



Katarzyna Warzecha

University of Economics in Katowice
Faculty of Management
Department of Econometrics
warzecha@ue.katowice.pl

**THE USE OF QUANTITATIVE METHODS
IN RESEARCH ON SELECTED BEHAVIORAL
ADDICTIONS OF YOUNG PEOPLE**

Summary: The aim of this article is to present the use of quantitative methods in research on selected behavioral addictions of young people, and in particular in research on pathological use of the Internet by Silesian young people. Hellwig's taxonomic measure of development was used in the research which allowed the arrangement of districts in Silesia province as regards the availability of the Internet access for young people in schools and the creation of ranking of districts with schools equipped with computers in the highest degree. The use of Czekanowski's method allowed the identification of groups of districts with similar level of the availability of the Internet access for young people in schools. In the conducted analyses, the hypothesis whether the territorial location of researched units influences the availability of the Internet access will be verified. For this purpose the spatial statistics will be used – Moran's measures of local and global autocorrelation. The study will be based on data from the Local Data Bank of Polish CSO (GUS) from 2012 and from own survey study conducted in selected cities of Silesia Province. The Internet addiction will be examined with the use of K. Young's test – Internet Addiction Test (IAT). The calculations will be made in R Cran and Microsoft Excel.

Keywords: behavioral addictions, Internet, young people, spatial statistics, Czekanowski's diagram, K. Young's test.

Introduction

Addictive disorder is the term associated the most with the addiction to psychoactive substances such as: alcohol, nicotine, medicines, drugs or so called "designer drugs" which gain more and more popularity among teenagers every day. The beginning of 21st century is called "the era of new addictions". The

term “behavioral addiction” or “action addiction” is classified as behavioral disorder of addictive nature which is not connected with taking psychoactive substances and its main aim is to perform specific actions in pathological way in order to put the individual in a better mood, improve his lowered self – assessment or gloomy state of mind [Jaraczewska, Adamczyk-Zientara, 2015, p. 53]. The individual is not able to control this addictive behavior despite the fact that it can disturb many spheres of his proper functioning. The main reasons of existence of such addictions are the changes of civilization, fast pace of life and more and more consumerist attitude towards life, stressful life conditions and accompanying negative emotions. The modern individual seeks fast pleasure, immediate gratification and he encounters difficulty in controlling his own impulses [Ogińska-Bulik, 2010]. The behavioral addictions are among others: spending time on the Internet (so called: webaholism), gaming, participation in games of chance (pathological gambling), workaholism, shopping addiction, sex addiction, obsessive and compulsive eating or exercising [Woronowicz, 2012].

According to the specialist literature and research conducted in Poland and all over the world, it is widely known that last years are significant in the increase of troublesome behaviors among children and teenagers. For some behaviors (e.g. aggression, violence, crime, drug addiction or alcoholism) there are available reliable methods of measuring them and effective and practical solutions (so called good practices). But when it comes to new troublesome behaviors among children and teenagers (e.g. computer games or Internet addiction, troublesome use of social media – social webs and mobile phones, gambling, lobbying, cyberbullying, using drastic diets, juvenile prostitution and the phenomenon of sponsorship) there are not enough ready-to-use research tools which could help in fast identification of children and teenagers afflicted with these problems [Jarczyńska, 2014, p. 8-9].

In the further examination the troublesome behaviors among children and teenagers connected with the use of computer and spending time on the Internet for many hours will be described and the quantitative methods used to research the availability of the Internet access for young people in Silesian schools will be presented.

Along with the occurrence of the Internet (at the end of 60s, 20th century) and the development of computerization it is possible to observe (especially among young people) that traditional communication means such as: television, radio, press or books are superseded by so called new media i.e. the Internet or mobile phones. The Internet is the modern tool used for the entertainment and interesting way of spending leisure time for modern young people, it facilitates life in many of its aspects but uncontrolled use of this medium may result in se-

vere disturbances in the areas of mental and social functioning. The computer and the Internet access may addict on the same level with alcohol or other stimulants. The Internet is also a very valuable source of knowledge for young people, on condition that the contents to which teenagers have access are controlled.

1. The use of taxonomic methods in the research of the availability of Internet access for young people in schools

Hellwig's measure of development and Czekanowski's diagram

In the research of the availability of Internet access for Silesian young people in schools the division of researched area for the districts was adopted. Silesia province with the territory of 12 333 km² constitutes 3.9% of the state territory. In administrative division according to the Nomenclature of Territorial Units for Statistical Purposes (NTS4) 17 districts and 19 cities with district status (municipal districts) are distinguished and presented in Figure 1 [www 1; www 2].

The level of availability of the Internet access among young people in schools of Silesian districts was characterized with the use of variables defining its various aspects (variables in division into stimulants and destimulants are presented in Table 1). On the basis of chosen variables the availability of the Internet access was characterized with the use of Hellwig's synthetic taxonomic measure of development (the description of the measure: Zeliaś (ed.) [2000]; Zeliaś (ed.) [1989]; Młodak [2006]; Warzecha [2009]). Hellwig's measure allows the arrangement of the tested units (districts) according to the researched phenomenon.



Fig. 1. Silesia Province with the division for districts in 2012

Source: [www 2].

Destimulants were converted into stimulants, subsequently all of the variables were normalized (due to the fact that our diagnostic variables are in different measure units they cannot be aggregated directly) according to formula (1) with the use of Perkal's Method:

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{S(x_j)} \quad (1)$$

where: \bar{x}_j is the mean value of x_j variable; $S(x_j)$ is the standard deviation of x_j variable.

Subsequently, the Hellwig's taxonomic measure of development (z_i) was calculated, i.e. the synthetic measure of development which takes the values within the range [0,1]. The higher value of this indicator the more favorable position of the object. In extreme cases, the values from outside the mentioned scope may appear which is a signal that the level of development of a given unit is drastically different from other units.

Table 1. Variables characterizing the level of Internet access for young people in schools

Variable and its description	Nature of variable	Coefficient of variation CV [in %]
		2012
X ₁ – number of students per 1 computer with Internet access which is assigned for use by students in upper secondary schools	Destimulant	24.2
X ₂ – number of students per 1 computer with Internet access which is assigned for use by students in secondary schools	Destimulant	20.5
X ₃ – number of students per 1 computer with Internet access which is assigned for use by students in primary schools	Destimulant	22.2
X ₄ – share of upper secondary schools equipped with the computers with Internet access assigned for use by students	Stimulant	19.6
X ₅ – share of secondary schools equipped with the computers with Internet access assigned for use by students	Stimulant	10.9

Source: Own elaboration and calculations on the basis of data from the Local Data Bank of Polish CSO (GUS) [accessible at [www 3](http://www3)].

Hellwig's taxonomic measure of development was calculated according to the formula (2):

$$z_i = 1 - \frac{d_{i0}}{d_0} \quad (2)$$

where: d_{i0} is the distance of i -object from the model object. The value of d_0 is indicated with the formula (3):

$$d_0 = \frac{1}{m} \sum_{i=1}^m d_{i0} + 2 \cdot \sqrt{\frac{1}{m} \sum_{i=1}^m \left(d_{i0} - \frac{1}{m} \sum_{i=1}^m d_{i0} \right)^2} \quad (3)$$

On the basis of the data presented in Table 2 and Figure 2 it is visible that in Silesian districts ranking as regards the availability of the Internet access for young people in schools in 2012 leading positions were held by districts: częstochowski, gliwicki and m. Piekary Śląskie and closing positions were held by m. Jastrzębie-Zdrój, m. Sosnowiec and m. Ruda Śląska.

Table 2. The values of Hellwig's synthetic measure for districts in Silesia Province in 2012

District	z_i	Rank	District	z_i	Rank
częstochowski	0.728	1	bieruńsko-lędzki	0.338	19
gliwicki	0.616	2	m. Siemianowice Śl.	0.333	20
m. Piekary Śląskie	0.594	3	bielski	0.331	21
będziński	0.528	4	zawierciański	0.301	22
pszczyński	0.516	5	rybnicki	0.296	23
m. Dąbrowa Górnicza	0.484	6	m. Katowice	0.290	24
m. Bielsko-Biała	0.467	7	żywiecki	0.279	25
myszkowski	0.466	8	m. Świętochłowice	0.274	26
m. Tychy	0.451	9	wodzisławski	0.267	27
m. Rybnik	0.444	10	raciborski	0.255	28
tarnogórski	0.442	11	m. Częstochowa	0.228	29
m. Chorzów	0.434	12	m. Bytom	0.219	30
kłobucki	0.424	13	m. Mysłowice	0.215	31
m. Gliwice	0.414	14	m. Jaworzno	0.187	32
lubliniecki	0.405	15	m. Zabrze	0.096	33
m. Żory	0.378	16	m. Ruda Śląska	0.002	34
mikołowski	0.356	17	m. Sosnowiec	-0.023	35
cieszyński	0.348	18	m. Jastrzębie-Zdrój	-0.084	36

Source: Own elaboration.

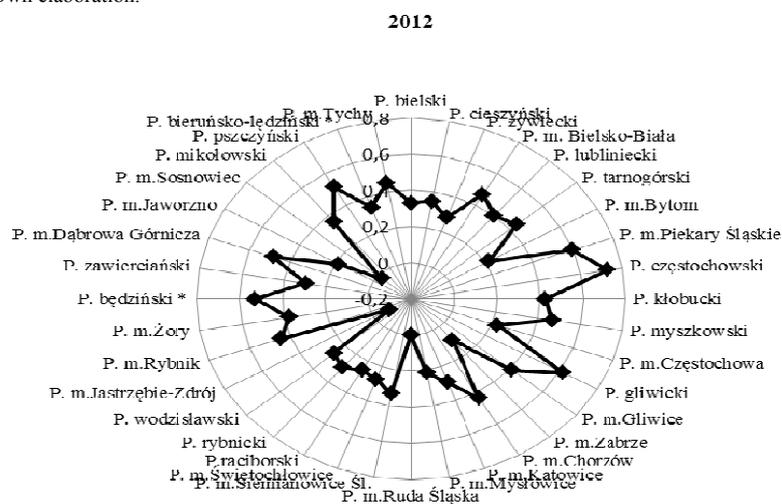


Fig. 2. The distance of researched districts from model according to Hellwig's method in 2012

Source: Own elaboration.

Czekanowski's method belongs to the group of multidimensional analysis methods (the oldest taxonomic method published in 1909 by Czekanowski) and its graphic demonstration is Czekanowski's diagram. The procedure of this method was described in Heffner, Gibas [2007, p. 55]. Czekanowski's method allows the identification of the groups of districts with the similar level of the availability of the Internet access among students in schools. If the groups of districts partially correspond to each other, the division is made on the basis of the shortest Euclidean distance of inconclusively defined district and other districts from possible groups of its affiliation.

The method of arithmetic means was used in order to establish which of the tested characteristics possessed the decisive influence on the division of similar groups of districts made with Czekanowski's method.

The above mentioned method is based on the calculations of the arithmetic means from the primary data: for all of the X_i variables and all of the districts (*general mean*), and subsequently the districts and X_i variables taken into consideration in particular groups of similar districts (*group means*). Next step is the calculation of quotient of group means and general means for every variable. If given $|quotient| > 1$ it proves that the particular variable (characteristic) is dominant in considered group and if $|quotient| < 1$ it informs about the lack of particular characteristic in this cluster [Heffner, 2007, p. 73].

In Table 3, for every group of district clusters which are similar as regards the availability of the Internet access among young people in schools, the quotient values which exceeded 1 were written in bold face, whereas the value of the characteristic which influences the particular group in the highest degree was additionally located on the darker background.

On the basis of Czekanowski's ordered diagram (Figure 3) it is possible to identify 5 groups of districts with similar level of the availability of the Internet access among young people in schools.

1. Group of districts: bielski, m. Gliwice, m. Rybnik, pszczyński, m. Bielsko-Biała, m. Dąbrowa-Górnica, będziński, m. Chorzów, cieszyński.
2. Group of districts: m. Mysłowice, m. Bytom, wodzisławski, m. Częstochowa.
3. Group of districts: żywiecki, zawierciański, kłobucki.
4. Group of districts: lubliniecki, m. Tychy, tarnogórski.
5. Group of districts: mikołowski, m. Katowice, m. Jaworzno, m. Żory, m. Siemianowice Śląskie.

The remaining districts (raciborski, bieruńsko-lędziński, m. Świętochłowice, gliwicki, częstochowski, myszkowski, m. Piekary, rybnicki, m. Zabrze, m. Jastrzębie-Zdrój, m. Ruda Śląska, m. Sosnowiec) do not show sufficiently close similarity with other districts.

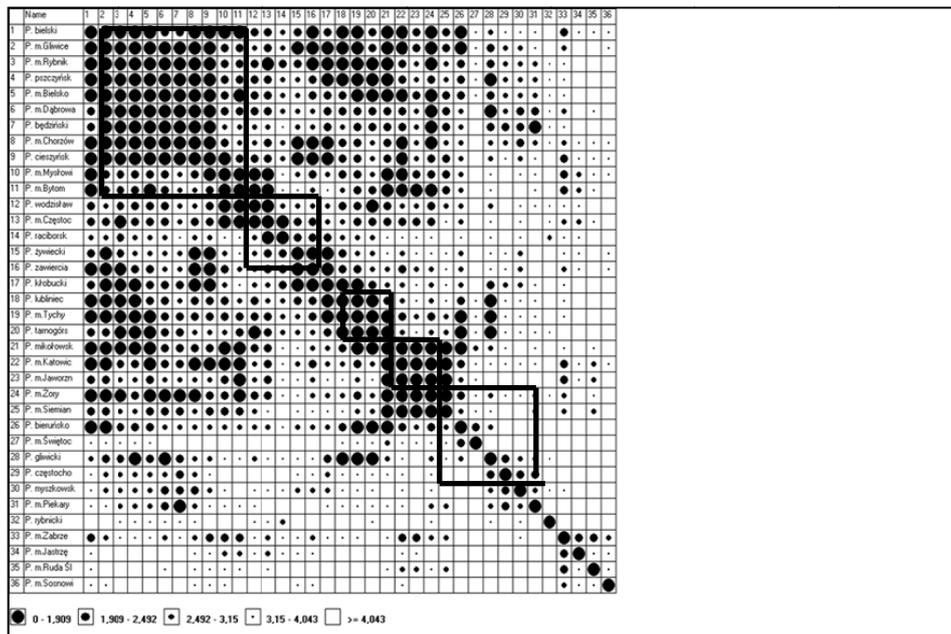


Fig. 3. Czekanowski's ordered diagram for x_1 - x_5 variables, 2012

Source: Own elaboration.

On the basis of the data presented in Table 3 in 2012 in group I which consists of cities with district status, namely: m. Gliwice, m. Rybnik, m. Bielsko-Biała, m. Dąbrowa-Górnica, m. Chorzów and districts such as: bielski, pszczyński, będziński, cieszyński, a percentage share of upper secondary schools equipped with the computers with Internet access assigned for use by students (x_4 variable) and a percentage share of secondary schools equipped with the computers with Internet access assigned for use by students (x_5 variable) were both on the slightly higher level than the mean level in Silesia Province.

Table 3. The comparison of group means with general means, x_1 - x_5 variables, 2012

Group number	Quotient of means for variables:				
	X_1	X_2	X_3	X_4	X_5
1	0.93	0.97	0.95	1.04	1.01
2	1.21	1.12	1.09	0.87	1.07
3	1.10	0.92	0.71	0.94	0.89
4	0.95	0.83	0.86	0.84	1.11
5	0.90	1.01	1.30	0.96	1.00

Source: Own calculations on the basis of data from the Local Data Bank of Polish CSO (GUS).

In 2012, in group II which consists of cities with district status, namely: m. Myslowice, m. Bytom, m. Częstochowa and the wodzisławski district, x_1 , x_2 , x_3 variables obtained higher level than the mean level in Silesia Province. And they are respectively: x_1 variable (students per 1 computer with Internet access which is assigned for use by students in upper secondary schools – 21% higher than the mean level of the whole province), x_2 variable (students per 1 computer with Internet access which is assigned for use by students in secondary schools – 12% higher than the mean level of the whole province) and x_3 variable (students per 1 computer with Internet access which is assigned for use by students in primary schools – 9% higher than the mean level of the whole province). It proves the unfavorable situation for this group of districts compared with other identified groups because all of the variables with the higher level than the mean level of the whole province were destimulants. Only the x_5 variable, namely percentage share of secondary schools equipped with the computers with Internet access assigned for use by students, could be found above the mean level of the province (exactly 7% higher than the mean level of the province) and it proved the favorable situation in this group of districts. The high level of variables with the negative influence on the availability of the Internet access among young people may suggest that group II is one of the “worst”.

In group III, consisting only of districts such as: żywiecki, zawierciański, kłobucki, there was the smallest number of students per 1 computer with Internet access which is assigned for use by students in primary schools (29% below the mean level in the province) which proves the favorable situation of this group of districts but at the same time it proves unfavorable situation as regards the significance of x_5 variable (11% below the mean level of the province). Therefore, those districts possessed the smallest percentage share of secondary schools equipped with computers with the Internet access assigned to use by students.

Group IV, consisting of the city with district status, namely m. Tychy and the districts such as: tarnogórski and lubliniecki turned out to have the best position comparing to other researched groups of districts. In this group, x_1 - x_3 variables could be found significantly below the mean level of the province which means that there was the smallest number of students per 1 computer with the Internet access assigned to use by students in upper secondary schools, secondary schools and primary schools and x_5 variable (percentage share of secondary schools equipped with the computers with Internet access assigned for use by students) could be found significantly above the mean level of the province.

In group V, consisting of the cities with district status such as: m. Katowice, m. Jaworzno, m. Żory, m. Siemianowice Śląskie and mikołowski district, there was the highest number of students per 1 computer with the Internet access assigned to

use by students in primary schools – significantly above the mean level of province (exactly 30% above the mean level of province), whereas the smallest number of students per 1 computer with the Internet access assigned to use by students in upper secondary schools – 10% below the mean level in the province.

2. The use of spatial statistics in the research of the availability of Internet access for young people in schools

Spatial statistics: global and local measures

In the further part of this study the hypothesis whether the territorial location of researched units influences the availability of the Internet access will be verified. For this purpose the spatial statistics will be used – Moran's measures of local and global autocorrelation. The calculations will be made in R Cran and Microsoft Excel.

Spatial statistics are one of the ways of testing the existence of the spatial autocorrelation, whereas the spatial autocorrelation indicates that nearby geographical observations are more similar to each other than distant observations [Kopczewska, 2011, p. 69]. If positive autocorrelation occurs in certain area, this means that there is a spatial cluster with high or low values of observed variables. It indicates that areas with high values of a given variable are clustered with other high value areas, and the areas with low values of a variable are clustered with other low value areas. In case of negative autocorrelation, the high value areas are neighboring to low value areas and vice versa, creating the alternating areas with dissimilar values of a variable (so called checkerboard). The lack of spatial autocorrelation indicates spatial randomness, which means that the high and low values of observed variable are distributed independently [cf. Suhecki, 2010, p. 103].

The measures of global autocorrelation (the Moran's I statistics – the single number indicator of autocorrelation or the general similarity of districts) and local autocorrelation (local Moran's I_i statistics – the statistics calculated for every area and answering the question whether the given area is similar/dissimilar to the neighboring areas) were taken into consideration in this research [cf. Kopczewska, 2011, p. 69].

The global Moran's I statistics is used to test the existence of global spatial autocorrelation and it is defined in formula 4:

$$I = \frac{n \cdot \sum_i \sum_j w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_i \sum_j w_{ij} \cdot \sum_i (x_i - \bar{x})^2} \quad (4)$$

where: x_i, x_j are the values of variable in spatial unit i, j ; \bar{x} is the mean value of variable for all of the spatial units; n is the total number of spatial units that are included in the study; w_{ij} is an element of spatial weights matrix.

The basic element of spatial analysis is determining the structure of neighborhood with the use of spatial weights. The spatial weights matrix can be defined by two categories of neighbors: contiguity-based neighbors and distance-based neighbors. In the research, it is assumed that mutual interactions between districts occur if they have common borders. Therefore, the binary matrix is created (taking the value of 1 if the districts are adjacent or taking the value of 0 if the districts are not neighboring). Next, the matrix created in such a manner have to be row-standardized, that allows the comparison of results of various areas that have been analyzed.

If the values of Moran's I statistics are positive and significant, they indicate the existence of positive spatial autocorrelation, i.e. the similarity between the analyzed objects in defined distance d . The negative values of Moran's I statistics indicate the negative autocorrelation and they refer to so called hot spots, namely the spots with markedly favored values (high or low). The values of statistics which equal 0 indicate the lack of spatial autocorrelation.

The graphic presentation of the Global Moran's I statistics is the scatter plot (Moran scatter plot), which shows local spatial associations (clusters), outliers and spatial instabilities [Anselin, 1995, p. 93-115]. The graph presents a standardized variable (here Hellwig's measure of development) in the x-axis versus the spatial lag of that standardized variable in the y-axis.

The graph divides into quarters in relation to point (0,0). The points situated in the bottom left quarter (LL) indicate the positive spatial autocorrelation and the low values of variable. The points situated in the top right quarter (HH) indicate the positive spatial autocorrelation and the high values of variable. The points situated in the top left quarter (HL) indicate the negative spatial autocorrelation and the high values of variable whereas the points situated in the bottom right quarter (LH) indicate the negative spatial autocorrelation and the low values of variable.

In the described Moran scatter plot the direction coefficient of linear regression is the Global Moran's I statistics (and it is interpreted as the intensity of the association between the degree of access to the Internet by young people in schools and geographical location of districts – therefore, it informs what percentage of the

tested phenomenon occurs in particular area – district and results from the values of this phenomenon in neighboring districts) [cf. Kopczewska, 2011, p. 72-75].

The local Moran I_i statistics allows the identification of spatial accumulation and measures whether the given spatial unit – district is surrounded by neighboring units with similar or dissimilar values of the tested variable in relation to random distribution of these values in space and it is determined by formula 5 [Kopczewska, 2011, p. 90]:

$$I_i = \frac{(x_i - \bar{x}) \sum_{i=1}^n w_{ij} (x_j - \bar{x})}{\sum_{i=1}^n \frac{(x_i - \bar{x})^2}{n}} \quad (5)$$

where: w_{ij} are the elements of first order row – standardized spatial weights matrix W , the other elements of the formula are defined as in the Global Moran's I statistics.

If the standardized Local Moran I_i statistics takes significantly negative values, it indicates that the object i is surrounded by the spatial units – districts with significantly dissimilar values of the tested variable, which should be interpreted as the negative autocorrelation. When the I_i statistics takes the significantly positive values, it indicates that the object i is surrounded by the similar neighboring spatial units – districts and we deal with the positive autocorrelation and clustering of the spatial units.

The Figure 4 below is the graphic presentation of Global Moran's I statistics – the scatter plot which shows local spatial associations and non-standardized observations.

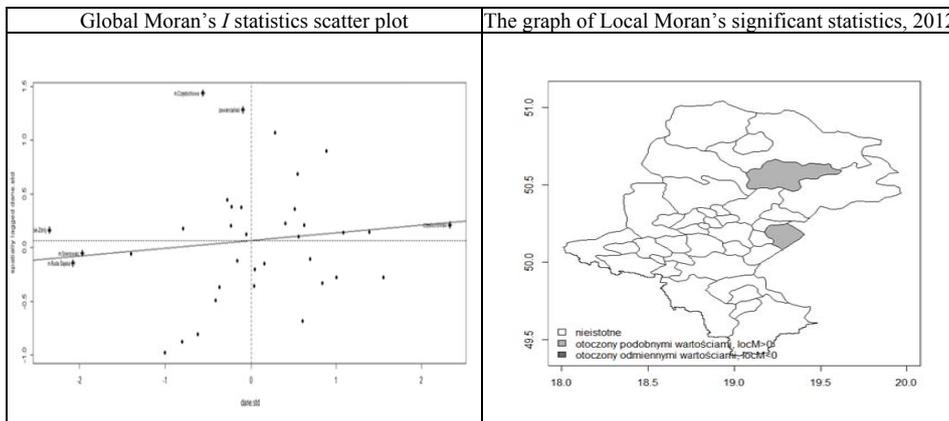


Fig. 4. The graphs of Global Moran's I statistics and Local Moran's significant statistics in 2012

Source: Own elaboration.

The conducted study presented protruding observations, non-standardized, i.e. the districts which protrude significantly from other districts (so-called hot spots). In 2012, protruding districts were as follows: m. Sosnowiec, m. Jastrzębie-Zdrój, m. Ruda Śląska, m. Częstochowa, zawierciański, częstochowski.

The calculated value of Global Moran's I statistics 0.085 (p-value = 0.189 > 0.05) indicates that there was no statistically significant similarity between provinces as regards the availability of the Internet access among students in schools of Silesia Province on the level of districts.

The last stage of the research was calculation of the Local Moran's I_i statistics and in Table 4 statistics which were statistically significant were written in boldface (with the level of significance 0.05). For the majority of districts the Local Moran's I_i statistics was statistically insignificant ($0.05 < \text{p-value} < 0.95$). The p-value which is less than 0.05 indicates that the significant positive spatial autocorrelation occurs, while the values higher than 0.95 indicate the existence of significant negative local autocorrelation.

Table 4. Local Moran's I_i statistics of Hellwig's measure of development in 2012

District	I_i	p-value	District	I_i	p-value
częstochowski	0.498	0.085	bieruńsko-łędziński	0.022	0.421
gliwicki	-0.343	0.811	m. Siemianowice Śl.	-0.913	0.523
m. Piekary Śląskie	0.211	0.321	bielski	-0.055	0.520
będziński	0.164	0.211	zawierciański	-0.131	0.576
pszczyński	-0.281	0.745	rybnicki	-0.014	0.458
m. Dąbrowa Górnicza	-0.285	0.674	m. Katowice	0.144	0.221
m. Bielsko-Biała	-0.088	0.524	żywiecki	-0.062	0.517
myszkowski	0.855	0.031	m. Świętochłowice	0.524	0.124
m. Tychy	0.062	0.417	wodzisławski	0.225	0.354
m. Rybnik	0.142	0.321	raciborski	-0.122	0.544
tarnogórski	0.186	0.245	m. Częstochowa	-0.855	0.881
m. Chorzów	-0.422	0.832	m. Bytom	-0.133	0.595
kłobucki	0.378	0.216	m. Mysłowice	0.741	0.056
m. Gliwice	0.088	0.425	m. Jaworzno	1.025	0.033
lubliniecki	0.322	0.211	m. Zabrze	0.081	0.355
m. Żory	-0.035	0.455	m. Ruda Śląska	0.298	0.166
mikołowski	-0.011	0.485	m. Sosnowiec	0.105	0.375
cieszyński	-0.009	0.470	m. Jastrzębie-Zdrój	-0.388	0.814

From the data presented in Figure 4 and Table 4 it follows that in 2012 the Local Moran's I_i statistics was significant and higher than 0 only for districts such as: myszkowski (0.855 p-value 0.031) and m. Jaworzno (1.025 p-value 0.033) which indicates that those districts are surrounded by districts with significantly similar values of the tested variable. Those districts are so called clusters.

3. The equipment of young people with modern means of communication – the Internet addiction risk

According to the Local Data Bank of Polish CSO (GUS) research [www 4] in 2014 74.8% of researched households in Poland possessed the Internet access in home, with the reservation that the Internet access is more popular in households with children than in households without children. The use of the information and telecommunications technology is on the higher level in the younger groups submitted to the research and it equals 94% of researched households with the Internet access and with the children as the members of those households. It seems that young people are very particular population from the perspective of use of the information and telecommunications technology in everyday life. Local Data Bank of Polish CSO (GUS) research indicates that almost the half of the researched 12-15 year olds accessed the Internet outside their homes with the use of mobile phone or smartphone. The laptop computer was used to access the Internet outside the house by almost 1/3 of researched young people in age 12-15. The share of the people using the mobile tools to access the Internet outside the house was higher in case of 12-15 year olds than in 16-74 year olds. In case of the mobile phones it was 18.9% higher and in case of the laptop computers it was 9.1% higher. Smartphones were used by young people mostly to listen to the music, to connect to social media and to play the games where the share of 12-15 year olds using smartphones equals respectively to 26.8%, 26.3% and 23,5%. In the researched group, there is visible a disproportion as regards the sex in case of the use of the smartphone to play the games, watch films and listen to the music (the percentage was higher in boys than in girls respectively: 9.2%, 6.5% and 5.1%).

The main aim of the conducted author's own research was the investigation of the level of the equipment of Silesian young people between 13 and 29 years old with modern means of communication with the access to the Internet and the research with the use of K. Young's screen tests – Internet Addiction Test (IAT) to establish what percentage of Silesian young people is at the Internet addiction risk and is addicted to the Web. The research was conducted with the use of self-administered survey on the purposefully chosen quota sample of young people in several cities of Silesia Province (Katowice, Mysłowice, Zabrze, Jaworzno, Sosnowiec) between December 2013 and May 2014. The surveyed young people attended to secondary schools, upper secondary schools and universities. The sample (after rejecting the surveys that were filled in incorrectly) encompassed 1037 people between 13 and 29 years old (including 319 university students, 470 upper secondary school students and 248 secondary school students).

The described results are the part of the research which is available among other author's studies [Warzecha, 2014a; 2014b; 2015a; 2015b; 2015c; 2015d].

The IAT test used in the research is one of the most popular tests among screen tests employed to research the Internet addiction. Its high psychometric features are validated (the coefficient of the test validation – Cronbach's alpha is high and it equals 0.89). The full description of the test can be found in studies Young [1998]; Warzecha [2014a].

As it is shown in Figure 5, the surveyed students are quite well equipped with modern means of communication but the group with the best equipment is upper secondary school students. The desktop computer is available to about 80% of university students and upper secondary school students and about 37% of surveyed secondary school students. Less than 90% of surveyed university students, 80% of upper secondary school students and 43% of secondary school students owns a laptop computer. About 77% of upper secondary school students, 70% of university students and about 32% of secondary school students owns a mobile phone. Smartphone was in possession of about 71% of university students, over 61% of upper secondary students and about 38% secondary school students, and the more and more popular among young people tablet was the property of every third upper secondary school student and of every fourth secondary school student and university student.

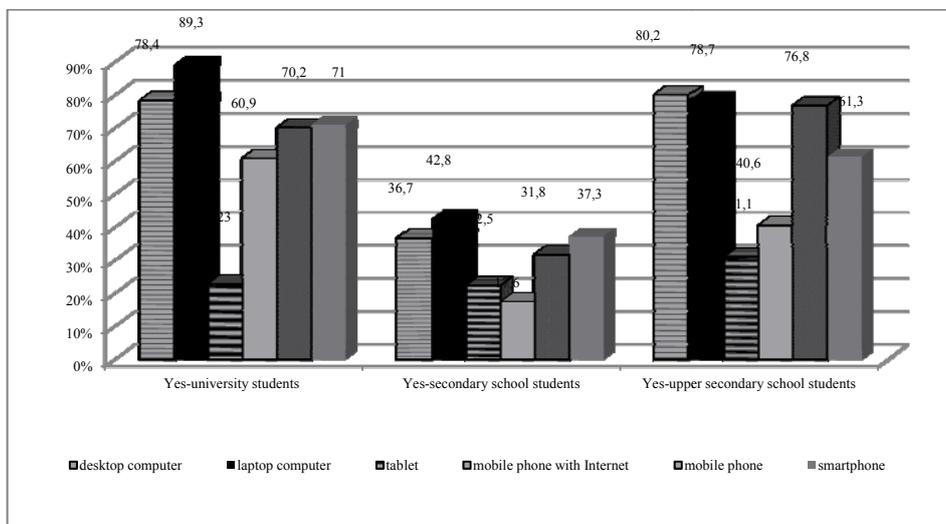


Fig. 5. The equipment of Silesian young people in modern means of communication according to school type (results in percentage)

Source: Elaboration on the basis of own research.

The results of Kimberly Young's test – Internet Addiction test (IAT) of the researched group of students between 13 and 29 years old are presented in Table 5 in general and with the division for the sex.

Table 5. The number and the percentage of students at risk and with no risk of the Internet addiction, in general, according to school type and with the division for the sex¹

Type of school	No risk group		Group at risk*		Total N = N ₁ + N ₂
	N ₁	%	N ₂	%	
Young people in general	591	57.0	446	43.0	1037
Women	363	60.5	237	39.5	600
Men	228	52.2	209	47.8	437
University students	179	56.1	140	43.9	319
Secondary school students	148	59.7	100	40.3	248
Upper secondary school students	264	56.2	206	43.8	470

* The people who were addicted to the Internet constituted insignificant percentage of the surveyed people (it was 2.8% in secondary schools: 6 women and 1 man, 2.8% in upper secondary schools: 8 women and 5 men, 2.5% in university students: 5 woman and 3 man) therefore they were classified in the further research and analyses as the people at risk of the Internet addiction.

Source: Elaboration based on own research, partial results available in studies of Warzecha [2014a].

On the basis of the general results obtained by Silesian young people in IAT scale (Table 5) 28 people (2.7%²), from the 1037 people of researched students, fulfilled – defined by Young – criteria of the Internet addiction, 446 people (43%) fulfilled the criteria of being at risk with the addiction to the Web and 591 people (57%) were not at risk of the Internet addiction. As it is visible in author's previous research (data presented in Table 5), the highest number of people at risk with the Internet addiction could be found among university students (43.9% of people at risk of the Internet addiction and addicted to the Internet are the university students), then there are upper secondary school students (43.8% of people at risk of the Internet addiction and addicted to the Internet are the upper secondary school students) and at the end there are the secondary school students (40.3% of people at risk of the Internet addiction and addicted to the Internet are the secondary school students).

¹ In the research of the Internet addiction with the use of Young's IAT test various criteria of who is qualified as a person pathologically using the Internet (addicted to the Internet) are assumed. In the research, the division of K. Young was employed and described in the instruction to the test realization [Young, 1998, p. 237-244].

² The similar research results with the use of Young's IAT test – 2.8% of surveyed people fulfilled the criteria of the Internet addiction, and 39.5% of surveyed people fulfilled the criteria of being at the risk of the Internet addiction. Data on the basis of Pawłowska, Potembska [2011, p. 439-442].

The general results of the test in IAT scale, obtained by the Silesian young people with the division for sex, indicate that more men than women are at risk of the Internet addiction (about the half of surveyed men (47.8%) was at risk of the Internet addiction and addicted to the Internet, in comparison to 39.5% of women who were at risk of the Internet addiction and addicted to the Web).

Conclusions

The computer with the Internet access, and in particular more and more popular laptop computer and mobile phone or smartphone are nowadays the most popular modern means of communication of contemporary young people. The Internet, as an informational medium, helps young people in obtaining and broadening the knowledge but at the same time, if inappropriately used, may lead to addiction. That is why, the constant monitoring of young people's Internet activity by their parents is so important.

The quantitative methods shown in this study are very useful tools to research the availability of the Internet access among young people in schools (Hellwig's method, Czekanowski's diagram, methods of spatial statistics). According to the available subject literature the spatial methods are used more frequently in the analyses of economic and demographic processes [Zeug-Żebro et al., 2014; Wolny-Dominiak, Zeug-Żebro, 2012, Warzecha, Wójcik, 2015e].

Hellwig's taxonomic measure of development, which was used in the research, allowed the arrangement of Silesia Province districts as regards the availability of the Internet access among young people in schools and the creation of a ranking of districts with schools equipped with computers in the highest degree. With the use of Czekanowski's method group of districts with similar level of the availability of the Internet access among students in schools was identified.

On the basis of the current and the previous author's research [Warzecha, Wójcik, 2015e] it is possible to ascertain that over a span of 10 years (analyzed years 2003, 2008, 2012) there is a significant change in the availability of the Internet access among young people in schools in Silesia Province. The worst conditions are invariably in Sosnowiec, Ruda Śląska, Jaworzno and Zabrze. The best conditions are in częstochowski and gliwicki districts and in Piekary Śląskie.

When it comes to the estimation of the equipment of Silesian young people with the modern means of communication it is clearly visible that upper secondary school students possess the best equipment, further on university students and at the end secondary school students.

The results of K. Young's screen tests indicate that being at risk of the Internet addiction and being addicted to the Internet is the characteristic seen more often at men's group than in women's group. Moreover, the highest number of university students and upper secondary school students fulfilled the criteria of being at risk and being addicted to the Web.

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**ZASTOSOWANIE METOD ILOŚCIOWYCH W BADANIACH
WYBRANYCH UZALEŻNIEŃ BEHAWIORALNYCH MŁODZIEŻY**

Streszczenie: Celem artykułu jest pokazanie zastosowania metod ilościowych w badaniach wybranych uzależnień behawioralnych młodzieży, a w szczególności w badaniu patologicznego używania Internetu przez śląską młodzież. W badaniach wykorzystano taksonomiczną miarę rozwoju Z. Hellwiga, która pozwoliła na uporządkowanie powiatów województwa śląskiego pod względem dostępności do Internetu młodzieży w szkołach i stworzenie rankingu powiatów najlepiej wyposażonych szkół w komputery. Zastosowanie metody Czekanowskiego pozwoliło na wyodrębnienie grup powiatów o podobnym poziomie dostępności do Internetu uczniów w szkołach. W prowadzonych analizach sprawdzono także hipotezę, czy na dostępność do Internetu ma wpływ położenie terytorialne badanych jednostek (w tym celu wykorzystano statystyki przestrzenne: mierniki lokalnej i globalnej autokorelacji Morana). W badaniach opierano się na danych pochodzących z Banku Danych Lokalnych GUS z 2012 oraz z badań własnych (ankietowych) przeprowadzonych w wybranych miastach województwa śląskiego. Uzależnienie od Internetu zbadano za pomocą testu K. Young – Internet Adiction Test. Obliczenia przeprowadzono z wykorzystaniem programu R Cran, pakietu Excel i SPSS.

Słowa kluczowe: uzależnienia behawioralne, Internet, młodzież, statystyki przestrzenne, diagram Czekanowskiego, test K. Young.