

CHARACTERISTICS OF INTERNET USE AMONGST ITALIAN UNIVERSITY STUDENTS

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SUMMARY

Background: Problematic Internet use (PIU), that may be defined as the inability to control one's use of Internet with negative consequences in daily life, is an emerging problem involving primarily, but not only young generations. Different studies have shown that students are particularly vulnerable to PIU. Given the paucity of information on PIU in our country, the aim of this paper was at investigating the characteristics of PIU amongst Italian University students.

Subjects and methods: A self-assessment questionnaire, referred by the acronym QUNT ("Questionario sull'Utilizzo delle Nuove Tecnologie"), composed by 101 items grouped together to identify a series of factors, was developed and sent through e-mail invitation to several students from three Italian Universities.

Results: The returned questionnaires were 3324, out of a total of 51,304 sent, with no difference between the two sexes. On the contrary, the distribution of the QUNT factors was different in the two sexes, in people living alone and in overweight subjects. Men resulted to be more involved in online recreational activities, whereas women seemed more attracted to instant messaging and generally to social networks. PIU was significantly more present in men than women. The comparisons of QUNT factor scores in the four BMI categories showed that the greater the BMI the greater the score of some factors.

Conclusions: The findings of the present study indicate that the use of Internet through new technologies may exceed its real utility amongst Italian university student, with some sex-related differences. Men seem more prone to use Internet for passing time and women for social relationships. Men are also at risk of developing PIU. Again, Internet use might be a basic vulnerability factor of increasing weight gain and obesity amongst young people.

Key words: new technologies- Internet - social network - problematic social media use - university students

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INTRODUCTION

Problematic Internet use (PIU) or Internet addiction is a behavioral addiction that is attracting increasing attention and warning given the wide spread of Internet everywhere (Christakis 2010). It has been included in the section 3 of DSM-5, reserved to conditions that require further research before they can be formally considered 'full disorders' (Block 2008, American Psychiatric Association 2013, Kuss et al. 2014). Indeed, while the Internet became commercially available in the early 1990s and is relatively young, in comparison to abuse drugs, only recently it has been considered a major treat to society due to its addictive nature. According to the Internet World Stats, Pigdom, a society that features up to date world Internet usage, population statistics and other issues (Miniwatts 2017), it was estimated that at the end of June 2017 more than 7,500,000,000 of the world's population uses the Internet. With no doubt, we cannot disregard that Internet has promoted the rapid and easy access to any kind of information, while representing an extraordinary tool to communicate and even to entertain (Valkenburg & Peter 2011, Ryan et al. 2014). In any case, for too many

people, and especially younger generations, the so-called digital natives who are exposed since their infancy to Internet tools to play, communicate and interact, Internet is no more a tool, but a scope, sometimes the sole scope of everyday life and, as such, it may become an addiction (Council On Communications & Media 2016, Reid Chaisakos et al. 2016).

The term Internet addiction was coined ironically in 1995 by Ivan Goldberg a newyorker psychiatrist to label those individuals who declared to use Internet between 8 and 60 hours a week. It was then found that 65 of Internet users fitted the profile typical of addicted subjects, according to DSM-IV criteria (Goldberg 1995). Problematic Internet use is defined as "inability to control one's use of the Internet which leads to negative consequences in daily life", and can be classified in cybersex addiction, cyber relationship addiction, net gaming or net compulsion, information overloaded, and computer addiction (role play video-games) (Scherer 1997, Young 1999, 2001, 2003). Currently, the Internet gaming disorder has been included in the last edition of DSM, the DSM-5 in the section 3 only, and not as a distinct nosological category (APA 2013).

Nowadays, no precise and validated criteria are still available to diagnose PIU that is reported to have a current prevalence ranging between 3% and 26% amongst university students from different countries (Morahan-Martin & Schumacher 2003, Niemz et al. 2005, Ni et al. 2009, Frangos et al. 2010, Christakis et al. 2011, Canan et al. 2012, Durkee et al. 2012, Li et al. 2015). From the nosological point of view, much disagreement exists as to whether PIU is a behavioral addiction, an impulse control disorder, a subtype of obsessive-compulsive disorder (Shapira et al. 2000, Beard & Wolf 2001, Davis 2001, Block 2008, Zhang et al. 2008, Tao Huang et al. 2010, Van Rooj et al. 2010, Starcevic 2013, Van Rooj & Prause 2014, Starcevic & Billieux 2017), or a maladaptive coping response to stress (Chakraborty et al. 2010, Caselli et al. 2012, Carli et al. 2013, Li et al. 2015). A recent study showed the results of standardized measures and focus group discussions indicating substantial overlap between students' experiences of PIU and signs and symptoms listed in DSM-5 criteria for different disorders, specifically substance use disorder, gambling disorder, and Internet gaming disorder (Li et al. 2016).

Symptoms of PIU encompass those typical of addiction such as craving, dependence, tolerance and abstinence, as well as worries with Internet activities, inability to reduce its use that serves also to reduce stress/anxiety and to increase mood, or to replace other activities and relationships (Lortie & Guitton 2013, Marazziti et al. 2015). The Internet use may continue in spite of the awareness of the detrimental consequences, and is not recognized to be a problem (Young 1998, Spada 2014, Li et al. 2015). Again, it may be complicated by sleep, seclusion, delay of work, disregard for normal drives, impaired quality of family and social life, problems with partner/friends/relationships, loneliness, loss of real friends/peers/partners (Morahan-Martin & Schumacher 2003, Dong et al. 2011). Converging data would indicate also that PIU may led to a wide range of negative consequences such as depression (Ko et al. 2010, Park et al. 2013), social phobia or isolation, until the extreme social withdrawal defined by us "technological autism" (Wei et al. 2012, Li et al. 2015), sleeplessness and stress-related disorders (Lam 2014, Li et al. 2015). The sum of sleeplessness and stress system activation following PIU coupled with sedentary life habits has been also related to obesity (Vandelanotte et al. 2009, Lam 2014, Hoare et al. 2016), and to increased attention and cognitive disturbances with poorer school performances amongst students of different nations (Derbyshire et al. 2013, Sernomanci et al. 2014). Further, some studies found an association with substance abuse, self-injurious behavior, increased impulsivity and even suicide attempts (Lam et al. 2009, Yen et al. 2009, Lee et al. 2012, Sun et al. 2012, Li et al. 2015, Baroni et al. 2019).

Given the limited information available in our country, the primary aim of this paper was at investigating the characteristics of Internet use, through latest techno-

logies (PCs, smartphones and tablets), amongst Italian University students by means of a specific questionnaire developed by us. The secondary aims were at exploring the presence and prevalence of PIU, and the possible relationships between characteristics of Internet use, PIU and different categories of the body mass index (BMI).

SUBJECTS AND METHODS

A specific interactive platform and website (<http://dronet.araneus.it/questionario>) on new technologies were created on an external server. The platform allowed access to the self-assessment questionnaire only via the Internet.

On the same time, a self-assessment questionnaire, referred by the acronym QUNT ("Questionario sull'Utilizzo delle Nuove Tecnologie") was developed. The QUNT consists of two sections, one for demographic data and another including 101 items. Forty-five, out of the total 101 items consisted of five possible answers, according to a Likert five-point scale with 1 indicating 'completely false' and 5 indicating 'completely true'; three items were multiple-choice questions; ten were focused on the use of "instant messaging" (with five possible answers, according to a Likert five-point scale with 1 indicating 'completely false' and 5 indicating 'completely true'), and 42 items on the use of "social networks" (instant messaging: whatsapp, telegram, skype, and social networks: facebook, twitter and instagram) (with five possible answers, according to a Likert five-point scale with 1 indicating 'completely false' and 5 indicating 'completely true'). The item #101 was actually a question on the liking/utility or not the questionnaire.

The items considered of greater relevance were put together in order to identify factors built according to "a priori" criteria extrapolated from the data available in scientific literature (Berad & Wolf 2001, Caplan 2002, Caselli et al. 2012, Lortie & Guitton 2013). These factors were "time spent online" (item 2, 3, 4, 5, 6, 7, 25, 33), "social withdrawal" (item 8, 10, 18, 22, 30, 35), "abstraction from reality" (item 11, 13, 24), "loss of control" (item 19, 20, 32, 36), "addiction to pornography" (item 26, 27), "ludopathy" (item 40 a-1, 41, 42, 43), "addiction to social networks". (49, 50, 51, 52, 53, 54, 55, 56, 57). The "addiction to social networks" factor was further divided into the following sub-factors: "addiction to facebook" (item 60 a.d, 61-75), "addiction to twitter" (item 76-86), "addiction to instagram" (item 86-97).

The factor scores were calculated as sum of the scores obtained in each item divided the maximum score in percentage.

We chose the answer 4 (between four and six hours a day) or 5 (> six hours a day) of item 2 "time spent online", as the cut-off point to identify the possible presence of PIU, according to current literature, although controversies do exist (American Psychiatric Association 2013).

In collaboration with the Deans of the Universities of Pisa, Brescia and Naples and the Directors, respectively, of the Psychiatric, the Psychology and the Psychiatry Departments of the local Medical schools, an e-mail invitation was sent to all students of all faculties to ask them to complete the questionnaire in the period November 2015 - January 2016. A second mail was sent as a reminder after two months. The access to the questionnaire was possible through email invitation only. In no way, it was possible to identify the participants whose anonymity was warranted.

We obtained the approval from the Ethics Committee of Pisa, the organizing centre, that is considered sufficient also for the other centres. In addition, at the very beginning, the study had already been approved by the Presidenza del Consiglio dei Ministri" of the Italian Government.

Statistical analyses

The following analyses were used for the primary aims. The independent t-test was applied to compare the mean scores of the factors on the basis of these variables: sex (M/F); single (yes/no); living together (yes/no).

As for the secondary aims, the chi-square analysis was used to compare categorical variables, the prevalence of PIU and its difference between the two sex. The One-Way ANOVA followed by Bonferroni's test for post-hoc was used to assess the comparisons of QUNT factor scores in the four BMI categories.

All statistics were carried out by the Statistical Package for Social Sciences (SPSS), version 22 (IBM Corp. 2013).

RESULTS

The returned questionnaires were 3324 (6.47%), of which 1754 (51 %) from women and 1570 (49%) from men, out of the total of 51,304 sent to students. They were distributed as follows: 2022 belonging to the

University of Pisa, 798 to that of Brescia, and 326 to that of Naples. The mean age of participants was: 23.4 ± 5 years, with no difference between the two sexes (23.4 ± 4 and 23.3 ± 5 years, in men and women, respectively), or amongst the three centers. The students were evenly distributed amongst the different faculties. In Pisa only, there was a slight, albeit not significant preponderance of students of computer science. Almost all students declared that the smartphone was the most used device to access to Internet.

One thousand nine hundred ten subjects were involved in a love relationship and the remaining 1414 ones were single. Four hundred ten subjects of the first group lived with the partner.

Some significant differences were observed in the QUNT factors according to sex. Generally, men spent more time on line than women, although the difference was not significant (mean score \pm SD: 2.72 ± 0.70 vs. 2.69 ± 0.69 hours in men and women, respectively; $p=0.338$). However, those subjects (1239, 37.3 %) who were probably affected by PIU, according to the set point defined by us (answer 4 or 5 of item #2), were predominantly men than women (632, 38.8% vs 497, 33.3%; $p<0.001$) (Figure 1).

The distribution of the QUNT factors was different in the two sexes. Men showed significantly higher scores (mean \pm SD) than women at the following factors: "social withdrawal" (1.43 ± 0.48 vs. 1.33 ± 0.39 , $p<0.001$); "abstraction from reality" (1.76 ± 0.69 vs. 1.69 ± 0.62 , $p=0.005$); "loss of control" (1.52 ± 0.57 vs. 1.46 ± 0.53 , $p=0.002$); "pornography addiction" (2.02 ± 0.74 vs. 1.24 ± 0.46 , $p=0.0001$); "ludopathy" (2.04 ± 1.07 vs. 1.55 ± 0.76 , $p=0.002$), and "addiction to twitter" (1.34 ± 0.52 vs. 1.26 ± 0.45 , $p=0.012$). Women showed higher scores (mean \pm SD) than men at the following factors: "addiction to instant messaging" (2.88 ± 0.83 vs 2.66 ± 0.82 , $p<0.001$); "addiction to social networks" (SD 2.11 ± 0.59 vs 2.00 ± 0.61 , $p<0.001$); "addiction to facebook" (2.11 ± 0.59 vs. 2.00 ± 0.61 $p<0.001$), and "addiction to instagram" (2.18 ± 0.73 vs. 1.96 ± 0.69 respectively, $p<0.001$) (Figure 2).

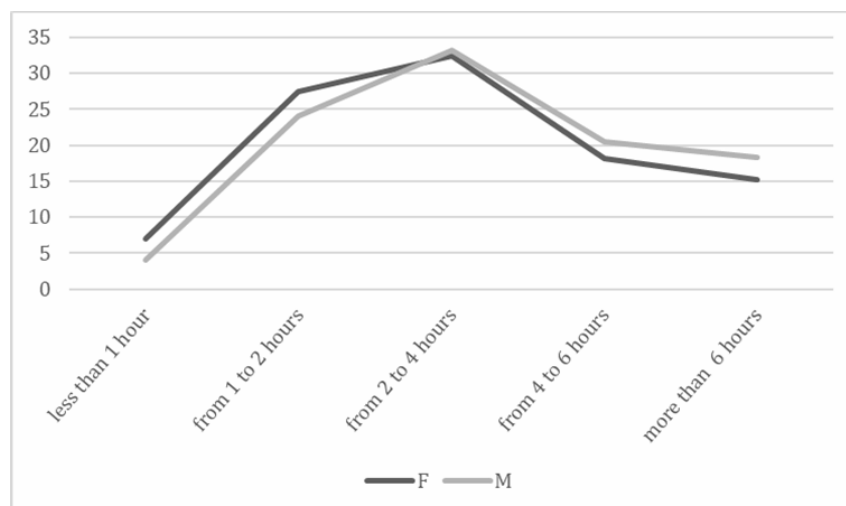


Figure 1. Distribution of the QUNT factors in men and women

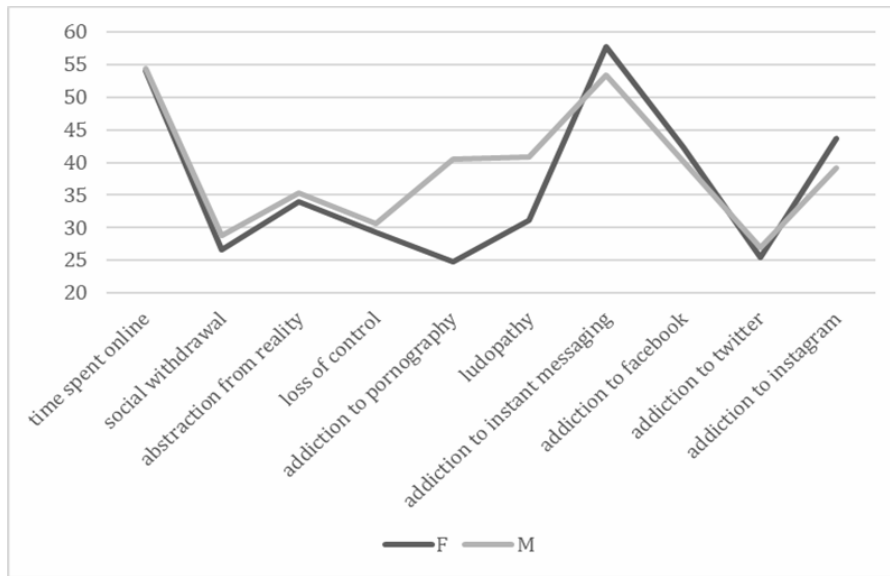


Figure 2. Distribution of the "time spent online" factor in men and women

Table 1. Comparisons of QUNT factor scores in the four BMI categories

Factors	UW	NW	OW	OB	F	p	Post-hoc comparison: significant differences (p<0.05)
Time spent online	52.24±13.58	53.96±13.17	55.51±12.77	55.73±14.54	3.88	0.009	OW>UW
Social withdrawal	25.69±6.65	27.44±8.61	28.53±9.74	30.41±10.04	9.90	<0.001	OW>UW; OB>UW; OB>NW
Abstraction from reality	32.48±11.52	34.46±13.13	35.31±13.98	36.01±13.54	2.68	0.045	none
Loss of control	28.40±8.81	29.89±11.12	30.34±11.39	31.11±11.81	1.91	1.91	none
Addiction to pornography	27.12±11.76	31.79±14.27	34.97±14.88	36.38±16.79	18.66	<0.001	NW>UW; OW>UW; OB>UW; NW>UW; OW>NW; OB>NW; OB>NW
Ludopathy	33.06±17.97	36.03±18.85	39.68±22.41	41.06±23.39	4.26	0.005	OW>NW
Addiction to instant messaging	55.05±16.33	56.02±16.47	54.24±17.36	55.40±19.09	1.62	0.181	none
Addiction to facebook	41.50±11.61	41.13±12.15	41.30±12.17	43.64±13.90	1.71	0.162	none
Addiction to twitter	24.17±5.36	26.00±9.73	25.98±10.11	30.80±12.24	4.97	0.002	OB>UW; OB>NW; OB>OW
Addiction to instagram	45.42±15.28	41.85±14.70	41.24±14.03	42.09±13.45	1.51	0.210	none

BMI: body mass index; UW: underweight; normal weight: NW; OW: overweight; OB1: obesity; OB2: second degree of obesity; OB3: third degree of obesity

The analysis of the difference in QUNT factors according to being single or involved in a love relationship led to the following results. Single subjects showed significantly higher scores at the following factors: "time spent online" (2.75±0.67 vs 2.67±0.64, p<0.001); "social withdrawal" (1.40±0.45 vs 1.36±0.42 p=0.007); "abstraction from reality" (1.80±0.70 vs 1.66±0.62, p<0.001); "loss of control" (1.52±0.76 vs 1.46±0.67, p<0.001); "addiction to pornography" (1.73±0.59 vs 1.52±0.51, p<0.001); "addiction to facebook" (2.11±0.64 vs 2.02±0.58, p<0.001); and "addiction to twitter" (1.37±0.57 vs 1.24±0.40, p<0.001).

There were some differences even on "addiction to instant-messaging" "addiction to instagram" factors, but they did not reach the statistical significance.

The analysis of the differences between partners living or not living together (Total: 1910; 410 vs 1500)

showed some significant differences. The following factors showed higher scores in subjects who did not live with the partner vs those who lived with the partner: "time spent online" (2.69±0.64 vs 2.58±0.66, p=0.004); "addiction to pornography" (1.53±0.67 vs 1.45±0.67, p=0.047); "ludopathy" (1.81±0.95 vs 1.74±0.97, p=0.007); and "addiction to facebook" (2.03±0.59 vs 1.96±0.54, p=0.033).

The total sample was then subdivided according to the common BMI (kg/m²) categories. One hundred eighty-one subjects had a BMI less than 18.50 (underweight, UW); 2481 between 18.51 and 24.9 (normal weight, NW); 517 between 25 and 30 (overweight, OW); 106 between 30.1 and 34.9 (first degree of obesity, OB1); 29 between 35 and 39.9 (second degree of obesity, OB2); and 9 greater than 40 (third degree of obesity, OB3). The categories OB1, OB2 and OB3 were merged in the

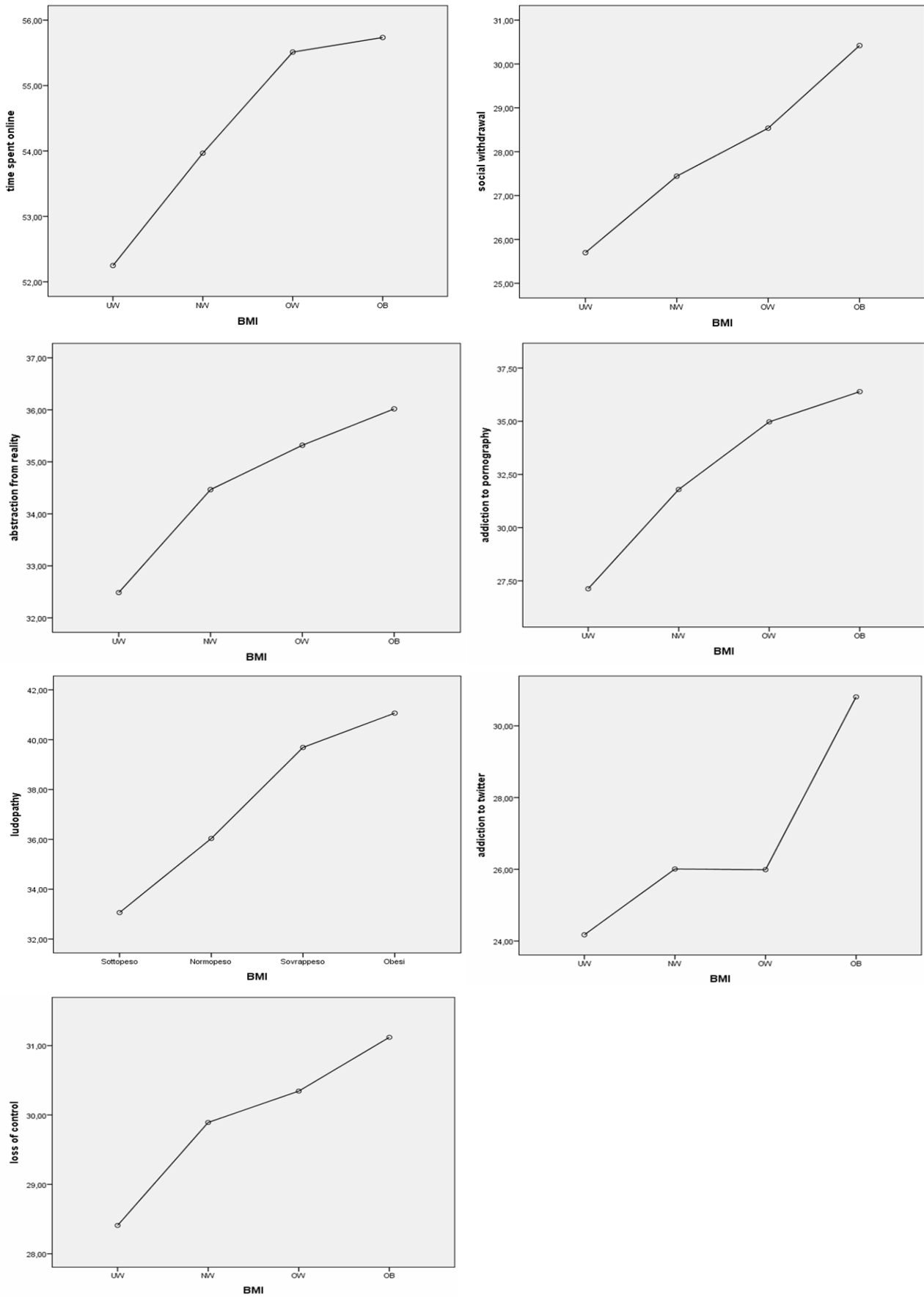


Figure 3. Trend of the percentage scores of the seven QUNT factors

category "Obese" (OB). The comparisons of QUNT factor scores in the four BMI categories are reported in table 1 that shows that the greater the BMI the greater the score, although significant differences did not exist for all categories and factors. Moreover, the panels of figure 3 depict the trend of the percentage scores of the seven factors, hence indicating that the higher the score of the factors "time spent online", "social withdrawal", "abstraction from reality", "loss of control", "addiction to pornography", "ludopathy", "addiction to twitter", the higher the BMI. Even the factor "addiction to facebook" showed a trend towards higher score in the OB vs NW individuals (Figure 3).

DISCUSSION

The present study is the result of a collaborative survey exploring the prevalence and the characteristics of Internet use by new technologies (PCs, smartphones and tablets), as well as of PIU, amongst University students. Indeed, this population is particularly vulnerable to abuse them, given their increasing use in university settings that now has reached 100% of the students (Miniwatts Marketing Group 2017).

Two university centers were selected on the basis of their geographical locations (Northern and Southern Italy, Brescia and Naples, respectively) by the coordinating center, Pisa that is located in central Italy, in order to obtain data from different Italian areas. Several students of all faculties received the invitation by their secretariats to fill a questionnaire, the so-called QUNT ("Questionario sull'Utilizzo delle Nuove Tecnologie"), developed by us for this specific purpose. The QUNT item "time spent online" was considered crucial to identify PIU when it was > four hours a day (answer 4 or 5).

About 7% of the students (3324 out of the total of 51,304 who received the QUNT surveys) returned them correctly filled: this response rate was quite low and might have affected the representativeness of the results. There was a preponderance (2022) of students belonging to Pisa University, a number significant higher than that (798) of Brescia and (326) of Naples: this can be ascribed to the specific advertisings carried out by the general secretariat of Pisa University and by the local newspapers emphasizing the survey. In the three centres, both sexes were equally represented. Similarly, there was an even distribution of responses amongst the different faculties.

Not surprisingly, almost all participants reported that the access to Internet is achieved mostly by smartphones.

When the distribution of QUNT factors was analyzed according to sex, some significant differences emerged. Indeed, men showed higher scores than women at different factors, such as "social withdrawal", "abstraction from reality", "loss of control", "pornography addiction", "ludopathy" and "addiction to twitter". Women had higher scores than men on "addiction from instant messaging", "addiction from social networks",

"addiction to facebook", and "addiction to instagram". Therefore, it seems that women use new technologies more for creating and maintaining social relationships, while men for entertainment and passing time (Ryan et al. 2014). Interestingly, in a group of drug addicts such differences were not present, as if abused drugs provoked a sort of "flattening" effects decreasing some sex-related characteristics (Baroni et al. 2019).

The results showed also that 37% of students gave the answer 4 or 5 (between 4 and 6 hours a day and > six hours a day, respectively) at the item #2 ("time spent online"), suggestive of PIU. This percentage is higher than those reported in the available literature amongst university students that is very heterogeneous, while ranging between 1% to 26.3% (Niemz et al. 2005, Ni et al. 2009, Canan et al. 2012, Durkee et al. 2012, Li et al. 2015). However, it should be underlined, that the selection criteria of the students in the published studies were quite different, as they were the questionnaires (Moreno et al. 2011, Jelenchick et al. 2012). Another major bias is that generally the subjects were recruited within the same university, while in our study we included students belonging to three different centers (Fortson et al. 2007). Again, it is also true that PIU is an increasing problem that should be considered an epidemic and our study reflects more updated and realistic scenarios. Not surprisingly, we observed a preponderance of PIU amongst male students, in agreement with other data gathered in different countries (Anderson et al. 2005, Ni et al. 2009, Frangos et al. 2010, Li et al. 2015).

Some significant differences were also present in being single vs being involved in a love relationship, with no sex difference. Not surprisingly, single subjects spent more time online, and showed higher scores at factors suggestive of Internet usage for passing time or for recreation, such as "social withdrawal", "abstraction from reality", "loss of control", "addiction to pornography", "addiction to facebook", and "addiction to twitter" factors.

A large percentage of single male subjects (72%) answered 4 or 5 at the item #4: this would hence support a vulnerability of this sex to PIU when it is coupled with being single. These findings would indicate that a highly emotional loving relationship might in some way prevent subjects, especially if male, from becoming excessive or problematic Internet users. The "protective" impact of a love relationship is again supported by our finding reporting that those subjects living with their partners show lower scores at "time spent online", "addiction to pornography", "gambling addiction", and "addiction to facebook" factors (Tucker 2015).

The comparisons of the QUNT factor score percentages in the BMI categories led to intriguing results. Indeed, obesity (assessed by the standard BMI values and including in one category only all subjects from the first to third degree of obesity) led to higher scores of "time spent online", "social withdrawal", "abstraction from reality" and "loss of control" factors: that is to say,

the more obese the subjects, the higher the scores. Previous studies already highlighted that video gaming and excessive Internet usage is associated with poor physical activity (Marshall et al. 2004) and bad dieting habits (Park et al. 2010). Therefore, it is evident that Internet use may promote sedentary behaviors (Hoare et al. 2016) that may give raise to that vicious circle at the basis of several metabolic and mental disorders that may be also intertwined (Catena Dell'Osso et al. 2013, Sridar & Sanjiana 2016). Reduced sleeping time and disrupted circadian rhythms are other factors that may increase the probability of the same disorders (Lam 2014, Li et al. 2015), as well as of decline of school performances (Derbyshire et al. 2013, Sernomanci et al. 2014).

Our study has some limitations that should be acknowledged. First, the QUNT questionnaire was not validated, although this is quite common in studies in this field (Niemz et al. 2005, Ni et al. 2009, Canan et al. 2012, Durkee et al. 2012, Li et al. 2015). Second, the response rate was low and might have influenced the ensuing data and their generalizability. Third, the prevalence of PIU was inferred from one item only, but it was a corollary of the main objective of the study exploring primarily the characteristics of Internet use. Fourth, no information was gathered on emotional distress, or associated mental disorders, substance abuse and disturbed behaviours that are currently under investigation.

CONCLUSIONS

The findings of our study show that very often the usage of Internet through new technologies, especially smartphones, amongst a large sample of students from three major Italian universities may exceeds their real use, as the majority of the subjects resulted to spend online an excessive period of time and about one third (37.3%) a “pathological” time. There were some gender differences, as male subjects were more involved in online recreational activities, as shown by a series of factors identified by the QUNT, while female subjects were more addicted to instant messaging and generally to social networks. For this reason, male subjects, especially if single or not living together with their partners showed more propensity to social withdrawal, to gaming online, to reduce real contacts with peers and, in ultimate analysis to PIU.

The relationship between time spent online (and related sedentary life style) and BMI would suggest that the Internet use might be one of the factors the basis of increasing weight gain and obesity amongst adolescents and young adults worldwide (Vandelanotte et al. 2009, Hoare et al. 2016). Therefore, preventive strategies of Internet misuse should be rapidly implemented to avoid the possibility not only of physical changes that may lead to severe metabolic and cardiovascular disorders, or psychological/psychiatric disorders, but also, as pavented by some researchers, to an irreversible “mind change” of next generations that can be detrimental for the future of our species (Greenfield 2015).

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Contribution of individual authors:

Donatella Marazziti: study design, data collection, first draft, approval of the final version.

Stefano Baroni: study design, data collection, first draft.

Federico Mucci: data collection, first draft.

Armando Piccinni, Alberto Ghilardi, Andrea Fiorillo, Mario Luciano, Gaia Sampogna & Ilenia Moroni: data collection.

Gabriele Massimetti: statistical analysis.

Liliana Dell'Osso: study design, data collection.

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