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The causes of I.C.T. use which increase time spent on the Internet by secondary school students and affect exposure to bullying from other students

Mirjana Radetić-Paić^a  and Valter Boljunčić^b

^aFaculty of Educational Sciences, Juraj Dobrila University of Pula, Pula, Croatia; ^bFaculty of Informatics, Juraj Dobrila University of Pula, Pula, Croatia

ABSTRACT

The goal of the article is to explore the relationship between reasons for using the Internet and time spent on the Internet. The article also deals with reasons for using the Internet and exposure to bullying among adolescents. The survey was carried out on 710 secondary school students, based on a questionnaire about the habits and frequency of using information and communication technology (I.C.T.). The basic statistical values and multiple linear regression analysis were used. Based on the evaluation of the obtained data, the main reason for Internet use are video games, which confirms the first hypothesis, i.e., the relationship between the reason for using the Internet and the time spent using it. The second hypothesis can also be confirmed, i.e., that there is a significant statistical correlation between the time spent using the Internet and exposure to bullying, in the sense that certain reasons for using I.C.T. contribute to lower exposure to bullying. The results point to the resilience factors under consideration in a sense that some of these variables contribute to a shorter use of the Internet, and so to a lower exposure to bullying. Based on the obtained results it is possible to plan further preventive interventions in that sense.

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1. Introduction

In the last decades information and communication technology (I.C.T.) has changed, and is changing, the world dramatically, especially from 2005 with the appearance of the broadband Internet access (Battiti et al., 2005). Such an impact is significant in the life of today's generation of adolescent since they are exposed to I.C.T. from their early days, using the Internet in every aspect of life. The implication of I.C.T. technology is doubtlessly positive, bringing revolution in the field of science, education, culture and entertainment, offering easy access to communications and information (Diomidous et al., 2016). On the other hand, the possible negative aspects of the

CONTACT Mirjana Radetić-Paić  miradet@unipu.hr

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exaggerated use of the Internet, without control, in relations to social, psychological and work environment, cannot be excluded (Nalwa & Anand, 2003).

One of the negative aspects can originate from the increased time spent on the Internet, i.e., Internet addiction. This can lead to a significant decrease of social, professional or academic functioning. A growing number of people are reporting longer times spent on the Internet in order to increase their personal sense of happiness (Moren, Jelenchick, & Christakis, 2013). Internet use, and also other aspects of I.C.T. use on different devices, can somehow blur causes and consequences. Some authors (Aboujaoude, 2017) approached the problem of Internet Addiction Disorder considering different factors, i.e., problematic behavior in virtual environment, needs to distinguish between addiction due to medium or addiction due to content browsing, challenges in defining excessive Internet use since more and more people are present on social networks, leading possibly to a wrong distinction between problems due to the use of the Internet and other gaming platforms, in relation to messaging available on the same platforms (Aboujaoude, 2010; 2017; Griffiths & Szabo, 2014; Starcevic & Aboujaoude, 2017). There is also a problem of terminology of Internet psychopathology, sometimes called Internet Addiction (Young, 2010), or Problematic Internet Use (Demetrovics et al., 2008; Spada, 2014), or Compulsive Internet Use (van Rooij et al., 2010), or Pathologic Electronic Media Use (Pies, 2009).

The other negative aspect of Internet use is (cyber)bullying. This is especially present among young generations, adolescents, provoking in them a sense of loneliness and insecurity. As a consequence, they can become unhappy and frightened, lack self-assurance or unwillingly go to school seeking ways to stay away from other students. Sources and reasons for bullying should be researched more in deep, especially in the case of adolescents, considered the most vulnerable category.

Considering the negative impact of Internet use on adolescents, more precisely secondary school students, since they are the most vulnerable group due to the fact that adolescents spend quite a lot of time on the Internet, sometimes having problems distinguishing between the time spent for educational reasons, and time spent for entertainment (Pontes et al., 2015). There is also, among other things, a lack of monitoring and censorship of their activity on the Internet (Yeap et al., 2015). This, along with other reasons, can contribute to being overexposed to negative aspects of Internet use, one of the most problematic being cyberbullying. Cyberbullying among adolescents can lead to extreme cases, besides the ones before mentioned, even to suicide. Cyberbullying can occur in different forms, not only as aggressive and rough behavior, but also as intimidation (Bishop, 2013). Being exposed to daily cyberbullying can lead to skipping school, being expelled from school, and poorer academic success. There are also other psychosomatic problems, such as headaches, abdominal pains, depression, and low self-esteem, i.e., young people can judge themselves adversely in different fields, such as in general, or in academic or nonacademic achievement than most of their peers (Vejmelka, 2012).

Following this, excessive Internet use and cyberbullying can have an implication on inferior school achievement. Some authors (Tsai & Lin, 2003) state that there were cases in which students were so much occupied with the Internet that they skipped lessons or exams, even when they were conscious that could fail and not be

promoted to the next school year. Internet availability and use spread in the general population, but research of different aspects of behavior in that contest are missing (Jones et al., 2008).

2. Research topic

2.1. The problem under investigation

The main goal of this article is to evaluate the contribution of different variables which describe reasons for I.C.T. use in explaining time spent on the Internet and frequency of bullying among adolescents.

2.2. Research aims

Based on the research, the following aims were established:

- to determine the value of predictive variables which describe reasons for I.C.T. use in correlation to time spent by secondary school students on the Internet,
- to determine the value of predictive variables which describe reasons for I.C.T. use in correlation to the frequency of secondary school students' exposure to bullying from their peers.

2.3. Hypotheses

Following the stated goals, two hypotheses were tested:

H1: There is a statistically significant correlation between reasons for I.C.T. use and time spent on the Internet.

H2: There is a statistically significant correlation between reasons for I.C.T. use and frequency of secondary school students' exposure to bullying from theirs peers.

The purpose of the research was to obtain a deeper insight of the causes of negative aspects of Internet use, such as the negative impact on school performance, and on adolescents' mental health, and possibly prevent, or decrease those aspects.

2.4. Survey group

The sample group in the survey consists of 710 secondary school students from Pula, Croatia, among them 39.3% were male and 60.7% were female students. Considering age, the survey group consists of secondary school students aged 14 to 19, with most of them, a little less than 80%, being between 15 and 17. Considering the grades they attend, the survey group is relatively uniform. More than half of the survey group were students from vocational four-year secondary schools, 40.1% attended Gymnasium, and 6.2% attended three-year vocational schools.

2.5. Variables used in the questionnaire

The questionnaire used was taken from Grist et al. (2018) and is standardised. Questions were formatted in order to evaluate the habits in Internet use of mobile applications with tablets or smartphones, in regard to mental health.

Criterion (dependent) variables used were:

- *How many hours during the working days do you spend on the Internet using a smartphone, tablet or computer* (possible answers on a Likert-type scale: 1 hour, 2 hours, 3 hours, 4 hours, 5 hours and 6 or more hours),
- *How often have you been exposed to bullying (physical attack, mockery, excluded from group ...) from your peers in the last four weeks* (possible answers on a Likert-type scale: never, once, few times, once a week, every day).

2.6. Data processing methods

Data analysis, in addition to calculating basic statistical values, was performed using the multiple linear regression, in the S.P.S.S. licensed computer program. The multiple linear regression used two or more predictor (independent) variables to establish the correlation with one criterion (dependent) variable. Two runs of data processing with same predictor variables were performed.

Main goal of MLR is to obtain functional dependence of criterion variable from predict variables, where linear function is obtained as $x \rightarrow \hat{y} = \alpha + \beta x$ (β and x being vectors in case of multiple linear regression), and here is $y = \hat{y} + \varepsilon$, where y represent observed data, \hat{y} being data obtained using MLR, and ε are residuals. One of the key coefficients obtained using MLR is coefficient of determination, i.e., R^2 (or r^2 in case of linear regression analysis). This coefficient indicates a strength test or index of representativity of MLR analysis, showing proportion of the variance in the dependent variable that is predictable from the independent variables (goodness of fit), and is obtained as:

$$r^2 = \frac{SSR}{SST}$$

where SSR is sum of squares of residuals of variables and SST is the sum of squares of variance of observed values and mean values of dependent variable, i.e., coefficient of determination is calculated as:

$$r^2 = \frac{\sum_{i=1}^n (\hat{y}_i - \bar{y})^2}{\sum_{i=1}^n (y_i - \bar{y})^2}$$

where y represent observed data, \bar{y} being mean of the observed data, and \hat{y} being data obtained using MLR.

Value of coefficient of determination can be in interval $0 \leq r^2 \leq 1$, and regression model is more representative if it is nearer to 1.

2.7. Data collection

The research was conducted in 2019 among secondary school students of Pula, Croatia. During the research ethical standards were respected. The students under survey signed the approval for participation and were, as well as their parents and teachers, informed of the goal of the research and of using data for strictly scientific purposes.

3. Results

Table 1 presents the basic statistical values of the variables considered. *Messaging and phone calls*, and also *playing games* are the most common reasons for using smartphone, tablet or computer, while *online shopping* is the last one. Choices are ranked according to the importance of the reason for I.C.T. use, so *Minimum* denotes a more favourable ranked choice.

Considering the first criterion variable (Hypothesis 1), Table 2 offers answers to the question “*How many hours during the working days do you spend on the Internet using a smartphone, tablet or computer?*” were given. Results show that over 50% of the survey group spend five or more hours using the Internet on working days.

Regarding the second criterion variable (Hypothesis 2) the answers to the question “*How often have you been exposed to bullying (physical attack, mockery, excluded from group ...) from your peers in the last four weeks*” are given in Table 3 showing that a large majority of students were not subject to bullying. On the other hand, in absolute terms, 26 secondary school students were bullied in the last four weeks which is not negligible.

3.1. Results of multiple linear regression analysis of the time spent on the Internet

Firstly, the multiple regression analysis where the criterion variable is time spent using the Internet was considered. The obtained results (Table 4) show that there is a statistically significant multiple correlation coefficient R between the predictor variables and criterion variable, i.e., how well a value of the criterion variable can be predicted using values of predictor variables. So, from the values of predictor variables it

Table 1. Statistical values of variables.

Variables	N	Min	Max	Mean	Std. Dev.
Messaging and phone calls	710	1.00	3.00	2.5511	.6568
E-mail	710	1.00	4.00	2.1509	.7157
Searching the Internet for educational or health reasons	710	1.00	4.00	1.7101	.8182
Searching the Internet for entertainment	710	1.00	5.00	1.7918	.8341
Downloading or watching movies, TV series or listening to music	710	1.00	6.00	2.1079	.8703
playing games	710	1.00	3.00	2.5502	.7395
Reading e-books or listening to audio books	710	1.00	3.00	2.3922	.7230
Reading news, online newspapers or portals	710	1.00	3.00	2.3203	.7348
Online shopping	710	1.00	22.00	1.4656	1.1717
Using social networks (Facebook, Instagram, including blogs and forums)	710	1.00	3.00	2.3723	.7007
Travel and navigation (Google maps, bus schedule, etc.)	710	1.00	3.00	2.1349	.7987
Using different applications (not including social networks)	710	1.00	4.00	1.7000	.9200

Source: Authors' research.

Table 2. Time spent using the Internet on working days.

Time	f	%
1 hour	28	3.9
2 hours	65	9.2
3 hours	111	15.6
4 hours	124	17.5
5 hours	124	17.5
6 or more hours	241	33.8

Source: Authors' research.

Table 3. Frequency of bullying from another adolescent in the last four weeks.

Bullying	f	%
Newer	684	96.3
Once	8	1.1
Few times	17	2.4
Every day	1	.1

Source: Authors' research.

Table 4. Multiple regression coefficient.

	Value
Multiple R	.976
Multiple R^2	.953
Adjusted R^2	.849
F	8.46
p	.014
Std.Err. of Estimate	.787

Source: Authors' research.

Table 5. Multiple regression analysis to determine the time spent using the Internet.

Variables	B	Std.Err. of B	Beta	t	p -level
Constant	8.415	23.98		3.51	.017
Messaging and phone calls	.911	.476	.426	1.914	.114
E-mail	-.612	.563	-.234	-1.086	.327
Searching the Internet for educational or health reasons	.687	.315	.273	2.181	.081
Searching the Internet for entertainment	1.060	.494	.421	2.147	.085
Downloading or watching movies, TV series or listening to music	-1.725	.400	-.672	-4.318	.008*
Playing games	2.072	.478	.824	4.339	.007*
Reading e-books or listening to audio books	-1.335	.361	-.531	-3.698	.014
Reading news, online newspapers or portals	-1.530	.394	-.682	-3.878	.012*
Online shopping	-.440	.332	-.196	-1.325	.242
Using social networks (Facebook, Instagram, including blogs and forums)	.836	.390	.340	2.145	.085
Travel and navigation (Google maps, bus schedule, etc.)	-1.639	.345	-.768	-4.747	.005*
Using different applications (not including social networks)	-.548	.336	-.267	-1.631	.164

Source: Authors' research.

is possible to foresee the time spent on the Internet, since there is almost 98% of joint variance.

Standardised regression coefficient (Table 5) is the highest, thus statistically significant and having a greater effect on the dependent variable, for variables *travel and navigations* (Google maps, bus schedule, etc.), *playing games*, *downloading or watching movies, TV series or listening to the music* and *reading news, online newspapers or portals*. Other predictor variables also contribute in defining the latent criterion, but are not statistically significant predictors of the criterion variable sign. Taking in account the Beta coefficient, most of the aforementioned statistically significant variables have

an impact on decreasing time spent using the Internet, except the variable *playing games*.

3.2. Results of multiple linear regression analysis of the frequency of secondary school students being exposed to bullying from their peers

For the second hypothesis, the results of the multiple linear regression analysis where the dependent variable is the frequency of secondary school students exposed to bullying from their peers (Table 6), show that there is also a statistically significant coefficient of multiple correlation between predictor variables and the criterion variable. Similarly, predictor variables explain 98% of joint variance with the dependent variable. In other words, knowing the predictor variables helps in predicting the frequency of bullying between adolescents.

Standardised regression coefficient (Table 7) is the highest, and also statistically significant for predictor variables *reading news, online newspapers or portals, using different applications (not including social networks), searching Internet for educational or health reasons, online shopping and e-mailing*. Taking into account the sign of the *Beta* coefficient, all of the aforementioned statistically significant predictor variables have an impact on decreasing frequency of secondary school students' exposure to bullying from their peers, thus being factors of resilience to bullying.

In both multiple linear regression analysis the coefficient of determination, i.e., R^2 , as a strength test or index of representativeness of the multiple linear regression analysis, is very good, showing the proportion of the variance in the dependent variable that is predictable from the independent variables (goodness of fit).

Table 6. Multiple regression coefficient.

	Value
Multiple R	.976
Multiple R^2	.954
Adjusted R^2	.842
F	8.55
p	.014
Std.Err. of Estimate	.26

Source: Authors' research.

Table 7. Multiple regression analysis to determine the frequency of bullying from adolescents.

Variables	B	Std.Err. of B	Beta	t	p-level
Constant	6.904	.783		8.820	.000
Messaging and phone calls	-.302	.155	-.431	-1.946	.109
E-mail	-.653	.184	-.760	-3.552	.016*
Searching the Internet for educational or health reasons	-.512	.103	-.621	-4.979	.004*
Searching the Internet for entertainment	5.942	.161	.072	.369	.727
Downloading or watching movies, TV series or listening to music	-.195	.130	-.231	-1.494	.195
Playing games	.191	.156	.232	1.227	.274
Reading e-books or listening to audio books	.305	.118	.370	2.589	.059
Reading news, online newspapers or portals	-.740	.129	-1.01	-5.747	.002*
Online shopping	-.515	.108	-.699	-4.750	.005*
Using social networks (Facebook, Instagram, including blogs and forums)	2.322	.127	.029	.183	.862
Travel and navigation (Google maps, bus schedule, etc.)	-.137	.113	-.195	-1.214	.279
Using different applications (not including social networks)	-.643	.110	-.953	-5.864	.002*

Source: Authors' research.

4. Conclusion

The article's first research topic was to explore the time spent on the Internet by secondary school students regarding the type of Internet use. Results show that when secondary school students use I.C.T. for playing games it is possible to predict that they will spend more hours on the Internet on working days using a smartphone, tablet or computer. For that reason, it is justified to accept the first hypothesis. The incorporation of "Internet gaming disorder" in the fifth edition of Diagnostic and Statistical Manual of mental disorders, DSM-V (Aboujaoude, 2017; American Psychiatric Association, 2013) shows the significance of this problem among the young generation. The problem is that the time spent playing games on the Internet is increasing, from 5.1 hours a week in 2011 to 6.5 hours a week in 2017 (The Nielsen Company, 2017). In this context, research shows that secondary school students who are less academically oriented, spend more time playing games on the Internet, which further complicates their academic achievement by demotivating them for further learning (Bilić & Ljubin, 2011).

The second hypothesis can also be justified. Namely, there is a statistically significant correlation between the reasons for I.C.T. use and frequency of secondary school students' exposure to bullying from their peers, i.e., certainty of Internet use contributes to a decrease in the frequency of bullying especially by those who do not use social networks.

The research also shows that there are multiple positive aspects of Internet use, and most applications are simple to use (user-friendly). Some applications are a quite good tool to facilitate human interaction in the sense of diversity and exchange of ideas, attitudes and opinions, which represents a continuous change in the users' perspective (Chou et al., 2005).

On the other hand, Internet literacy (Leung & Lee, 2012) has positive effects on academic achievement because this kind of literacy means that the person is capable to comprehend, interpret and evaluate the contexts in which certain information is given.

Limitations in the article, considering the interpretation of the results, are primarily related to the standardised instrument meant only for female adolescents, and in this article, differences regarding gender were not analyzed.

The results of both regressions show also some internal factors of resilience in the variables used in the sense that some of them contribute to the decreased time spent on the Internet, i.e., lower exposure to bullying. The significance of the results is that they give an insight into the reasons for Internet use by secondary school students from Pula, Croatia and offer possible directives for planning prevention activities, that is, to invest in resilience factors when there are problems in I.C.T. use in the broader sense.

Disclosure statement

No potential conflict of interest was reported by the authors.

ORCID

Mirjana Radetić-Paić  <http://orcid.org/0000-0002-5256-724X>

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