

Psychoactive Substances and Mobile Virtual Spaces: Impact on Teaching and Learning of Anatomy

Sustancias Psicoactivas y Espacios Virtuales Móviles:
Impacto en la Enseñanza y Aprendizaje de la Anatomía

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SUMMARY: In preliminary studies, we recorded increased prevalence of psychoactive substances use in students retaking classes and with work activities. This constantly growing university population showed a greater use of mobile virtual spaces (mVS). The objective was to evaluate the adhesion characteristics, implications and impact of these factors in the teaching and learning process of anatomy. A cross-sectional observational study using standardized and anonymous survey on 326 students. Statistical parameters were applied and ethical and legal requirements were met. Forty-five percent reported that they used substances to increase the hours of study, highlighting coffee, energy drinks, psychoactive drugs (modafinil) and acetylsalicylic acid (ASA). Working hours were proportional to the amount of substances. Among those students retaking classes, this variable was consistent with the use of psychoactive drugs (modafinil: $r = -0.88$; ASA: $r = -0.73$). We recorded that the increased prevalence of psychoactive drugs use was associated with increased adherence to mVS. Work activity was crucial in the results of these factors, which had impact on attentional educational sphere.

KEY WORDS: Anatomy; Psychoactive substances; Mobile virtual spaces.

INTRODUCCIÓN

Everybody knows that to increase cognitive performance before an exam at the university, many students use psychoactive substances to increase waking hours and attentional capacity (Carrillo-Larco, 2012; Finger *et al.*, 2013; Mazzoglio y Nabar *et al.*, 2011; Vera Navarrete, 2012). But these substances interfere with the formation of engrams (a substrate of long-term and associative memory), interfere with learning and can cause drug dependency and intellectual performance involvement (Algieri *et al.*, 2014; Buckingham, 2003; Duart & Sandra, 2000; Geddes, 2004).

While providing a clinical response in the short term, they can lead to dependence and altered mental performance, especially attentional and mnemonic level impact on executive function, among other consequences which affect both individual health and social (Mazzoglio y Nabar *et al.*; Vera Navarrete).

The social fabric developed in Argentina presently in university education is not the same in which it was created; many political, economic and social causes have

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influenced the country in the last century (Algieri *et al.*, 2014; Buckingham; Correa Gorospe, 2005; Geddes; Levis, 2007; Marengo & Urvoy, 1975). Students work many hours a day to the detriment of their hours of rest and sleep, preparedness levels prior to university entry are poor and create difficulties in learning abstract concepts. Therefore, social and academic policies have been created for students and their development, at the start of school through subjective management in the context of information technology and education.

The qualitative parameters related to population issues and virtual learning environments (VLEs) use introduced bias in research results of the application at university facilities. The diversity of university population in Argentina determined that the technological means for logins are multiple (PC, tablets, smartphones), consistent with the educational purpose and economic and occupational characteristics of students.

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The objective was to evaluate the adhesion characteristics, implications and impact of these factors in the teaching and learning process of Anatomy.

MATERIAL AND METHOD

An observational and cross-sectional study was carried out by implementing a standardized and anonymous survey on 366 college students pertaining to the 2013 period of Human Anatomy Subject from 3rd Chair of Anatomy at the University of Buenos Aires. The population characteristics are shown in Table I. Statistical parameters

Table I. Population characteristics of the sample.

Age	19 years	23.77%
	20 years	40.98%
	21 years	21.31%
	>21 years	13.94%
Sex	Female	71.31%
	Male	28.69%
Origin	Argentine	94.26%
	Foreing	5.74%
Work?	Yes	37.71%
	No	62.29%
How many hours a day?	<4 hours	4.35%
	4-8 hours	73.91%
	>4 hours	21.74%
How many days a week?	<5 days	25.41%
	5 days	50.82%
	>5 days	23.77%
It works simultaneously while studying?	Yes	40.98%
	No	59.02%
It is your first time coursing human anatomy?	Yes	68.03%
	No	31.97%
How many hours do you bring a week to study Anatomy?	<15 hours	30.33%
	15 hours	19.67%
	20 hours	28.69%
	25 hours	12.29%
	>25 days	9.02%

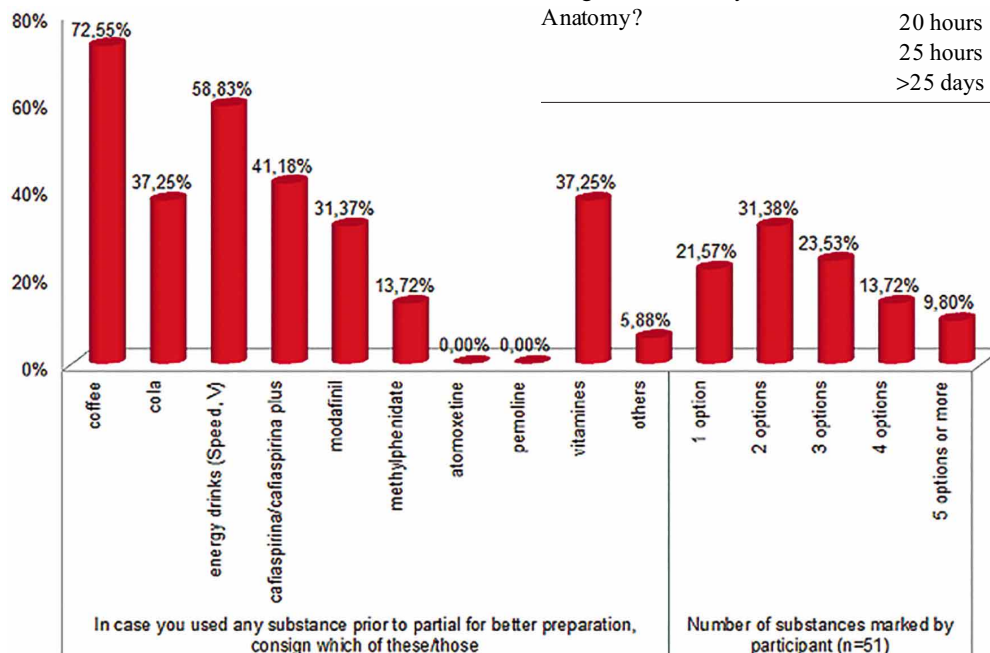


Fig. 1. Percentage of substances used by students and amount of choice of the same.

were applied to results and ethical and legal requirements were complied (Good Clinical Practices-GCP-current provisions and adherence to ethical principles arising from the Declaration of Helsinki).

RESULTS

The 45% reported to have used substances in order to increase the hours of study, highlighting coffee (72.5%), energy drinks (58.83%), psychotropic drugs (45.09%) and acetylsalicylic acid (ASA) (41.18%). The 54.91% (n= 28) chose between 2 and 3 options from the list of substances;

modafinil (31.37%) and methylphenidate (13.72%) (Fig. 1) use prevailed among psychotropic drugs, by a friend's recommendation (37.25%) and by prescription (33.33%) (Fig. 2).

Among students with work activities (62.46%), although the login was quantitatively higher from work desktops or from public access, we recorded a higher proportion of logins from mobile devices (notebook and netbook) with connection via public or mobile WiFi, followed by login using tablet PC and smartphone. In this subgroup, we recorded more variety of devices for logging in the virtual space with a mostly mobile connection (not exclusive) (Figs. 3 and 4).

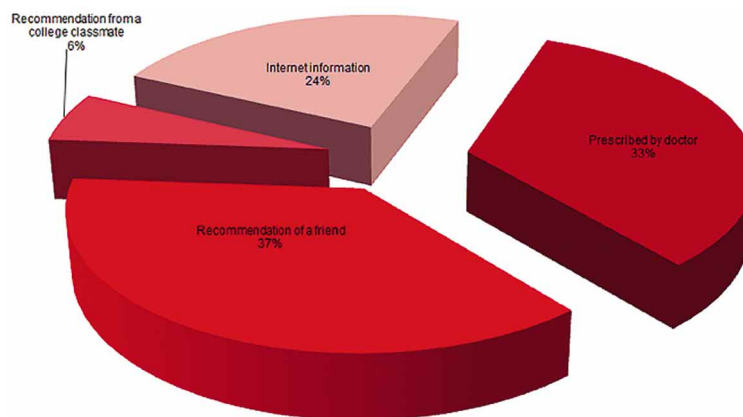


Fig. 2. Percentage of responses about media access to psychoactive substances.

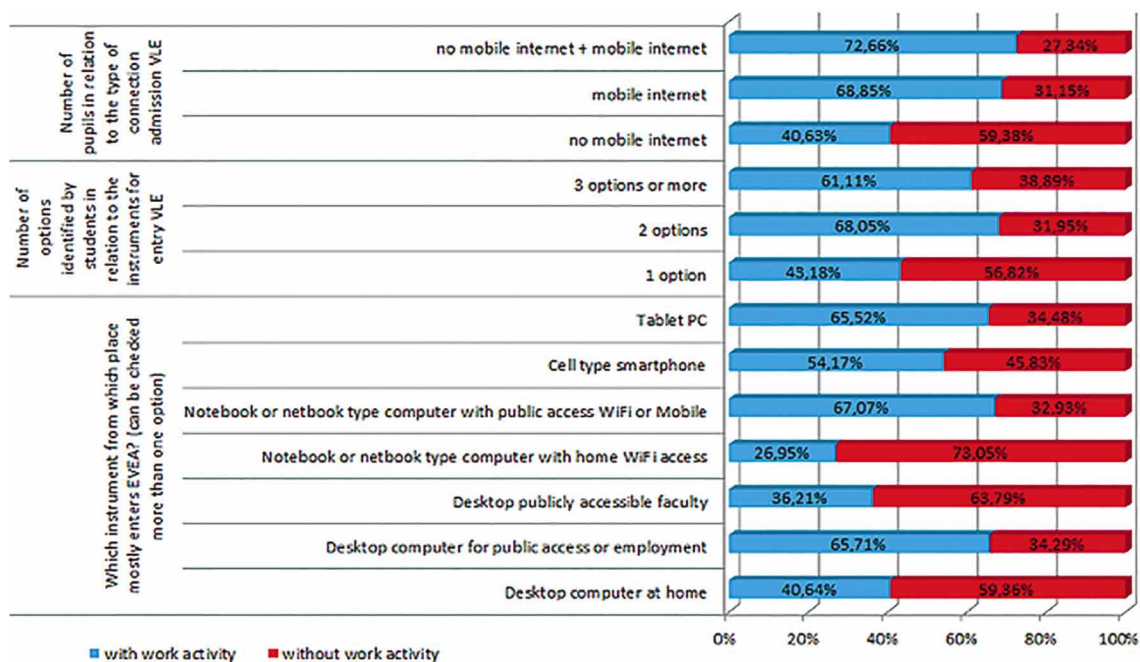


Fig. 3. Quantitative results of responses related to the technological tools and connection means used for entry into VLE specifying the employment status of students.

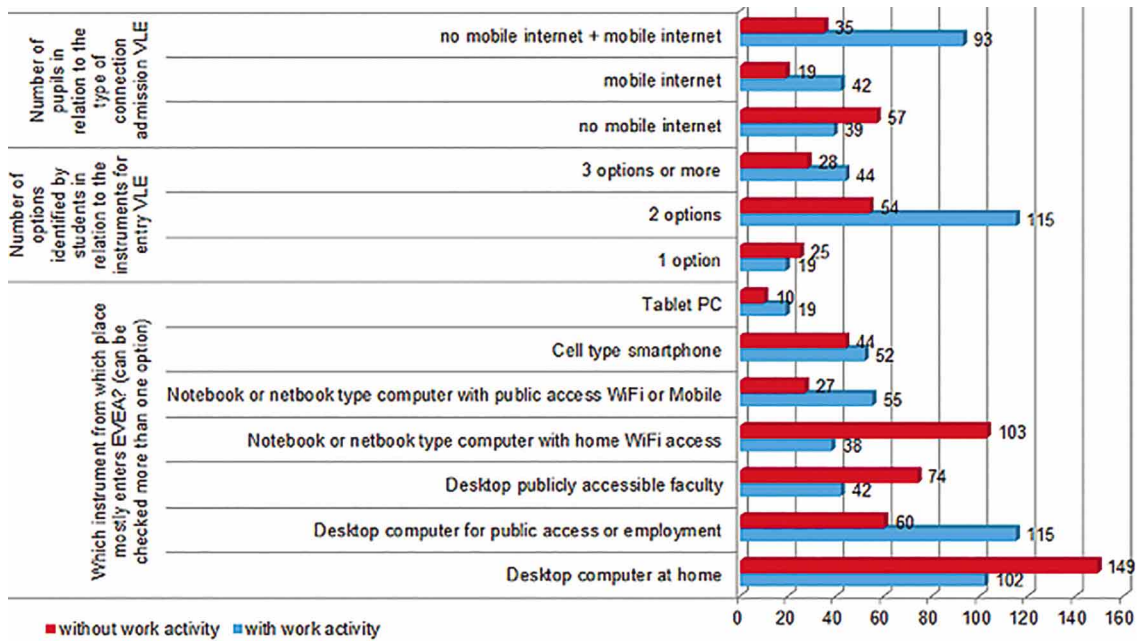


Fig. 4. Percentage of responses related to the technological tools and connection means used for entry into VLE specifying the employment status of students.

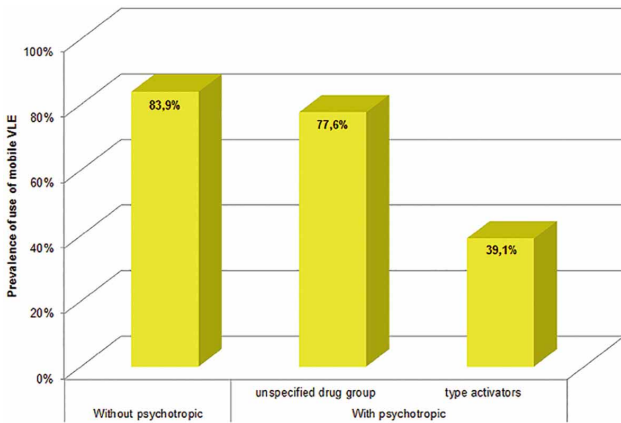


Fig. 5. Prevalence of use of mobile VLE as student group that used psychoactive drugs or not.

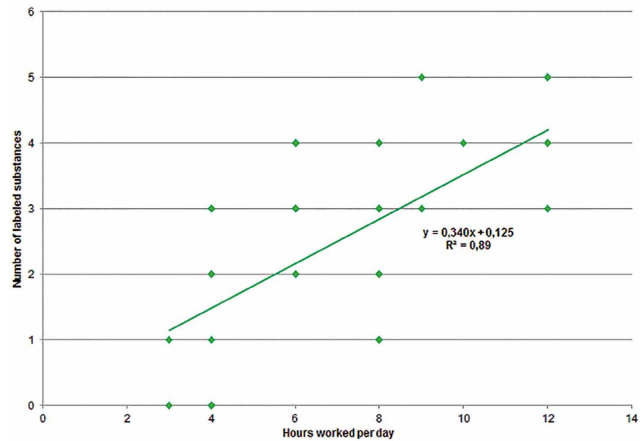


Fig. 6. Correlation between the amount of hours worked per day according to the hours worked per day between students with work activity substances.

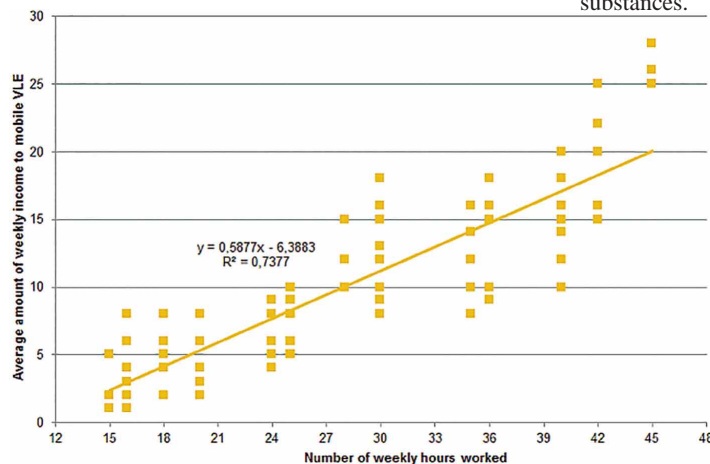


Fig. 7. Correlation between the amount of weekly income to the mobile EVEA depending on the number of work hours of students.

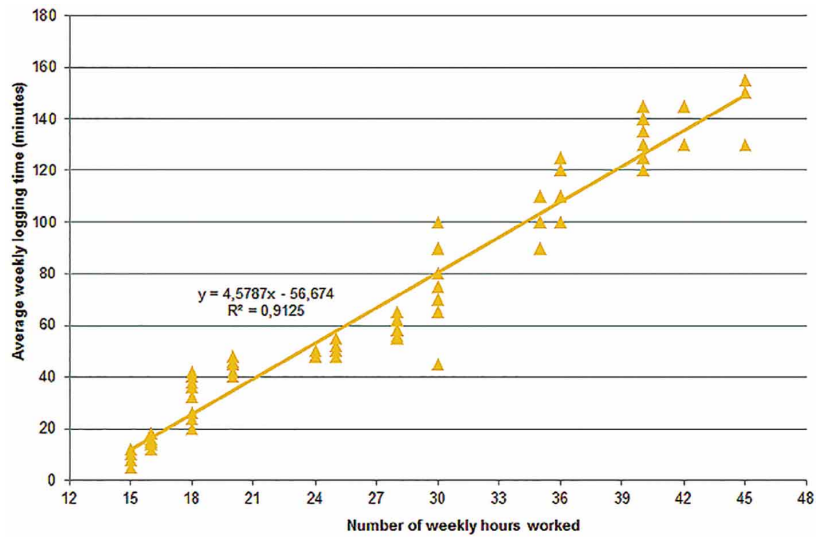


Fig. 8. Correlation between weekly time logging on mobile EVEA depending on the number of work hours of students.

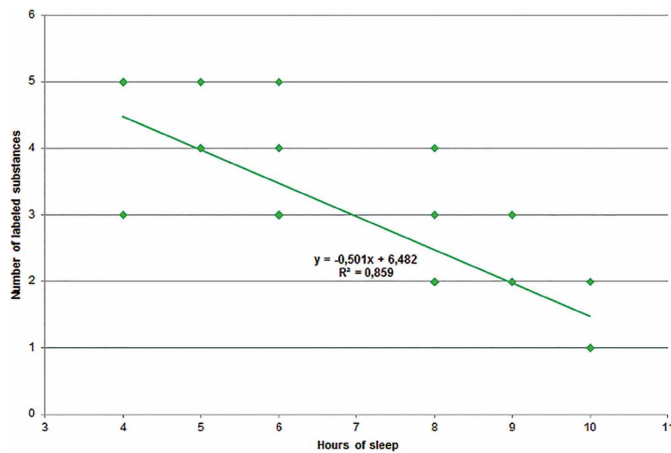


Fig. 9. Correlation between the amount of labeled according to sleep in the group of students who repeated the matter.

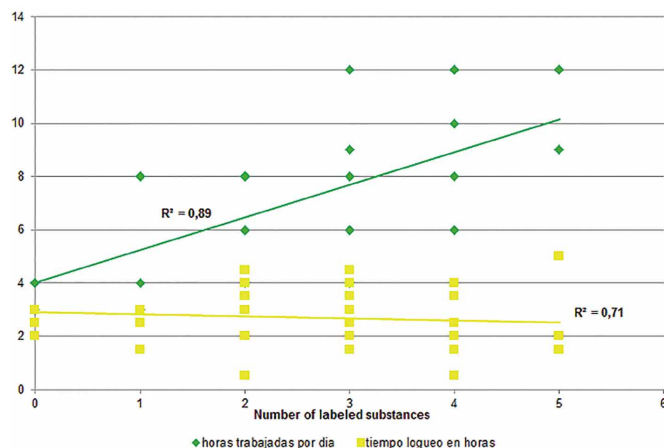


Fig. 10. Correlation between the amount of substances used and working hours per day and logging.

In reference to the above, 30.74% felt that mVLS helped in their learning process because it allowed them to share study information among peers, the 25.78% said that similar exercises helped them to consolidate knowledge (images and clinical cases of a same subject), 20.31% said that it allowed them to interrelate concepts quickly with images and links to other sites of Anatomy and the 19.9% claimed that it allowed them to increase their attention when studying in a virtual and social environment with impact on adherence with subject.

Students who used psychoactive drugs, especially activators (modafinil and methylphenidate), showed a decreased prevalence of mVLS use (Fig. 5).

Students with work activities showed an increased use of substances and showed positive correlation between substance use and the number of daily hours worked ($r^2= 0.89$) (Fig. 6), as well as between the number of hours worked per week and the mean login per week ($r^2= 0.74$) and the average of weekly login time ($r^2= 0.91$) (Figs. 7 and 8).

Among students who retake classes, a lower average of hours of sleep that presented a negative correlation with a psychoactive substance use ($r=-0.86$) (Fig. 9) was shown.

The amount of psychoactive substances used related to the number of hours worked per week ($r^2= 0.89$) and weekly login time in mVLE ($r^2=0.71$) (Fig. 10).

DISCUSSION

The social interference of new technologies produces significant changes in the modes of access to information, work with it in the construction of knowledge and build social relationships among users within a virtual classroom.

The impact of ICT not only led to the transformation of daily practices, but also redefined the educational paradigm in which virtual spaces were developed applied to teaching through an "inclusive-education" concept. The impact was not only unidirectional but also changed the student user's subjective position and in their cognitive structure, enabling their understanding of instructional resources as a means for learning (Duart & Sandra; Levis; Marengo & Urvoy).

In our work, we determined how students with work activities adapt the educational resources to their schedule and accessibility, generating mobile virtual spaces (mVLS) without limit as regard time and place of login. The correlations showed and determined that the amount of labor hours were proportional to the amount of logins per week and to the time of logins of these students.

The implementation of ICTs, especially the VLS, in our Department of Anatomy emerged as a restorative pedagogical project against the low percentage of students who attend classes without having read the subject of study for the Practical Work and a few who said to have memorized just a few concepts.

International and national preliminary research showed that EVEA increased adherence, concentration and attention when studying (Algieri *et al.*, 2008; Arteaga & Pimienta; Correa Gorospe; Levis; Tornese *et al.*, 2012), through synchronous stimulation (visual, auditory, associative) of analogous sensory pathways, and thus increase and reinforce learning capacity (Arteaga & Pimienta; Sweller *et al.*, 1998). For effective and meaningful memory consolidation, a more open attentional field is required (Paas *et al.*, 2004). Attentional brain activations by reverberating circuits are used to strengthen and complement mnemonic engrams in fronto-temporal-parietal crusts so as to integrate knowledge based on learning and divergent stimuli. Instructional strategies that allow such increases are problem-based learning, clinical-surgical and clinical-imaging cases, and collective glossaries with the purpose of achieving an efficient uptake of attention, focused on maintenance of sustained and selective attention in each exercise that enables executive cognitive learning based on repetition and association in various pedagogical scenarios (forums, self-

assessments, descriptions of clinical correlates), thereby generating skills in students.

We recorded that 65% of respondents began to consolidate concepts three days before the exam, which makes associative processes difficult since there is limited time and it is inhibited by the few hours of sleep that will not allow consolidation of mnemonic circuits. Another factor limiting the generation of mnemonic engrams and subsequent learning is the increased use of benzodiazepines by students. They are associated with a deleterious effect on learning by altering cognitive mechanisms (primarily anterograde memory), among other disadvantages. Regarding the high use substances used to increase the hours of study, although they activate the nervous system, there is no evidence that they improve the storage capacity and associative learning, but they do increase waking hours with an increase of sustained attention and inhibition mechanisms necessary to focus attention on relevant issues, without mentioning the potential dependence, tolerance generated and biochemical interactions, since 55% of respondents reported to have used between 2 and 3 substances for this purpose (Jufe, 2006; Molholm *et al.*, 2006; Paas *et al.*; Sweller *et al.*).

The dissemination and accessibility of the population to smartphones and tablet PC enabled its wide dissemination among college students. As observed in the results of this study, users of technologies redefine not only the teaching aim but also the utility, purpose and objective of the teacher. One of these goals is education, from the update data submitted or static information, and cooperative learning in virtual environments online. The high-definition images access points and Wi-Fi helped the students use TC as an instructional resource in the process of teaching and learning. The constraints presented to this use are related to economic factors, connection speed and local insecurity; for these reasons its use was highly prevalent in public places.

The VLS, particularly the mobiles (mVLS), permit a bidirectional exchange between students and teachers with their tutors and synchronous online form, together with the importance of social interaction for learning of higher psychological processes, already postulated by Vygotsky (Carretero, 2009) and tested in many more recent studies (Burgos & Koper, 2005; Correa Gorospe). In our work, the aforementioned possibility of communication, rapid interplay of concepts and the possibility of consolidation by different exercises were the characteristics most valued by students. These facts reaffirm that effective and meaningful learning is achieved in a social context, characterized by collaboration, feedback and discussion.

CONCLUSIONS. We evidenced that the high prevalence of substance use was associated with increased adherence to mobile virtual learning spaces. Work activity was determined in the results of these variables, which had an impact on substance use and educational level in the attentional field. We observed that those students who had not used psychoactive activators presented a higher use of mobile virtual spaces, a fact that will be the subject of future investigations.

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RESUMEN: En estudios preliminares registramos alta prevalencia de uso de sustancias psicoactivas en alumnos recurrentes y con actividades laborales. Esta población universitaria, en constante crecimiento, presentó mayor utilización de los espacios virtuales móviles (mEVEA). El objetivo fue evaluar las características de adhesión, implicancia e impacto de dichos factores en el proceso de enseñanza y aprendizaje de la Anatomía. Estudio observacional y transversal mediante encuesta estandarizada y anónima en 326 alumnos. Se aplicaron parámetros estadísticos y se cumplió con requisitos ético-legales. El 45% refirió consumir sustancias para aumentar las horas de estudio, destacándose el café, energizantes bebidas, psicofármacos (modafinilo) y ácido acetilsalicílico (AA). Las horas laborales fueron proporcionales con la cantidad de sustancias, entre los recurrentes dicha variable fue correlativa con el uso de fármacos psicoactivos (modafinilo: $r = -0,88$; AA: $r = -0,73$). Registramos que la alta prevalencia de consumo de sustancias psicoactivas se asoció con un incremento en la adherencia a los mEVEA. La actividad laboral fue determinante en los resultados de dichas variables, las cuales tuvieron impacto pedagógico en la esfera atencional.

PALABRAS CLAVE: Anatomía; Sustancias psicoactivas; Espacios virtuales móviles.

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