (Dworak et al., 2007).

Sleep can be defined as an active, repetitive and reversible state of perceptual disengagement from and unresponsiveness to the environment. Sleep deprivation occurs when an individual fails to get enough sleep. Teens need an average of about nine hours of sleep per night (Rajaratnam et al, 2015). Proper sleep length and quality are essential components of one's physical and emotional well-being. This health need may be discounted by many college students in the current fast paced, technologically oriented society (Buboltz et al., 2009).

Reduced sleep length and quality may negatively impact cognitive functioning, general health, and feelings of well-being. At the adolescent stage in life, adolescents suffer from increasing school, family, and social pressure and from an environmentally induced delay of sleep timing. These altered sleep patterns lead to a marked increase in sleepiness that usually facilitates cognitive, emotional, behavioral and academic failure (Carskadon et al., 2004).

Increased technology use has been attributed to increased learning and behavioral problems including difficulty sitting still, controlling behavior and paying attention. When children and youth are using technology, their attention is constantly being directed by the game or images on the screen. There is a theory called "directed attention fatigue" which says that the brain gets tired or overloaded when this happens. This fatigue leads to distractibility, impulsive behavior, irritability and difficulty concentrating (Louv 2008). The impact of technology on adolescent tends to be influenced by various factors including the type of technology being used, the frequency and duration of use, as well as the socioeconomic and individual differences (Willoughby 2008).

#### Significance of the study

In a study conducted by Lenhart et al., (2010) found that 93% teens ages 12-17 go online, 69% of teens have their own computer, 63% of teen internet users go online every day, 27% of teens use their phone to get online, 24% of teens with a game console use it to go online, 73% of teens are on a social network.

Another study conducted at Port Said in Egypt found that there is the negative impact of the excessive technology usage on adolescents' sleep, and consequently on their attention abilities and school achievement. Since the majority of adolescents, students were having computers at home and 50.1% in their bedrooms. Almost all of them (98.4%) had their own cell phones. The prevalence of their related problems is expected to be high (Khalil, 2012).

There are very limited previously published studies that conducted in Assiut city about the pattern of technology use among adolescent and its effect on sleep patterns, attention difficulties, and academic achievement, therefore; the current study will provide information which will help to guide the design and implementation of appropriate prevention and intervention strategies targeted to adolescent.

### Aims of the Study

#### This study aimed to

1. Study the pattern of technology use among middle adolescents' students?
2. Identify the effect of technology usage on sleep patterns, attention difficulties and academic achievement of middle adolescent's students.

#### Research questions

1. What pattern of technology did adolescent students use?
2. Is adolescent technology usage has an effect on their sleep patterns, attention difficulties, and academic achievement?

### Subjects & Method

#### Research design

Descriptive research design was used to conduct this study

#### Setting

This study was conducted at 10 secondary schools in Assiut city. The selected schools represent all geographic areas of Assiut city. These included three technical schools (Assiut el-fanea el-sanaiaa girl, nursing school of Assiut university and EL -tegara boys), three public schools ( Naser El-sanawee El-askaree, Kadegaa yousef, and EL-gamaa EL-moshtaraka) and four privet schools ( El-faransescan EL moshtaraka, El salam Eadade Sanawe, Dar EL-Andalos and Dar Heraa).

#### Sample

All convenient students enrolled in the first and second grades in the previous mentioned secondary schools were included in this study ( the third grad is excluded because has a specific attention in our culture so the habitual activity of the student was changed). Their total number was (953) students after

receiving their consents for participation in this study with the following inclusion criteria:-

1. Both Gender.
2. Middle adolescent student age (15-17).

#### Tools

After reviewing the relevant literature, four tools were utilized to collect data pertinent to study.

**Tool (1):** self-administrative interview questionnaire.

It consisted of two parts.

**Part I:** Personal data included age, sex, number of siblings, birth order and type of study.

**Part II:** Socioeconomic scale: -

It was developed by **Abd El-Tawab, (2004)** and used to assess socioeconomic status and it included four main items: parent level of education (8 sub items), parent occupation (3 sub items), family income (6 sub items) and family lifestyle (3 sub items). each item has one score. The total score was divided into three classes as a high class from 85-100%, moderate from 84-60% and low class less than 60%. The item of income was modified according to the rate of inflation and increased to be conforming with recent income through comparing the difference of the value of the golden pound in 2004 to that in 2014 and multiplying the rate of inflation to the scale.

**Tool (2):** Data about student's technology usage and sleep patterns. It was adapted from Dehmler (2009). Twenty-five items questionnaire was composed of 16 items regarding overall technology usage and 9 items regarding sleep patterns. The first eight items were used to measure the participant's daily use of Internet, cell phones and computer games (general technology usage). Then, a nocturnal technology use items that inquired about the participant's technology use after 10:00 pm (9-16). Finally, the last nine items (17-25 items) were to measure the student's sleep quantity and quality. The process of translation- retranslation was used to ensure the validity of this tool by researcher".

**Tool (3):** Attention Difficulties scale was used to assess the attention difficulties based on the Working Memory scale from the Behavior Rating Inventory of Executive Function (BRIEF) (Gioia, 2005). The scale included 15 items. The internal consistency of the Working Memory scale is reported to be between 0.89 to 0.93 and test-retest reliability between (0.82 to 0.86).

#### The scoring system

Technology usage score was calculated by summing the response. The total 9 technology usage score was determined to range from 3-16 and divided into low general technology usage scores (Mean=>8) and high general technology usage scores (Mean=<8). The nocturnal technology usage scores range from the 1-25. a low score (Mean=<14) indicated a low level of

nocturnal technology use while high scores (Mean=>14) indicated a high level of nocturnal technology use. Regarding the sleep pattern score, ranged from 0-5. Low scores (>7) indicated poor quality of sleep and high score (<7) indicated a good quality of sleep. The total attention difficulty score was calculated based on student's responses to items. The responses were measured on Likert scale ranging from 1-3. for every response:

Often = 3, sometimes = 2 and never = 1. The scores ranged from 15 to 45. A score falling between 15 and 24 indicates "no attention difficulties", a score between 25 and 35 indicates "some attention difficulties" and a score between 36 and 45 indicates "moderate or extreme attention difficulties".

**Tool (4):** assessment level of academic achievement.

It was used to measure the level of academic achievement based on marks given to each student by their teachers, an average mark was calculated to be used as a global score. Teacher evaluations were used as criteria of school performance, obtaining high coefficients between different evaluations at different parts of time. The teacher evaluations were summed up and mean scores are adapted to a scale from (1-5) where: 1= Fail, 2= Pass, 3= Good, 4= V. Good, 5= Excellent.

#### Method of data collection

- The researcher reviewed related literature, both local and international to acquire in-depth knowledge about the subject, and to be able to design the data collection tools. Then, the tools were prepared, transferred and reviewed by five experts in nursing and medicine to ascertain their content validity. The validity was 96%.
- Before starting this study, it was necessary to secure the approval of authorities in the setting of the study. The referee permission was obtained from Ministry of Education in Assiut Governorate, and an official permission from the managers of the ten secondary schools was also secured.

#### A pilot study

A pilot study was carried out before starting of data collection (10%). Their number of subjects was (90) to test the applicability and clarity of the tools. Also, it helped to determine the time needed for filling up the questionnaire, and Cronbach alpha coefficients were calculated and were 0.823 for technology & 0.791 for sleep, this indicating good reliability. The time needed to fill out the tool of data collection was 15-20 minutes. The pilot subjects were not included in the main study sample.

#### Field of the work

Data were collected during the period from the beginning of September 2013 until the end of May 2014. Data collection was done by the researcher during the school day. The data was collected

according to every school policy. The actual work started by meeting the school manager throughout the morning or evening school day, the researcher first introduced herself to them and gave them a complete back ground about the study and the tool of data collection format which was predesigned by the researcher in Arabic in order to collect the required data. Then the researcher went to students' classrooms then introduced herself to them, and explained research aims. The researcher invited students to participate in the study by filling out the questionnaire and if the researcher found any absentee in the class, she would come back to this student another day to invite him to participate in the study. Then the questionnaire was disrupted. Students were asked to read each question carefully and to answer the questions honestly. Students were asked to circle the answer that best describe them the majority of the time. The researcher was available for more clarification whenever needed. Students were voluntary and once the student completed the questioners the researcher collected the questioners from the students by herself in every visit. The researcher visited each school from three to four times per week to collect the data.

#### **Ethical Considerations**

The researcher explained to each student the aim of the study and informed that the information obtained would be confidential and only used for the purpose of the study. Students have ethical rights to participate or refuse participation in the study. Consent to participate in the study was in a paper by school managers and oral from the students.

#### **Statistical Analysis of data**

Data were collected, tabulated and analyzed. Data entry was done using SPSS 16.0 statistical software package. Quantitative data were presented by mean and standard deviation while qualitative data were presented by frequency distribution. Chi Square and Fisher exact tests were used. Correlation analysis was used for assessment of interrelationship between the technology uses among middle adolescent and its effect on sleep patterns, attention difficulties, and academic achievement.

## Result

Table (1): Socio-demographic characteristics of the studied students (n= 952).

Item	No. (n= 952)	%
<b>Age in years</b>		
< 16	422	44.3
≥ 16	530	55.7
Mean ± SD (Range)	15.59 ± 0.57 (14 – 17)	
<b>Sex:</b>		
Male	469	49.3
Female	483	50.7
<b>Number of male siblings</b>		
None	159	16.7
One	366	38.4
Two	271	28.5
Three or more	156	16.4
<b>Number of female siblings</b>		
None	201	21.1
One	321	33.7
Two	244	25.6
Three or more	186	19.5
<b>Birth order</b>		
First	314	33.0
Second	237	24.9
Third	204	21.4
Fourth or more	197	20.7
<b>Social class</b>		
Low	167	17.5
Middle	674	70.8
High	111	11.7
<b>School category</b>		
Public	296	35.4
Privet	319	33.5
Technical	337	31.1

Table (2): The distribution of general technology usage among the studied students (n=952).

Item	No. (n= 952)	%
<b>Having computer at home</b>		
Yes	823	86.4
No	129	13.6
<b>Having computer at bedroom</b>		
Yes	425	44.6
No	527	55.4
<b>Number of hours of browsing internet per day</b>		
Never	322	33.8
Between one and two hours	411	43.2
Between 2 and 3 hours	66	6.9
Between 3 and 4 hours	153	16.1

Item	No. (n= 952)	%
<b>Number of computer games</b>		
Never	323	33.9
One time per week	224	23.5
Two-time per week	122	12.8
Mor than two times per week	170	17.9
Every day	113	11.9
<b>No. of hours of computer games</b>		
Never	394	41.4
Between one and two hours	424	44.5
Between 2 and 3 hours	63	6.6
Three or more hours	71	7.5
<b>Having cell phone</b>		
Yes	898	94.3
No	54	5.7
<b>First choice in calling friends:</b>		
Using a phone	751	78.9
Text messaging	7	0.7
Instant messaging	5	0.5
Social networking website	14	1.5
E-mailing	175	18.4
<b>Limitations for number of SMS</b>		
Yes	54	5.7
Sometimes	169	17.8
No	729	76.6

Table (3): The percentages of nocturnal technology use by the studied students (n= 952).

Item	No. (n=952)	%
<b>No. of using the internet for social or communications after 10 PM</b>		
Non	386	40.5
2 times / month	61	6.4
1 time/ week	91	9.6
Several times per week	190	20.0
Every night	224	23.5
<b>No. of using the internet for fun after 10 PM</b>		
Non	371	39.0
2 times / month	82	8.6
1 time / week	118	12.4
Several times / week	221	23.2
Every night	160	16.8
<b>No. of using the internet for education after 10 PM</b>		
Non	504	52.9
2 times /month	179	18.8
1 time /week	103	10.8
Several times / week	123	12.9
Every night	43	4.5
<b>Time of sending and receiving SMS and calls</b>		
Non	179	18.8
Before 10:00 pm	256	26.9
Between 10:00 pm and midnight	140	14.7

Item	No. (n=952)	%
Between midnight and 3:00 am	33	3.5
Between 3:00 and 6:00 am	9	0.9
At any time of the night	335	35.2
<b>No. of sending and receiving calls after 10 PM</b>		
Never	288	30.3
1 time / month	70	7.4
1 – 3 times per month	99	10.4
Several times /week	312	32.8
Every night	183	19.2
<b>No. of sleeping during watching TV</b>		
Non	447	47.0
1 time / month	92	9.7
2 – 3 times / month	112	11.8
Several times / week	220	23.1
Every night	81	8.5

Table (4): Characteristics of sleep patterns among studied students (n= 952).

Item	No. (n= 952)	%
<b>Quantity of sleep/24 hr</b>		
< 8 hours	610	64.1
≥ 8 hours	342	35.9
<b>Mean ± SD (Range)</b>	7.19 ± 1.74 (2.5 – 14.0)	
<b>Main cause of go to bed time at night</b>		
My parents set my bedtime	47	4.9
I feel sleepy	484	50.8
I finish my homework	303	31.8
My TV shows are over	20	2.1
I finish text messaging and talking on the phone	16	1.7
I finish socializing	30	3.2
I finish using the computer	52	5.5
<b>Number of waking up at night</b>		
Never	236	24.8
Once	352	37.0
2 or 3 times	177	18.6
More than 3 times	43	4.5
I have no idea.	144	15.1
<b>Main cause of wake up at night</b>		
My cell phone rings	108	11.3
I get a text message	17	1.8
My television wakes me up	12	1.3
I have to go to the bathroom	289	30.4
I have not any reasons, I just wake up.	264	27.7
I don't wake up during the night	262	27.5
<b>Time of taking nap</b>		
I never nap	230	24.2
I sometimes nap on school days, but not on weekends	383	40.2
I sometimes nap on weekends, but not on school days	62	6.5
I sometimes nap on school days and weekends	192	20.2
I never nap unless I am sick	85	8.9

Item	No. (n= 952)	%
<b>How often do you think that you get enough sleep?</b>		
Always	114	12.0
Usually	213	22.4
Sometimes	479	50.3
Rarely	120	12.6
Never	26	2.7
<b>In general, do you feel that you get ...</b>		
Too much sleep hours	112	11.8
Enough sleep hours	563	59.1
Too little sleep hours	277	29.1

**Table (5): Relationship between student's technology use and their socio-demographic characteristics (n=952).**

Variables	Age in years				Sex				Social level						Type of secondary school					
	< 16		≥ 16		Male		Female		Low		Middle		High		Technical		Private		Public	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
<b>General technology</b>																				
Low	245	58.1	304	57.4	221	47.1	328	67.9	132	79.0	359	53.3	58	52.3	209	70.6	154	48.3	186	55.2
High	177	41.9	226	42.6	248	52.9	155	32.1	35	21.0	315	46.7	53	47.7	87	29.4	165	51.7	151	44.8
P-value	0.828				0.000*				0.000*						0.000*					
<b>Nocturnal technology</b>																				
Low	255	60.4	331	62.5	267	56.9	319	66.0	143	85.6	386	57.3	57	51.4	240	81.1	147	46.1	199	59.1
High	167	39.6	199	37.5	202	43.1	164	34.0	24	14.4	288	42.7	54	48.6	56	18.9	172	53.9	138	40.9
P-value	0.523				0.004*				0.000*						0.000*					

\* Statistically significant at  $p < 0.05$

**Table (6): The relationship between levels of technology use and presence of computer among studied students (n= 952).**

Variables	Having computer at home				P-value	Having computer at bedroom				P-value
	Yes		No			Yes		No		
	No.	%	No.	%		No.	%	No.	%	
<b>General technology</b>										
Low	426	51.8	123	95.3	0.000*	160	37.6	389	73.8	0.01*
High	397	48.2	6	4.7		265	62.4	138	26.2	
<b>Nocturnal technology</b>										
Low	464	56.4	122	94.6	0.000*	192	45.2	394	74.8	0.00*
High	359	43.6	7	5.4		233	54.8	133	25.2	

\* Statistically significant at  $p < 0.05$

**Table (7): Relation between technology use and sleep patterns, attention difficulties and academic achievement among the studied students (n= 952).**

Variables	Total technology				P-value
	Low (n= 576)		High (n= 376)		
	No.	%	No.	%	
<b>the quantity of sleep</b>					
< 8 hours	54.6	54.6	277	45.4	0.000*
≥ 8 hours	243	71.1	99	28.9	



Variables	Total technology				P-value
	Low (n= 576)		High (n= 376)		
	No.	%	No.	%	
<b>Sleep</b>					0.000*
Low quality	205	35.6	183	48.7	
High quality	371	64.4	193	51.3	
<b>Attention</b>					0.000*
No attention	240	41.7	90	23.9	
Some attention	300	52.1	250	66.5	
Extreme attention	36	6.2	36	9.6	
<b>Academic achievement</b>					0.004*
Failed	23	4.0	17	4.5	
Pass	49	8.5	31	8.2	
Good	103	17.9	88	23.4	
Very good	106	18.4	93	24.7	
Excellent	295	51.2	147	39.1	

\* Statistically significant at  $p < 0.05$

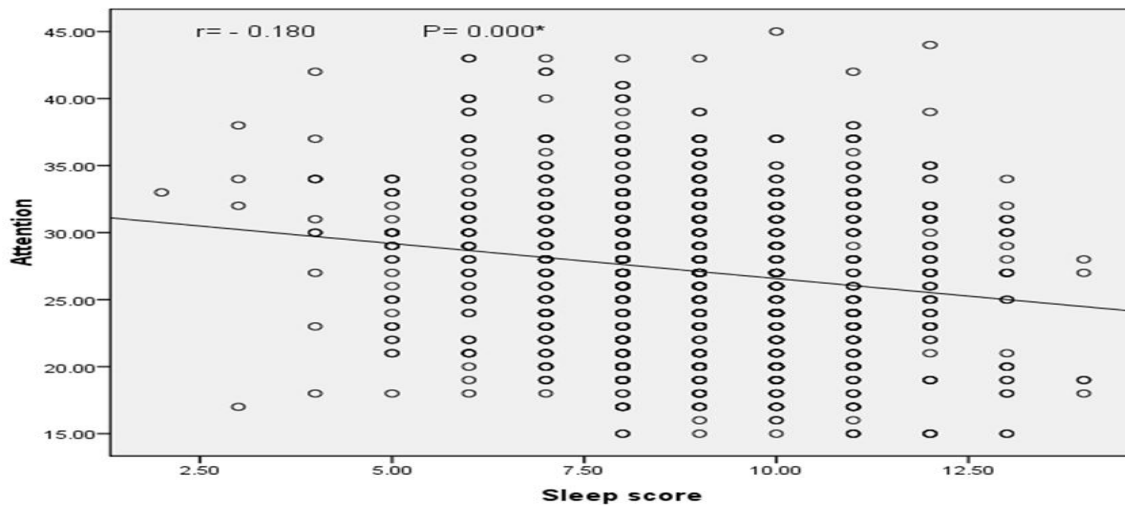


Figure (1): Correlation between attention difficulties and sleep patterns.

Nine hundred and fifty-two students were studied in this study represent the three categories of the secondary schools in Assiut City (technical, public and private); the total number of each category was not different (**figure 1**): More than half of the students (55.7%) their age were  $\geq 16$  years with mean of (15.59) and slightly more than half of them were females. According to birth order, one-third (33.0 %) of the studied students were the first child. The majority of the studied students (70.6%) came from middle social class **Table (1)**.

**Table (2)**: described the distribution of the percentages of the studied students according to their use of general technology. It was found that the most

of the studied students (86.4 %) have computers at home and 44.6 % of them in their bedroom. More than two-fifths of the students mentioned spending 1 to up 2 hours of browsing the internet or playing computer games (43.2 % and 44.5 %, respectively). Regarding cell phone, the majority of studies students (94.3 %) had their own cell phone. Furthermore, (78.9 %) of them mentioned that the cell phone is the first choice in calling their friends with no limitations of SMS number.

As illustrated in **Table (3)**: more than one-third of studied students (39.0 %) were never using the internet for fun after 10:00 pm compared to more than half of them (52.9 %) never used the internet for

education after 10:00 pm. Concerning the students who used nocturnal technology (using the internet for fun, playing computer games, sending and receiving calls) it was found that the higher percentage of them used it several times per week (23.2 %, 8.1 % and 32.8 % respectively). In addition, 35.2 % of the students reported generally sending and receiving SMS and phone call at any time of the night. When asking students about numbers of sleeping while watching television, nearly half of them (47.0 %) reported "never" falling asleep while watching television and only (8.5%) of them reported "every night".

Regarding characteristics of sleep among studied students, it was noticed that about two-thirds of them (64.1 %) reported sleeping for less than 8 hours each night and the main causes of going to bed were feeling sleepy and finishing homework ( 50.8 % and 31.8 % respectively). As for sleep quality, only about one-quarter of the student (24.8 %) never wake up at night. More than one-quarter of the students mentioned that " going to bathroom" and "have not any reasons, I just wake up" were causes of waking up (30.4 % and 27.7 %, respectively) and only 14.4 % of them attributed they're waking up to technology using ( 11.3 % cell phone call, 1.6 % text message and 1.3 % from television). About napping habits, one-third of the students mentioned never napping or napping "only when sick" and the remaining two-thirds of them sometimes taking a nap. More than half of the students (59.1%) reported getting enough sleep, where (29.1%) reported: "too little sleep" and only 11. % of them reported, "too much sleep" (**table 4**).

**From Table (5)**, It is obviously noted that the majority of low social level's students were low nocturnal and general technology users (79.0 % and 85.6 %, respectively) while the majority of high technology users (nocturnal and general) came from high social class (47.7 %, 48.7 % respectively) with statistically significant differences ( $p > 0.001$ ). Regarding types of school, it was found that the higher statistical significant percentage of high technology users (nocturnal and general) were private schools students (53.9 % and 51.1 % respectively) compared to the majority of technical schools students (81.1 % and 70.6 %) had low nocturnal and general use, respectively. Moreover, the table indicated that uses of technology are a gender biased as the higher percentages of the level of high general and nocturnal technology usage (52.9 % and 43.1 %) were males compared to (67.9 % and 66.0 %) of females were low general and nocturnal technology users respectively.

When examining the relationship between presence of computer at bedroom and use of technology

among students, **Table (6)**: Showed that percentage of the high level of using technology (nocturnal and general) were higher among student having computer at home (48.2 % and 43.6 % respectively) compared with those not (5.4 % and 4.7 %) with statistically significant differences ( $p < 0.001$ ). Furthermore, the same table revealed that there was a significant association between usage of technology and presence of a computer at bedroom. It was found the majority of students didn't have computer at bedroom had low uses nocturnal and general technology (73.8 and 74.8 %, respectively) ( $p < 0.05$ ). On the other hand, (62.4% and 54.8 %) of the students having computer at bedroom were high general and nocturnal technology users respectively

In order to assess the relation between technology use and sleep, attention and academic achievement among studied students, **Table (7)**: shows significant associations between high and low technology users and their sleep quantity, sleep quality, attention and academic achievement. It was found that the students with low quality of sleep were high technology users compared to low technology users who reported high quality of sleep ( $p = 0.001$ ). Regarding attention deficit, it was found that no attention difficulties percentage was higher in low technology users (41.7 %) than high those (23.9 %). As for academic achievement, more than half (51.2 %) of low technology users had an excellent score of academic achievement. It is evident that there is a negative impact of high technology use on the students sleep, attention, and academic achievement.

The correlation between students' sleep scores and their attention scores is portaged in **Figure (8)**: It obvious that the more students sleep score increase (high score indicated the high quality of sleep), the attention deficit score decrease with a statistically significant difference ( $P = 0.000$ ,  $R = 0.180$ ).

## Discussion

Modern technology has experienced vast expansion in recent years, leading to its extensive use by people from all generations. The vast majority of adolescents have access to computers, the internet, cell phones, video games, and many other forms of modern technology. The increasing amount of time children spend on modern technology has raised questions about the use of the technology. With the increased role of modern technology in the adolescents' lives has come the increased concern about how children might be affected (**Simuforosa, 2013**).

Results of the present study indicated that the majority of the studied students have computer at home and nearly half of them in their bedroom. These findings are in accordance with **Dehmler, (2009)**

who reported that the majority of adolescents reported having a computer in their home and 30% of them reported having access to a computer in their bedroom. Also the current study's results found that most of the studied students had their own cell-phone. This might be attributed to the parent buy the cell-phone for their children to be aware of their whereabouts. This finding in line with **Lenhart, (2015)** who reported that fully 88% of American Teens ages 13 to 17 have a mobile phone of some kind and a majority of teens have smartphones.

Based on the above findings of the present study (**Tables 2 & 3**): it has become clear that the vast majority of adolescent students have access to computers, the Internet, cell phones, video games, and many other forms of modern technology and they have become an integral part of their life. This finding is in line with the study conducted in Egypt by **Khalil, (2012)** which demonstrated the very high percentages of ownership and utilization of various technologies among the adolescent students.

The technological era has caused transformations on contemporary culture due to the introduction of television and more recently microcomputers into the home. Since the mid-eighties, and with the growth of the Internet and its outstanding position in the media, the habit of "surfing the web" at night has gained popularity and followers, among young people and particularly adolescents. In the present study, more than one-third of the studied students were never using nocturnal technology and the higher percentage of the nocturnal technology user used it several times per week at irregular hours. The same finding was reached by (**Mesquita and Reimão, 2007**).

Gender is one of the predominantly investigated variables seen in this study. While some studies indicated no gender differences in the technology usage, the present study found that the use of technology is a gender biased phenomenon as the higher percentages of the level of high technology users (general and nocturnal) were males. A similar result was found by **Peiró-Velert et al., (2014)** a gender differentiation in some technology usage and (**Yang & Tung, 2007**) who found that males were more likely to become Internet abusers than females.

Regarding socio-economic status (SES), the present study concluded that SES was significantly associated with technology users. It is obviously noted that the majority of high technology users came from high social classes. The researcher hypothesized that it is difficult for children from a low social class to have technology equipment and learn about how to use that technology application. This finding is supported by **Madden, et al., (2013)**, who reported that in overall internet use, youth aged 12-17 that were living in lower-income and lower-education

households are still somewhat less likely to use the internet in any capacity — mobile or wired. In a similar study, **Jackson et al., (2006)**, examined the relationship between socioeconomic status and technology. They found that African Americans from low socioeconomic status tended to use the Internet less often than estimates of European Americans of higher socioeconomic status.

Furthermore, increased availability of Internet access in educational environments has raised the question of whether the level of technology usage may be dependent on the type of schools. In this regard, the current study showed that the higher statistical significant percentage of high technology users were private school students compared to the majority of technical school students who had low technology use. This can be attributed perhaps to teachers, managers, or schoolmates in private schools who encourage and reward students' technology usage. In addition, this result can be logically explained by the low-income status of the technical school students. It is likely that most friends and relatives of them are also of low-income status, and may not have access to the use of technology.

According to guidelines recommended by the **Centers for Disease Control, (2012)**, the average adolescent requires 8.5–9.25 hours of sleep per night. The current study found that about two-thirds of the adolescents included in the study reported sleeping for less than 8 hours each night. The explanation for this sleep pattern is that during this developmental stage, circadian rhythms shift causing teenagers to stay up later, which directly impacts sleep quantity **Carskadon, et al., (2004)**.

Concerning the potentially negative influence of technology use on adolescents' sleep, the study demonstrated that both the heavy use of the nocturnal technology and the presence of the computer in a child's bedroom have been linked to the short duration of sleep, and low sleep quality in children. These findings can be attributed to when students were kept up later at night, either due to Adolescents' internal biological clocks or nocturnal technology usage and were woken up early in the morning for school (the beginning school day in Egyptian schools is around 7 - 8 Am.), it is difficult for them to obtain adequate sleep. Similar findings were reached by **Khalil, (2012)** which revealed both the amount and quality of sleep are negatively affected a statistically significant relation between the feeling of sleep insufficiency and the nocturnal use of and technology, particularly the use of SMS, and social internet.

Also, the present study findings are in congruence with **Dehmler, (2009)** who found that adolescents who reported low levels of nocturnal technology use

reported sleeping longer than those who reported high levels of nocturnal technology use. In addition, **Li et al., (2007)**, the study demonstrated that the presence of media equipment in a child's bedroom and media use were correlated with unhealthy sleep patterns and significantly associated with sleep disturbances.

Some research has indicated that "heavy electronic media use" may be linked to mild attention difficulties (**Schmidt & Vanderwater, 2008**); whereas another research has indicated that spending one-hour playing digital games has been linked to reported attention difficulties (**Chan & Rabinowitz, 2006**).

Similarly, the current study found a significant correlation between the reported technology use level and self-reported attention difficulties where three in four of adolescents' excessive use of technology had some or extreme attention deficit. In congruence with this, **Khalil, (2012)**, found that adolescents' excessive use of technology seems to have a negative impact on their attention.

Sleep is essential for children's health and development and possibly plays an important role in learning and memory. Sleep deficits can cause someone to have difficulty with sustained attention, cognitive speed and accuracy, working memory, reaction time, and overall behavioral capability (**Maquet, 2001**).

Moreover, the relation between students' sleep scores and their attention scores is approached in this study. It was found that there is no statistically significant relation between the reported total sleep hours of the studied students and their attention. On the other hand, when the students' quality of sleep increased the attention deficit score decreased. This is supported by **Steenari et al., (2003)** who concluded that sleep quality rather than sleep duration appeared to be strongly associated with working memory performance. Also, in agreement with **Dworak & Wiater (2013)** who reported disrupted sleep during early childhood and adolescent can result in neurodevelopmental implications and emotional and behavioral consequences including impaired school performance, attention problems and a higher risk for ADHD.

Previous findings regarding technology use and academic achievement have been highly variable. Some indicated that technology has a positive effect on school achievement and other research indicated that it has a negative impact on academic achievement. The findings from the current study found that low technology users had excellent scores of academic achievement than the high technology users. It is possible that students increased use of technology had been accompanied by a decrease in

the amount sleep and an increase in attention difficulties, a fact that might cause students to lose focus on academic tasks and negatively affect their academic results. This finding seems to be congruent with **Zavodyny, (2006)** who asserted adolescents' increased use of modern technology has been accompanied by a decrease in the amount of sleep and increase in attention difficulties and poorer academic achievement.

On the same line, **Khalil, (2012)** reported that the direct relation between technology use and GPA scores gives controversial results, with lower GPA scores among those with excessive use of the internet for educational purposes and also indicated that the excessive use of technology even for educational purposes has a negative impact on school achievement. In addition, **Simuforosa, (2013)** found that when adolescents are exposed to computer games, television or another technological device, this detracts from the quality of sleep adolescents experience and will lead to poor academic performance as day functioning will be affected.

On the other hand, the present study showed that reported high quality of sleep and no attention difficulties percentage were higher in low technology users which indicated low technology usage was associated with better academic achievement. This result is similar to that of **Willoughby, (2008)** who found that adolescents who reported moderate internet use tended to report more positive academic achievement compared to adolescents who reported high levels of internet use.

One of the limitations of the study was that the data related to attention deficit was obtained through a self-report measure. It is possible that if attention difficulties were measured by direct observation, the results may have been different. Another limitation of the study was related to the academic achievement tool in which an average mark was calculated to be used as a global score. It is better to calculate the marks of each subject to determine which one of them is more affected.

## Conclusions

From this study it can be **concluded that** the findings lead to acceptance of our study hypotheses which revealed that the middle adolescents' students, who report higher amounts of nocturnal Technology use, had reported low quantity and quality of sleep and higher levels of attention difficulties and lower levels of academic achievement. Male students use of technology is higher than female students Since the majority of adolescents' students do have personal computers and cell phones, the use of technology was affected by the family socioeconomic status of the

adolescent students, while the low social level's students were low general and nocturnal technology users compared to high social level's students. The students having a computer at home were a high level of using technology (general and nocturnal) and especially with those that had a computer at the bedroom. The high technology users (general and nocturnal) were private schools students compared to the technical schools students. Also our study concluded that there is a negative effect of the excessive technology usage among middle adolescents students on their sleep, and consequently on their attention abilities and academic achievement.

### Recommendations

**Based on the findings of the current study, the following recommendations are suggested**

1. Educational programs should be directed to the adolescent students about property use of technology with explaining the hazard of excessive technology use.
2. More researchers to understand which aspects of media should be reduced and which enhanced.
3. Educational programs to parents and teachers should provide directions about total media use, including the negative effects of media use on health and sleep and provide adequate guidance for adolescents when needed.
4. Restriction of media time should be associated with alternative challenging activities, physical activity, and team sport can absolutely be recommended.
5. Further research is needed to determine the impacts of technology use on the student, social interesting and relationships.
6. More research is also needed on the various cognitive effects of video game play over time.
7. Parents should be aware of children and adolescents bedroom is not a place of technology devices (computer, TV).

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