# Substance use or abuse, internet use, psychopathology and suicidal ideation in adolescents?

## *Uso y abuso de sustancias psicotrópicas e internet, psicopatología e ideación suicida en adolescentes*

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## Abstract

Substance and Internet use or abuse, psychopathology and suicidal ideation appear to be related. The aim of this study is to investigate the association between use of psychotropic substances, inadequate Internet use, suicidal ideation and other psychopathological symptoms within the adolescent population. The present study was carried out as part of the Saving and Empowering Young Lives in Europe (SEYLE) project, funded by the European Union. The sample is composed of 1026 adolescents aged between 14 and 16 years from 12 state schools in Asturias (530 men and 496 women). This study adds to the possibility of knowing whether the SEYLE data is confirmed in a relatively isolated and recession hit province of Spain.

In the present study the following consumption rates were obtained: a) alcohol 11.89% in males and 7.86% in females; b) tobacco: 4.15% and 5.44 % in males and females respectively; c) other drugs: 6.98% in males and 4.44% in females; d) maladaptive or pathological Internet use: 14.53% and 20.77% in males and females respectively.

The variables that predict suicide ideation in the logistic regression model were: previous suicide attempts, depression, maladaptive or pathological Internet use, peer problems and alcohol consumption.

*Keywords:* Suicide; Substances; Internet; Psychopathology; Teenagers.

## Resumen

El uso o abuso de sustancias o internet, la psicopatología y la ideación suicida parecen estar relacionadas. El objetivo del presente estudio es investigar la asociación en población adolescente entre consumo de sustancias potencialmente adictivas, uso inadecuado de internet, psicopatología e ideación suicida. El estudio forma parte del proyecto europeo *Saving and Empowering Young Lives in Europe* (SEYLE). La muestra está compuesta por 1026 adolescentes con edades comprendidas entre 14 y 16 años procedentes de 12 centros escolares públicos del Principado de Asturias (530 varones y 496 mujeres). El presente trabajo aporta la posibilidad de conocer si los datos generales del proyecto SEYLE varían en una zona relativamente aislada y socioeconómicamente en recesión.

Las tasas obtenidas de consumo de las distintas sustancias y de uso de internet fueron: a) alcohol: 11,89% en varones y 7,86% en mujeres; b) tabaco: 4,15% y 5,44% en varones y mujeres respectivamente; c) otras drogas: 6,98% en varones y un 4,44% en mujeres; d) uso de internet desadaptativo o patológico: 14,53% y 20,77% en varones y mujeres respectivamente.

Se ha observado que las variables con capacidad predictiva sobre las conductas suicidas fueron: tentativas suicidas previas, síntomas depresivos, uso desadaptativo o patológico de internet, problemas con los compañeros y consumo de alcohol.

*Palabras clave:* Suicidio; Sustancias; Internet; Psicopatología; Adolescentes.

Suicidal behaviors and the use of potentially addictive psychoactive substances are two of the problems with the greatest impact on global public health, particularly among young people. Suicide is the second leading cause of death in people aged 15-29 (World Health Organization, 2012), and the proportion of psychotropic substance consumption among young people is high. The percentage of young people using psychoactive substances in 2014 was: alcohol 76.8%; tobacco 31.4%; cannabis 25.4%; cocaine 2.8% and other types of illegal drugs less than 1% (ESTUDES 2014). Under the heading of behaviors that may be considered non-substance related addictions (behavioral addictions), the excessive use of the Internet is a growing phenomenon of our time that occurs especially among groups of young people (Fioravanti, Dettore & Casale, 2012; Seybert, 2012; Smahel, Blinka & Ledabyl, 2008).

The pathological use of the Internet has in recent years transcended the category of impulse control disorder (Young, 1999) to be considered as a behavioral addiction (Griffiths, 2000), given that it shares common characteristics with other addictive behaviors (Brezing, Derevensky & Potenza, 2010; Goldstein & Volkow, 2011; Grant, Potenza, Weinstein & Gorelick, 2010; Kormas, Critselis, Janikian, Kafetzis & Tsitsika, 2011; Montag, Kirsch, Sauer, Markett & Reuter, 2012; Zhou et al., 2011). Pathological gambling is included in DSM-5 (APA, 2013) under addictive disorders and Internet gaming disorder is listed in the section headed Conditions for Further Study (Section III). However, despite their importance, the handbook does not include addiction to the Internet or new virtual technologies as a whole (Carbonell, 2014).

Among people who inject drugs, the use of substances such as alcohol, sedative-hypnotics and cannabis seems to be associated with a higher likelihood of subsequent attempted suicide (Artenie et al., 2015). People with substance dependence and a history of depression are at increased risk of suicide attempts, regardless of whether depression occurred before or during substance abuse (Aharonovich, Liu, Nunes & Hasin, 2002). Other types of mood disorders show the same trend, for example patients with bipolar disorder and alcohol abuse are at higher risk of suicide (Dalton, Cate-Carter, Mundo, Parikh & Kennedy, 2003; Hawton, Sutton, Haw, Sinclair & Harriss, 2005; Oquendo et al., 2010; Potash et al., 2000).

In adolescents, Internet addiction is associated with attention-deficit hyperactivity disorder (Gundogar, Bakim, Ozer & Karamustafalioglu, 2012; Yoo et al., 2004), depressive disorders (Andreou & Svoli, 2013; Sasmaz et al., 2014), anxiety disorders (Lee & Stapinski, 2012; Zboralski et al., 2009), and with suicidal behaviors (Fernández-Villa et al., 2015; Hakala, Rimpela, Saarni & Salminen, 2006; Kim, 2012; Kim et al., 2016; Shapira, Goldsmith, Keck, Khosla & McElroy, 2000).

The study of the relationship between substance use, Internet use and abuse, and suicide ideation and behaviors, and psychopathology (Al-Asadi, Klein & Meyer, 2015) is justified because it could improve the chances of reaching a better understanding of the psychopathological substrates underlying these phenomena (Kaess et al., 2014).

The aim of the present study is to assess the situation of a young population in relation to the consumption of psychotropic substances, suicidal ideation and other psychopathological symptoms, and to explore the possible associations between these aspects. The research is limited to the Autonomous Community of the Principality of Asturias, one of the areas of Spain with the lowest economic growth in the period 2000-2009, during which it has suffered a strong socioeconomic recession (INE, 2010), and has the added interest of enabling us to assess whether the unique socio-economic situation can produce differential data. It also provides an assessment of inappropriate Internet use as an emergent behavioral addiction with an influence on suicidal ideation.

## Method

This is an observational, descriptive and cross-sectional epidemiological study analyzing Spanish data from the Saving and Empowering Young Lives in Europe (SEYLE) (Wasserman et al., 2012) project and using the same methodology (Kaess et al., 2014).

### Participants

The sample (Spanish sub-sample) is composed of 1026 individuals, from 12 state schools in Oviedo, Gijón and Avilés randomly selected from among the schools in the Autonomous Community of Asturias, in accordance with the inclusion and exclusion criteria of the SEYLE project (Wasserman et al., 2010).

### Procedure

Prior to the start of the study and in compliance with the rules governing research on young people, the authorization of the juvenile prosecutor was obtained as well as the approval of the Ethics and Clinical Research Committee of the Principality of Asturias. Local school authorities granted permission to visit the randomly selected schools and participating individuals gave their approval and informed consent when requested.

### Instruments

A structured self-report questionnaire was used, administered in the classroom during school hours to collect data on lifestyles, behaviors, values, mental health and suicidality.

Suicidal ideation and behavior were measured using the Paykel Suicide Scale (PSS) (Paykel, Myers, Lindenthal &

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Tanner, 1974). The PSS comprises the following five questions: During the last two weeks: (i) Have you felt that life is not worth it?; (ii) Did you wish to be dead?; (iii) Have you thought about taking your life even though you were not really going to do it?; (iv) Have you reached the point where you have really considered taking your life or making plans about how you would do it?; and (v) Have you ever tried to take your life? The person was considered to have suicidal thoughts if they answered "yes" to questions (iii) or (iv) of the PSS. Suicide attempts were defined by the "yes" response to the last question (v) of the PSS.

In order to assess levels of substance use, the Global School-based Student Health Survey (GSHS) (World Health Organization, 2015) was used, with the following cut-off points: drinking any amount of alcohol on two or more occasions per week was considered alcohol consumption; regarding substance use, the cut-off was set at having used illicit drugs at least three times during their lifetimes and smoking more than ten cigarettes a day.

Pathological Internet use was evaluated using the Young's Diagnostic Questionnaire (YDQ) (Young, 1998). The score on the eight items reflects eight of the nine criteria for Internet gambling disorder in DSM-5. Based on the responses to the questionnaire, subjects were divided into three categories of Internet use. With one point for each affirmative answer, individuals scoring between 0 and 2 were considered to have adaptive Internet use (AIU), while scores of 3 and 4 signaled maladaptive Internet use (MIU). A score of 5 or above corresponded to pathological Internet use (PIU) (Kaess et al., 2014).

The Beck Depression Inventory (BDI-II) was used to evaluate depressive symptoms (Beck, Steer, Ball & Ranieri, 1996), with a score equal to or greater than 20 signaling a risk of depression. For the present study a modified version, the BDI-II, was used. The item "loss of libido" was removed from the scale as it was considered to be an inappropriate question for the adolescent population. Evidence shows that the omission of this question does not affect the reliability or validity of the instrument (Byrne, Stewart & Lee, 2004).

To assess degrees of psychopathology, the Strengths and Difficulties Questionnaire (SDQ) (Goodman, Meltzer & Bailey, 2003) was used. This evaluates emotional symptoms, behavior problems, hyperactivity/inattention, problems with peer relationship and pro-social behavior. The cut-off points were set as follows: a score equal to or greater than 7 for emotional symptoms, a score equal to or greater than 5 for behavior problems and a score equal to or greater than 7 for hyperactivity. In the case of peer problems, the cut-off was set at a score of 6 or higher, while the lack of pro-social behavior was defined as a score 4 or less (Carli et al., 2013).

To evaluate global subjective well-being, the WHO-5 Wellness Questionnaire (Topp, Ostergaard, Sondergaard & Bech, 2015) was employed.

### Data analysis

A study of the global and sex disaggregated sample was conducted. The values of the categorical variables were expressed in frequencies and percentages, and those of the continuous variables in means and standard deviations. In the categorical variables, the comparison between groups was performed using the Chi-square test, or Fisher's exact test in those cases in which a group was smaller than five. For quantitative variables, Student's t-test was applied for the comparison of means.

The analysis of the relationship between suicidal ideation, risk behaviors and the psychopathological characteristics of the subjects of the sample was carried out using a logistic regression model with forward selection, including as dependent variables all those that were significant in the univariate analysis (Tables 3 and 4), age and sex. Statistical significance was set at an alpha level of 5%.

## Results

We studied 1026 schoolchildren, 530 (51.66%) of which were males and 496 (48.34%) females, aged between 14 and 16. The mean age of the sample studied was 14.52 years (SD = 0.70), with no differences between the sexes.

Table 1 shows the rate of substance use and Internet usage patterns according to sex, with significantly higher alcohol consumption in men and a significantly higher maladaptive or pathological Internet use in women.

With regard to psychopathological characteristics (Table 2), women showed more emotional symptoms and previous suicide attempts, while men scored higher on hyperactivity and lack of pro-social behavior on the SDQ scale. Likewise, there were statistically significant differences in the perception of quality of life according to the WHO-5 questionnaire (higher among males).

Table 1. *Risk behaviors by sex. Substance use (alcohol, drugs and tobacco) and Internet use.*

| | Males (n=530) | Females (n=496) | X² | p-value |
|---|---|---|---|---|
| Consumption of alcohol | 63 (11.89%) | 39 (7.86%) | 4.20 | 0.040 |
| Consumption of drugs | 37 (6.98%) | 22 (4.44%) | 2.61 | 0.132 |
| Consumption of tobacco | 22 (4.15%) | 27 (5.44%) | 0.68 | 0.410 |
| Internet use | | | 4.91 | 0.027 |
| AIU | 453 (85.47%) | 393 (79.23%) | | |
| MIU | 58 (10.94%) | 78 (15.73%) | | |
| PIU | 19 (3.59%) | 25 (5.04%) | | |

*Note.* AIU: adaptive Internet use, MIU: maladaptive Internet use, PIU: pathological Internet use.

Table 2. *Psychopathological characteristics by sex.*

| | Males (n=530) | Females (n=496) | X²/T | p-value |
|---|---|---|---|---|
| Depression (BDI) | 29 (5.47%) | 40 (8.06%) | 3.25 | 0.126 |
| Emotional symptoms (SDQ) | 9 (1.70%) | 56 (11.29%) | 38.13 | ‹0.001 |
| Behavioral problems (SDQ) | 32 (6.04%) | 19 (3.83%) | 2.20 | 0.138 |
| Hyperactivity (SDQ) | 106 (20.00%) | 57 (11.49%) | 13.25 | ‹0.001 |
| Problems with peers (SDQ) | 15 (2.83%) | 14 (2.82%) | 0.03 | 0.863 |
| Lack of pro-social behavior (SDQ) | 17 (3.21%) | 1 (0.20%) | | ‹0.001 |
| Suicidal ideation | 37 (6.98%) | 40 (8.06%) | 0.43 | 0.510 |
| Prior suicide attempts | 11 (2.08%) | 21 (4.23%) | 3.9503 | 0.046 |
| Quality of life (WHO-5) | 68.21 (DE=19.16) | 64.40 (DE=18.15) | 3.27 | ‹0.001 |

Dividing the subjects of the study according to the presence of suicidal ideation (Table 3), a significant link was found between substance use (alcohol, illicit drugs and tobacco) and maladaptive or pathological use of the Internet with suicidal ideation. Table 4 shows the positive association between all psychopathological characteristics studied and suicidal ideation.

Table 5 shows the results of the logistic regression model for the likelihood of occurrence of suicidal ideation events. The presence of depressive symptoms and the existence of previous suicide attempts were found to have great predictive capacity with regard to suicidal behavior. This was lower in the case of problems with peers, alcohol consumption and maladaptive use of the Internet. Some variables that emerged as significant when performing univariate analysis included drug use, the significance of which disappears when it is studied in conjunction with the effect of the other variables.

## Discussion

The present study, conducted with adolescents of both sexes with a mean age of 14.52 years, has revealed high rates of substance use and maladaptive or pathological Internet, which is worrying given the negative consequences for physical and psychological health of young people (Fernández-Villa et al., 2013).

There are differences in the substance use profile, which is congruent with the data from the SEYLE project as a whole (Carli et al., 2014) but lower than data from other Spanish studies on older populations. The ESTUDES (ESTUDES 2014) survey of high school students aged 14-18 and a study of university students (Hernández-Serrano, Font-Mayolas & Gras, 2015) found far higher consumption rates of all substances; in addition, in the case of older res-

Table 3. *Risk behaviors in the presence of suicidal ideation. Substance use (alcohol, drugs and tobacco) and Internet use among males and females.*

| | Suicidal ideation (n=77) | No suicidal ideation (n=949) | X² | p-value |
|---|---|---|---|---|
| Consumption of alcohol | 25 (32.47%) | 77 (8.11%) | 44.50 | ‹0.001 |
| Consumption of drugs | 15 (19.48%) | 44 (4.64%) | 26.28 | ‹0.001 |
| Consumption of tobacco | 9 (11.69%) | 40 (4.21%) | 7.18 | 0.007 |
| Internet use | | | 590.11 | ‹0.001 |
| AIU | 37 (48.05%) | 809 (85.25%) | | |
| MIU | 25 (32.47%) | 111 (11.69%) | | |
| PIU | 15 (19.48%) | 29 (3.06%) | | |

*Note.* AIU: adaptive Internet use, MIU: maladaptive Internet use, PIU: pathological Internet use.

Table 4. *Psychopathological characteristics of individuals sampled according to presence of suicidal ideation.*

| | Suicidal ideation (n=77) | No suicidal ideation (n=949) | X²/T | p- value |
|---|---|---|---|---|
| Depression (BDI) | 37 (48.05%) | 32 (3.37%) | 219.59 | ‹0.001 |
| Emotional symptoms (SDQ) | 22 (28.57%) | 43 (4.53%) | 65.37 | ‹0.001 |
| Behavioral problems (SDQ) | 16 (20.78%) | 35 (3.69%) | 40.50 | ‹0.001 |
| Hyperactivity (SDQ) | 20 (25.97%) | 143 (15.07%) | 55.49 | 0.018 |
| Problems with peers (SDQ) | 10 (12.99%) | 19 (2.00%) | 27.42 | ‹0.001 |
| Lack of pro-social behavior (SDQ) | 5 (6.49%) | 13 (1.37%) | 8.08 | 0.004 |
| Prior suicide attempts | 18 (23.38%) | 14 (1.48%) | 105.93 | ‹0.001 |
| Quality of life (WHO-5) | 46.03 (19.43) | 68.02 (17.73) | 9.61 | ‹0.001 |

Table 5. *Logistic regression model of suicidal ideation.*

| Variable | B | OR | CI 95% | p |
|---|---|---|---|---|
| Constant | -2.03 | 0.13 | (0.05; 0.38) | ‹0.001 |
| Internet use | | | | ‹0.001 |
| MIU vs AIU | 1.09 | 2.37 | (1.19; 4.76) | |
| PIU vs MIU | 1.37 | 2.56 | (0.95; 6.92) | |
| Consumption of alcohol | 1.47 | 3.44 | (1.67; 7.07) | ‹0.001 |
| Depression (BDI) | 2.45 | 9.26 | (4.60; 18.64) | ‹0.001 |
| Problems with peers (SDQ) | 1.92 | 3.88 | (1.22; 12.37) | 0.029 |
| Prior suicide attempts | 2.52 | 8.45 | (3.31; 21.55) | ‹0.001 |
| Quality of life (WHO-5) | -0.03 | 0.97 | (0.95; 0.99) | ‹0.001 |

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pondents (university students), tobacco was the most heavily consumed substance, followed by cannabis. Mean age is an important element to take into consideration (14 in the present study), since the onset of alcohol or tobacco use at an early age is associated with subsequent regular intakes and increases the risk of developing other substance use disorders or dependence, and is also associated with problem gambling (Míguez & Becoña, 2015; Motos, Cortés, Giménez & Cadaveira, 2015). As for Internet use, the data are similar to the European sample, except in the case of PIU, which is more frequent in males (5.2% in males and 3.8% in females) in the European sample. Socioeconomic conditions and lack of social and family support may be the cause of variations in PIU risk (Durkee et al., 2012, 2016).

The rates of psychopathological symptoms are high considering the age of the population studied. It is remarkable that the prevalence of hyperactive disorders in males (20%) doubles the European sample rate (about 10%), although not among females. The prevalence figures for Attention Deficit Disorder and Hyperactivity obtained in other studies hover around 5% (Polanczyk, de Lima, Horta, Biederman & Rohde, 2007; Schlack, Mauz, Hebebrand & Holling, 2014; Willcutt, 2012). This rather notable difference could raise doubts regarding the validity of the scale used (SDQ).

In the case of suicidal ideation, the European sample returned rates (21.2% in men and 35.4% in women) almost four times higher than those of the Spanish sample. Despite the difficulty in ascertaining the determinants of ideation and suicidal behavior, this divergence is likely, at least in part, to be justified by the socio-cultural differences between Spain and the rest of the European Union. The culture of suicide has penetrated more deeply in other societies and although an increase has been observed in Spain in recent years, the suicide figures are lower than those of neighboring countries (Alvaro-Meca, Kneib, Gil-Prieto & Gil de, 2013; Kolves & De Leo, 2016).

Overall, the data of the present study confirm the association between consumption of potentially addictive psychotropic substances, inappropriate use of Internet, psychopathology and suicidal ideation, which could be based on common personality elements or neurobiological mechanisms (Albert, Rosso, Maina & Bogetto, 2008; Schoevers, Deeg, Van & Beekman, 2005; Sher, 2006). However, there are some differences, especially in the lack of a significant association between suicidal ideation and consumption of substances other than alcohol, or in the almost nonexistent effect of quality of life on suicidality.

The effect of Internet use on suicidality is confusing. On the one hand, it is believed to increase the risk of suicidal behavior since it facilitates interaction with other people with suicidal intentions, and it has been shown that exposure to such behaviors through the Internet is associated with the use of more dangerous methods of self-harm.

Moreover, the Internet can also be used for cyberbullying (Collings, Fortune, Steers, Currey & Hawton, 2011). On the other hand, the Internet could protect against suicidal ideation if used as a source of emotional support or as an instrument for improving coping strategies (Daine et al., 2013). In any case, in the discussion regarding inappropriate Internet use, the balance appears to be tipping towards negative effects and its use in general is associated with an increased risk of self-harm, suicidal ideation and depression (Madge et al., 2011; O'Connor, Rasmussen & Hawton, 2012).

The present study presents some limitations, among which is sample size, which despite being large, does not allow associations between infrequent variables such as drug use to be established nor analysis disaggregated by age groups to be performed.

## Conclusions

The present study has found a relatively high prevalence of psychotropic substance use, maladaptive or pathological use of the Internet, suicidal ideation and psychopathological symptoms in a sample of young adolescents.

The variables that predict suicidal ideation with a relevant effect are: prior suicide attempts, presence of depressive symptoms, maladaptive or pathological use of the Internet, alcohol consumption and problems with peers.

## Conflict of interests

The authors state that there is no conflict of interest.

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