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RESEARCH ARTICLES

Effects of a Prevention Program on Technological Addictions and Cognitive-Affective Dispositions in University Students

Efectos de un programa de prevención sobre las adicciones tecnológicas y disposiciones cognitiva-afectivas en universitarios

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Summary

Objective: The effects of an online prevention program on technological addictions and cognitive-affective dispositions in university students during the COVID-19 pandemic were evaluated. Methods: Forty-two students participated in the sample, of which 21 formed the experimental group (EG) and the other 21 students the control group (CG). Academic efficacy and academic engagement scales were used, as well as cell phone, internet and video game addiction tests. Results: The application of the program significantly reduced the internet addiction, cell phone and video games and at the same time significantly increased the positive assessment of academic engagement and academic efficacy; comparisons between the study groups (GE versus GC) according to the effect sizes (.30 < d >. 50) evidenced important practical differences in the internet addiction, cell phone and video games, for the three variables the GE showed lower averages than the GC; on the other hand the comparisons between GE and GC resulted with effect size differences between medium (d >.50) and large (d >.80) in academic efficacy and academic engagement respectively, in these two variables the GE showed higher averages. Conclusion: the prevention program has reduced technological addictions, as well as increased cognitive-affective dispositions in students.

Keywords: Smartphone; Internet; Videogame; Academic effectiveness; Engagement; University students.

Resumen

Objetivo: Se evaluó los efectos de un programa de prevención en línea sobre las adicciones tecnológicas y disposiciones cognitiva-afectivas en universitarios durante la pandemia COVID-19. Método: Participaron en la muestra 42 estudiantes, de los cuales 21 conformaron el grupo experimental (GE) y los otros 21 estudiantes el control (GC). Se utilizaron las escalas de eficacia académica y *engagement* académico, así como los test de adicción al teléfono móvil, al internet y a los videojuegos. Resultados: La aplicación del programa redujo significativamente la adicción al internet, teléfono móvil y videojuegos y a la vez aumentó significativamente la valoración positiva del compromiso académico y la eficacia académica; las comparaciones entre los grupos de estudio (GE versus GC) de acuerdo con los tamaños de efecto (.30 < *d* >.50) evidenciaron diferencias prácticas importantes en cuanto al uso adictivo de internet, del teléfono móvil y los videojuegos, para las tres variables el GE mostró menores promedios que el GC; de otra parte las comparaciones entre GE y GC resultaron con diferencias de magnitudes de efecto entre mediano (*d* >.50) y grande (*d* >.80) en eficacia académica y compromiso académico respectivamente, en estas dos variables el GE mostró mayores promedios. Conclusión: el programa de prevención ha reducido las adicciones tecnológicas, así como incrementó las disposiciones cognitiva-afectivas en el estudiantado.

Palabras clave: Smartphone; Internet; Videojuego; Eficacia académica; Engagement; Estudiantes universitarios.

Introduction

In recent decades, technological development has been surprising and has transformed life, changing to a great extent the real world into a virtual one. The use of the Internet has surpassed the use of television (Merca2.0, 2019). According to Brandwatch (2019), between the second and third quarters of 2017, there was a new social media consumer every 15 seconds; by 2018, almost three billion were active social media users, with an average of seven accounts. As highlighted by Jasso et al. (2018), the use of cell phones and social networks continues to grow and, with it, the risks of practicing unhealthy behaviors, such as the abuse of technologies, or even more

critical problems, such as addiction to the Internet, addiction to cell phones (smartphones), and addiction to video games. In the university context, the adverse effects also impact academic engagement and academic efficacy (Peris & Maganto, 2018; Vallejos-Flores et al., 2018.)

There are controversies about the impact of social networks (SNs) on teaching-learning activities. The responsible and controlled use of SNs has positively impacted virtual education and learning because they allow real-time access to updated information, group work through virtual spaces, and access to international teleconferences, among others (Bazán-Ramírez et al., 2022; Azevedo et al., 2018; Peris & Maganto, 2018). However, adverse effects on physical and psychological health, family interaction, and problems related to academic life and academic performance have also been found (Aldana-Zavala et al., 2021; Jasso et al., 2018).

In the pre-pandemic years of COVID-19, there were already serious concerns in the academic community about indiscriminate and idle cell phone use in learning spaces due to the negative impact on the academic performance of university students (Askew et al., 2019; Olivencia-Carrión et al., 2018; Senel et al., 2019). The confinement measures adopted as a biosecurity strategy during the pandemic worldwide, and in Peru declared mandatory (Supreme Decree No. 044-2020-PCM) on March 15, 2020, caused the suspension of classes at universities. In turn, such an event forced students to spend much of their time at home and devote their leisure or free time to the use of the Internet, smartphones, and video games (Gao et al., 2020), leading, with time, to their uncontrolled and problematic use (Sixto-Costoya et al., 2021) and, in some cases, to technological addictions (Jalal et al., 2020).

Technological Addictions

Technological addictions encompass a range of technology-mediated behaviors with the potential to develop excessive and problematic behaviors such as addiction to the Internet, cybersex, video games, social networks, and smartphones, among others (Ballester et al., 2020). Technology-mediated addictions to the Internet, smartphones, video games, and cybersex are sustainable and relatively independent constructs, with Internet addiction being a common vector mediating technology-related behavioral addiction (Baggio et al., 2018; Derevensky et al., 2019).

According to Chóliz et al. (2016), addictive behavior is a pathological dependence disorder characterized by loss of self-control, adversely affecting family, interpersonal, academic, and social relationships.

The Internet has revolutionized existence and marked a significant change since the pandemic. Although this new digital era has improved opportunities in education, commerce, communication, health, and social interaction, its excessive or uncontrolled use has led users to develop Internet addiction (IA) that manifests in the form of uncontrolled worries, impulses, or behaviors, leading to significant impairment accompanied by disturbance (Tahir et al., 2021). Young (1998) characterized IA as a loss of control of use and the presence of a set of physiological, cognitive, and behavioral symptoms, i.e., a 'net-dependent' subject overuses the Internet with the consequent alteration of the subject's professional, personal, or family goals. Along the same lines, Chóliz et al. (2016) pointed out that the characteristic pattern of Internet addiction is associated with the presence of abuse, withdrawal, maladjustment with loss of control, and escape.

Regarding cell phones, the largest user group is adolescents and young people (Aldana-Zavala et al., 2021). According to some studies, smartphone addiction varies between 20-40% in adolescents and young people (Buctot et al., 2020). Such addiction is characterized by an individual behavior in which control of use is lost, obsession, and significant problems in physiological, psychological, and social functions, with negative consequences on sleep, physical health, academic performance, and emotional problems (Gao et al., 2017; Chen et al., 2020). For

Chóliz et al. (2016), when the use of this device is characterized by withdrawal syndrome, tolerance, impulse control problems, increased abuse, and economic expenditure, it would be a case of cell phone addiction.

In recent decades, playing video games has skyrocketed with the advance of technology; 2.2 billion people play video games globally, with adolescents and young people standing out as regular players (O'Farrell et al., 2022). The prevalence of Internet gaming disorder, better known as video game addiction, is between 1 to 9% in the adolescent-young population. This disorder manifests with a significant clinical deterioration in the functioning of various areas of the user's life, such as social relationships, academic performance, work, and psychological well-being for one year (Carbonell, 2020; López-Fernández et al., 2020). In this same vein, Chóliz et al. (2016) stated that when this gaming behavior is characterized by withdrawal, compulsive gaming, the need to increase the game and detriment in control, interference in other activities, and associated problems, it would be a case of video game addiction.

Cognitive-Affective Dispositions

Dispositions are understood as intellectual, interpersonal, and intrapersonal attributes that shape the interactive history of people (Fonseca-Chacana, 2019). Specifically, in the academic context, dispositional factors are variables that increase or decrease the probability of a form of performance in higher-level students (Chávez-Victorino et al., 2022).

In the context of COVID-19, two dispositional factors that could regulate the teaching-learning process are perceived academic efficacy and academic engagement. The unfavorable presence of these variables could lead to a situation of academic risk as low academic performance or academic failure in students (Hernández et al., 2022). Therefore, it is crucial to have objective evidence to identify the differential role of these dispositions in the teaching-learning process, even more so in e-learning or online education with synchronous and asynchronous classes due to the pandemic.

Regarding the perception of academic efficacy, Bandura (1995) describes it as an aptitude that exerts an imposing effect on personal development and adaptation; determining motivation, effort, choice of activities, and perseverance in the face of adversities, as well as emotional states and associated thought patterns (Bandura, 1992; Warshawski, 2022). In this same vein, Cuartero & Tur (2021) point out that students with favorable perceived academic efficacy have a greater propensity to maintain high motivation levels for academic achievement and success. On the contrary, students with low academic efficacy tend to distrust their abilities and have difficulties in fulfilling their academic responsibilities (Warshawski, 2022).

Another significant construct assumed in the study is academic engagement, which, according to Salanova et al. (2005), is a constant motivational state experienced by students regarding their academic activities. This construct is configured by three dimensions: dedication (high levels of meaning given to study, feeling of pride and identity with the degree being pursued), vigor (high levels of energy, perseverance, and desire of engagement with study), and absorption (high levels of concentration and perception of scarcity of time and being trapped in study activities). According to Amerstorfer & Freiin von Münster-Kistner (2021), in the university context, academic engagement refers to professional degree planning, management, and completion. In the teaching-learning process, this dispositional factor would be conducive to critical and intense thinking-based learning, in which social interaction with teachers and classmates translates into an exchange of knowledge, experiences, and support.

At an international level, there are few studies aimed at reducing the problems related to the problematic or addictive use of interactive technologies and, conversely, promoting the appropriate use of technological devices (Internet, cell phones, and video games), and even fewer

studies seeking, in addition to the above, to increase student self-assessment of efficacy and academic commitment, as this study intends to do. The psychological intervention of technological addictions, rather than achieving total withdrawal, is aimed at relearning behavioral control through coping strategies in risk conditions (Echeburúa et al., 2005; Sixto-Costoya et al., 2021; Young, 2011). In this sense, the study conducted by Marco and Chóliz (2013) had as its main objective to achieve controlled use of computers, the Internet, and video games, and not to consider withdrawal as a therapeutic requirement, but to promote their adaptive use; the results showed a significant decrease in terms of time spent browsing, playing, subjective discomfort and loss of control and finally improvements in personal functionality. Another relevant study is the one conducted by Carbonell et al. (2010) who implemented a program for the healthy use of information technologies in adolescents, reporting that the intervention reduced the use of cell phones, the Internet, and video games.

At a national level, most studies are descriptive and correlational, linking addictions or addictive behaviors with various socio-affective and academic variables.

Specifically, in Peru, we have not found studies that propose prevention approach-based models to provide students with information and awareness of the consequences of technological addictions and promote academic dispositions, such as self-efficacy and commitment. The social impact intended by this study, once the problems or risks of technological addiction are overcome, is that students take advantage of the enormous potential offered by Internet-based technologies to collect, convey and exchange information, as a way to strengthen or acquire knowledge in their learning process and thus promote the personal and professional development of future citizens of society.

In this scenario where there is absent or scarce applied research on addictions to interactive technologies, but according to basic research, it was essential to propose programs aimed at reversing the adverse effects of technological addictions, the aim of this study is to evaluate the effects of a prevention program on technological addictions and cognitive-affective dispositions in university students during the context of the COVID-19 pandemic.

Method

Design

According to Balluerka and Vergara (2002), the general research method can be classified as experimental, selective, and observational. According to the aforementioned authors, this study assumes the experimental method because of the presence of manipulation of the independent variable or controlled variation of the dependent variable, and because it seeks to identify the existence of a causal relationship.

When research designs meet the criteria of manipulation, but not randomization, they are considered quasi-experimental (Ato & Vallejo, 2007; Ato & Vallejo, 2015), which is the one that corresponds to this study.

Participants

The population comprised 100 students in the fifth semester of the Psychology degree program at Universidad Nacional Federico Villarreal enrolled in the 2020 academic year. This population consisted of male and female students from two classrooms, aged between 20 and 26 years. The average age for male students was 22 (SD = 1.56) and for female students was 21.72 (SD = 1.78).

The sample comprising 42 students was estimated with the G-Power 3.1.9.2 software for a large effect size (d = 0.80), a statistical power of 0.80, and a confidence level of .05, one-

dimensional. The selection corresponds to a non-probabilistic convenience sample due to the availability of students' free time for the experimental work sessions. Each study group (experimental and control) consisted of 21 students. All participants in the experimental group (EG) belonged to one classroom, while all participants in the control group (CG) belonged to another classroom; the average age of the EG was 21.81 (SD = 1.94) and the average age in the CG was 21.76 (SD = 1.51).

Inclusion criteria: Acceptance to voluntarily participate in the study stated in the informed consent form.

Study Variables

Independent Variable.
PREADITEC prevention program. Categorized with 2 values: Receives treatment (EG) = 1, Does not receive treatment (CG) = 0.

Dependent Variables.

- Technological addictions: Internet addiction, cell phone addiction, video game addiction.
- Cognitive-affective dispositions: perceived academic efficacy and academic engagement.

Table 1 presents the operational definition of the dependent variables: technological addictions and cognitive-affective dispositions in university students.

Table 1.
Operationalization of the dependent variables

Variables	Dimensions	Items	Measure
Academic Engagement	Dedication Vigor Absorption	3, 4, 7 1, 2, 5 6, 8, 9	Interval
Perceived Academic Efficacy	One-dimensional	1, 2, 3, 4, 5, 6	Interval
Internet Addiction	Abuse Withdrawal Disturbance and Lack of Control Escape	6,10,12,13,14,18,19 3,4,22 1,2,5,21, 7, 8, 9, 16,17 11,15,20,23	Interval
Cell Phone Addiction	Abuse Control of Impulses Tolerance y Withdrawal Derived Problems	16, 18, 21 2, 6, 8, 12, 14, 17 1, 3, 4, 5, 7, 10, 11, 20 9, 13, 15, 19, 22	Interval
Video Game Addiction	Compulsive Gaming Withdrawal Tolerance and Interference Associate Problems and Escape	9, 11, 12, 15, 19, 20, 21, 3, 5, 14 1, 4, 7, 8, 10, 18, 23 2, 6, 16, 22, 13, 17, 24	Interval

Instruments

Sociodemographic Form.
A form was designed to collect sociodemographic data, such as age, sex, marital status, and academic semester.

Academic Engagement Scale for University Students (Work Engagement Scale UWES-S).
It is a 9-item self-report scale designed by Schaufeli et al. (2006) for students. It assesses three factors: dedication, vigor, and absorption. This scale has been reviewed in several psychometric studies, and the three-dimensionality of the construct has been verified by confirmatory factor analysis, with alpha values ranging from .79 to .84. Its 7-anchor graded response format ranges from never (0) to always (6). The study conducted by Capa-Luque et al. (2022) reports the results of the psychometric review of the instrument for the university population of Lima; the evidence of validity for the construct was examined by confirmatory factor analysis, demonstrating that the construct presents three first-order factors, and a general factor (CFI = .98, GFI=.98, RMR = .04 and RMSEA = .06); in terms of reliability, several internal consistency coefficients (ordinal alpha, McDonald's omega and H) were above .90.

Perceived Academic Efficacy Scale.
A self-report developed by Schaufeli et al. (2002). It comprises 6 items of categorical responses graduated from never/never (0) to always/every day (6). The authors report that the test has adequate construct validity and reliability. For its use, the metric properties were reviewed; the confirmatory factor analysis (CFA) showed that the scale presents a unidimensional internal structure of very good fit (CFI = .97, GFI = .96, TLI = .96, NFI = .97, SRMR = .02), with standardized factor loadings between .79 and .90; in terms of reliability, it showed a McDonald omega coefficient of .92 [95% CI = .91, .94].

Internet Addiction Test.
It is a self-report of 23 items prepared by Chóliz et al. (2016) that allows evaluating the level of dependence on the internet. It is configured in four dimensions: withdrawal, abuse, disturbance and lack of control, and escape. The instrument shows high reliability (Cronbach's alpha = .93) and constructs validity examined by exploratory factor analysis (EFA). For its use in this study, its psychometric properties were reviewed; the confirmatory factor analysis carried out with the robust DWLS estimator shows that the construct presents a four-factor structure; the fit indices were satisfactory (CFI = .96, GFI = .96, TLI = .96, NFI = .93, SRMR = .07); and in terms of reliability, an omega coefficient of .89 [95% CI = .87, .91] was found.

Cell Phone Addiction Test.
This 22-item self-report developed by Chóliz et al. (2016) evaluates the level of dependence on mobiles or cell phones. It measures four factors: problems derived from economic expenditure and abuse, difficulty to control the impulse, tolerance, and withdrawal. The instrument presents evidence of reliability (Cronbach's alpha = .93) and constructs validity examined through EFA. For this study the validity evidence was examined through the AFC executed with unweighted least squares. The results showed satisfactory robust fit indices (CFI = .99, GFI = .98, TLI= .99, NFI = .98, SRMR = .05). Likewise, the omega coefficient of .93 [95% CI = .92, .95] shows that the test guarantees obtaining reliable scores.

Video Game Addiction Test.
It is a 24-item self-report developed by Chóliz et al. (2016) to measure the level of dependence on video games. It is organized into four dimensions: withdrawal, compulsive gaming, associated problems and escape, tolerance, and interference with other activities. The test shows high reliability (Cronbach's alpha = .95) and construct validity examined by exploratory factor analysis. The psychometric review conducted showed satisfactory internal structure-based

validity (CFI = .93, IFI = .94, SRMR = .03, RMSEA = .06) and high reliability for test scores (ω = .98, α = .98).

Procedures

The instruments were applied to the participants of the experimental study using the form designed in Google Drive. The URL link was sent to the students' e-mail to be answered online. The subjects decided on their voluntary participation in the study, following the invitation and informed consent, i.e., the participants were selected, and the experimental program was implemented observing the ethical principles established in the Helsinki declaration, as well as complying with the ethical principles of psychologists and code of conduct (APA, 2017).

The PREADITEC prevention program was aimed at students who were in their third year of higher education and was designed based on literature about preventive strategies for addictions under a behavioral-cognitive conceptual framework. The PREADITEC program once developed was reviewed for readjustments by a panel of 5 clinical psychologists (with years of experience in the area of addictions, as well as in behavior modification and therapy) together with 2 educational psychologists with specialized training in behavior analysis. Given the difficulties in accessing study samples due to limitations due to the pandemic, it was not possible to pilot the program, but the experimental group was administered directly.

The aim of PREADITEC was to facilitate the acquisition of behavioral and cognitive skills that favor the appropriate use of technologies, such as the Internet, cell phones, and video games, as well as to increase academic commitment and self-efficacy in Psychology students.

All sessions were carried out virtually through the virtual platform ZOOM, for which didactic digital tools were used, strategies to encourage participation and permanent interaction of the experimental subjects; among the psychological techniques used were didactic discourse, modeling, role-playing, positive reinforcement, modeling, psychoeducational therapy, stimulus control, self-control, feedback. While the program was implemented in the experimental group, the control group continued its academic activities scheduled in the university curriculum as usual without any activities related to the research, only contact was made with the control group for the pre-test and post-test evaluation (on the same dates that the experimental group was evaluated).

During the obtaining of consent, the candidate group was informed that they would participate in a program (indicating the aim of the program, its modality, duration, and the corresponding benefits); while the control group was invited to participate in an investigation to validate a preventive program and for this purpose, their participation was required to answer the measurement instruments in two moments with a lapse of 8 weeks.

The intervention consisted of 8 sessions, a weekly session of 120 minutes. Table 2 briefly describes, for reasons of space, the contents and objectives of the intervention.

Table 2.
Sessions of the PREADITEC program

Sessions	Contents	Objectives
Session 1	Introduction to the technological addiction prevention program	• To help students become familiar and feel comfortable in the group situation. • To introduce the rules of the group. • To clarify the expectations of each of the experimental subjects about the prevention program.

		• To acknowledge the positive aspects of the preventive program. • Evaluation and data collection for the pre-test of the study.
Session 2	Principles of learning and maintenance of behaviors in technological addictions	• To make known the importance of learning in the development of addictive behavior. • To incorporate the notion of learning of behaviors by their consequences. • To identify the contingencies of the behaviors of problematic use of technologies.
Session 3	Effects of addiction to technologies on the university student - I	• To raise awareness of the consequences of addictive behavior in the academic life of the university student. • To facilitate the incorporation of skills that allow them to identify the consequences of risky behavior for technological addiction.
Session 4	Effects of addiction to technologies on the university student - II	• To raise awareness of the consequences of addictive behavior in the various areas of student interaction. • To facilitate the incorporation of skills in contingency management to regulate the use of technologies.
Session 5	Stimulus control strategies in technological addictions	• To incorporate skills in the identification of triggering stimuli and chain of behaviors that trigger desire and non-productive use of technologies and social networks.
Session 6	Self-control strategies in technological addictions	• To provide self-control strategies, such as self-observation and self-reporting of non-productive use of technologies in class. • To train them in constructing self-instructional messages for self-control and self-effective performance.
Session 7	Promoting adequate self-esteem	• To reinforce the behavioral change achieved by students based on the strategies worked on in the previous session. • To strengthen self-esteem, commitment, and their importance in the student's academic psychological growth.
Session 8	Closing of the technological addiction prevention program	• To receive feedback and reinforce the topics developed in the technological addiction prevention program. • To conduct the post-test evaluation.

Data Analysis

For data processing, the statistical packages used were SPSS version 25 for Windows, and GPower version 3.1.9.2 to estimate the effect size and statistical power.

The comparative analyses between the experimental and control groups were carried out with Student's t-test for independent samples to meet the normality and homogeneity of variances. To assess the differences among the study groups, in addition to taking into account the *p*-value, the effect sizes estimated with Cohen's *d* (Cohen, 1988) were considered. As suggested by previous editions and the seventh edition of the APA Publication Manual (2020), the use of the *p*-value as a null hypothesis significance test (NHST, for its acronym in English) is only an initial data or one that has limitations (Domínguez-Lara, 2018). Faced with such situation, a proposed solution consisted of reporting the effect size estimate (Cohen, 1988, Ferguson, 2009). The effect size quantifies the magnitude of the difference among two means (Cárdenas & Arancibia, 2014). The suggested cut-off points for Cohen's *d*are construed as a significant difference of small (.20), median (.50), and large (.80) sizes among the two means (Dominguez-Lara, 2018).

Ethical Considerations

The research protocol was approved by an evaluating committee of the Central Research Office of Universidad Nacional Federico Villarreal.

Results

Effects of the PREADITEC Program on Technological Addictions in Psychology Students.

As shown in Table 3, in the pre-intervention contrast between the experimental and control groups, no statistically significant differences were observed in terms of problematic or addictive use of the Internet, cell phone, and video games ($p > .05$). However, after implementing the PREADITEC program, statistically significant differences were observed according to the one-tailed Student's t-test. Likewise, the existing differences among the groups correspond to a medium effect size, as evidenced by Cohen's *d* ($.30 > d < .80$). For the sake of precision, it should be noted that the experimental group had lower average values than the control group in the post-test situation for the three interactive technologies.

Table 3.
Student's T Comparisons for Technological Addictions between the Study Groups.

	Situation	Groups	M	SD	$t_{(gl)}$	*p*	*d*
Internet	Pre-test	Experimental (n = 21)	74.00	14.43	0.773 $_{(40)}$	.44	
		Control (n = 21)	70.71	13.07			
	Post-test	Experimental (n = 21)	61.62	12.87	2.239 $_{(40)}$	.02	.69
		Control (n = 21)	69.67	10.27			
Cell Phone	Pre-test	Experimental (n = 21)	61.95	13.09	1.869 $_{(40)}$	.07	
		Control (n = 21)	53.67	15.53			
	Post-test	Experimental (n = 21)	51.62	13.94	1.682$_{(40)}$	.05	.52
		Control (n = 21)	58.57	12.82			
Video Games	Pre-test	Experimental (n = 21)	41.67	19.04	0.356 $_{(40)}$	.72	
		Control (n = 21)	39.81	14.50			
	Post-test	Experimental (n = 21)	34.19	14.55	1.736 $_{(40)}$	.04	.54
		Control (n = 21)	43.57	20.03			

Note: n: sample, M: arithmetic mean, SD: standard deviation, *t*: Student's t, *gl*: degrees of freedom, *p*: probability of significance, *d*: Cohen's d
$H_a\ \mu_{GE} < \mu_{GC}$

The Box Plot graphs in Figure 1 show that the score distributions in the control group are higher compared to the experimental group. Likewise, the measures of central tendency (mean and median) as the interquartile range (IQR) are higher for the control group, meaning that technological addictions were reduced in the experimental group after implementing the prevention program.

To add evidence on the efficacy of the PREADITEC program, comparisons were made before and after the intervention of the experimental group using the Student's t-test for paired samples. The results showed that the problematic or addictive use of the Internet ($t_{(20)} = 5.193$, $p < .01$, $d = 1.13$), cell phone ($t_{(20)} = 4.056$, $p < .01$, $d = .885$) and video games ($t_{(20)} = 3.137$, $p < .01$, $d = .685$) decreased significantly.

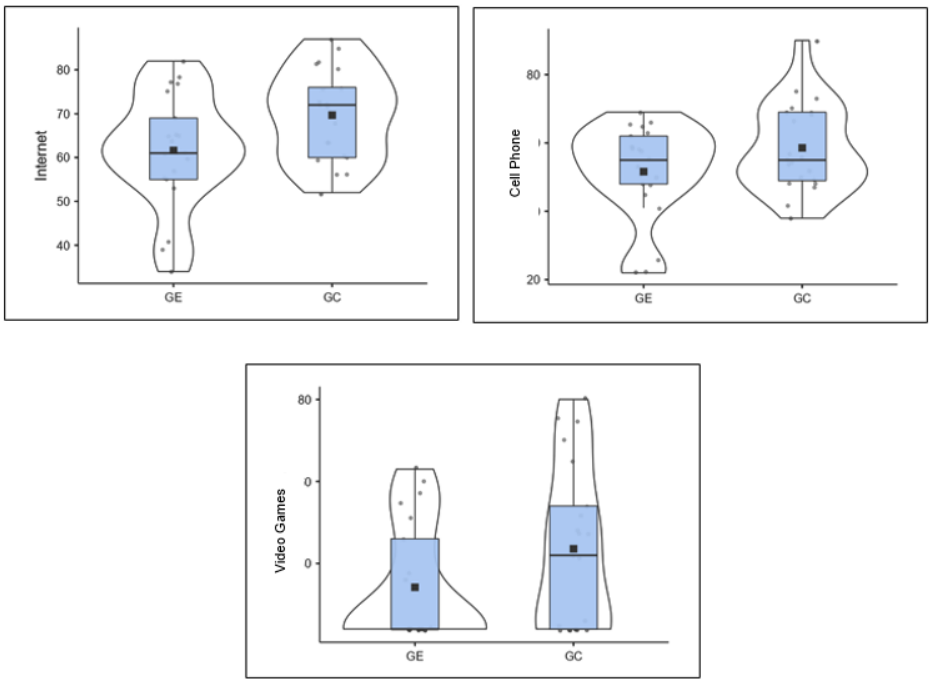

Figure 1.
Box Plot Graphs: scores of the technological addiction tests in the post-test situation for the experimental and control groups.

Effects of the PREADITEC program on the perception of cognitive-affective dispositions in Psychology students.

Table 4 shows that in the pre-test situation the study groups have similar states for academic efficacy and academic engagement ($p > .05$). However, after implementing the PREADITEC program, statistically significant ($p < .05$) and practical differences are observed, i.e., the experimental group denotes a higher perception of academic efficacy compared to the control group and such difference is of medium size ($d > .50$). In terms of academic engagement, the impact of the program has proved to be greater since the size of the effect is large and in favor of the experimental group ($d > .80$).

Table 4.
Comparisons of Cognitive-Affective Dispositions among the Study Groups

	Situation	Groups	M	SD	$t_{(gl)}$	*p*	*d*
Self-efficacyAutoefi	Pre-test	Experimental (n = 21)	23.43	4.62	0.724 (40)	.47	
		Control (n = 21)	24.19	6.07			
	Post-test	Experimental (n = 21)	28.29	4.07	2.077 (40)	.02	.64
		Control (n = 21)	25.57	4.38			
Engagement	Pre-test	Experimental (n = 21)	37.48	8.31	0.346 (40)	.73	
		Control (n = 21)	38.38	8.62			
	Post-test	Experimental (n = 21)	44.90	5.02	3.235 (40)	.001	.99
		Control (n = 21)	37.62	9.01			

Note: n: sample, M: arithmetic mean, SD: standard deviation, *t*: Student's t, *gl*: degrees of freedom, *p*: probability of significance, *d*: Cohen's d
H_a $\mu_{GE} < \mu_{GC}$

In Figure 2, the Box Plot graphs show that the distribution of scores on the self-efficacy and academic engagement scales are higher in the experimental group in contrast to the control group because, in addition to having the mean as the highest median in both variables, the experimental group shows a lower interquartile range. This means that the PREADITEC program significantly increased the cognitive-affective dispositions of university students during the context of the COVID-19 pandemic.

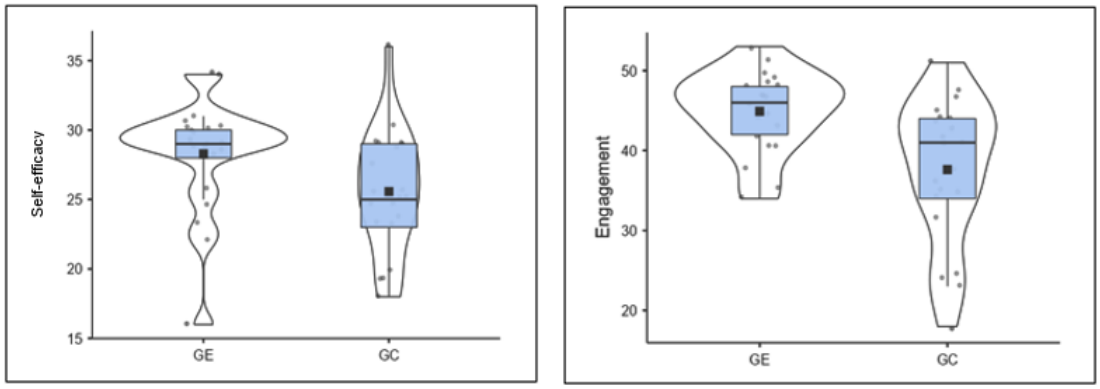

Figure 2.
Box Plot Graphs: scores of the cognitive-affective disposition tests in the post-test situation for the experimental and control groups.

Supplementarily, to strengthen the evidence on the efficacy of the PREADITEC program on cognitive-affective dispositions, comparisons were made before and after the intervention of the experimental group using the Student's t-test for paired samples. Both perceived academic efficacy ($t_{(20)} = 4.354$, $p < .01$, $d = .95$) and academic engagement ($t_{(20)} = 11.158$, $p < .01$, $d = 2.43$) increased significantly (large effect size).

Discussion

In this pandemic context, the study addresses the proposal and implementation of an online program for the prevention of technological addictions (PREADITEC) to achieve the appropriate use of technologies, such as the Internet, cell phone, and video games, and increase the perception of efficacy and academic engagement in Psychology students. Online education and service are not new. They have already been developing despite the obstacles, with an almost imperceptible growth. However, in 2020, the so-called eTherapy interventions, cybertherapy, telepsychology, virtual psychotherapy or web-based therapies were reaffirmed (Carbonell, 2014; Matute & Vadillo, 2012). Our online technological addiction intervention program was based on these referenced models to reach the beneficiary population in the context of COVID-19.

Due to the scarcity of related studies or absence of specific studies (national or international) aimed at proposing explanatory models that link technological tools with cognitive and socio-affective dispositions based on a prevention approach and supported by applied research evidence, this study has important implications as a methodological and practical contribution because it offers a structured prevention program to provide students (vulnerable population) with information about technological addictions, awareness of the negative consequences and promotion of soft skills necessary for a responsible and controlled use of technologies as their appropriate and controlled use is very encouraging in terms of benefits for students academically, personally and in terms of favorable impact on their health. The study with results partially similar to this one is that of Marco and Chóliz (2013) who through an experimental program reduced the addictive use of cell phones, the Internet, and video games. A common factor with our study is the adoption of a psychoeducational strategy aimed at promoting the adaptive, controlled and responsible use of interactive technologies.

Regarding the problematic or addictive use of the Internet following the online intervention, statistical and practical differences were found among the groups, with greater problematic use of the Internet in the control group compared to the experimental group, i.e., there was a considerable decrease in the addictive use of the Internet in the experimental group. Our results are close to those reported by Carbonell et al. (2010) who implemented a program for the healthy use of computer technologies (Internet, cell phone, and video games) by adolescents, reporting that their intervention program produced significant changes, reducing the use of technologies in the experimental group compared to the control group. It should be noted that the preventive objectives are different between chemical and behavioral addictions (Olivencia-Carrión et al., 2018). In this sense, regarding early intervention or treatment of addictions to the Internet or technologies, over the years it has been determined that it is not possible to reach total Internet use withdrawal but to propose a more realistic option that consists of training students to make appropriate and conscious use of technologies (Echeburúa et al., 2005; Greenfield, 2018; Young, 2011). The concern to reduce Internet addiction has already been seen in other countries, for instance, in Hong Kong the government has mobilized logistical, human, and technological resources to reduce the problematic use or addiction to the Internet to strengthen public awareness, and optimize digital literacy through the development of topics, such as the adverse consequences of prolonged Internet use, increased self-monitoring for regulated Internet use, Internet safety management skills, as well as, the development of online resources to raise public awareness, and the promotion of knowledge and skills for healthy Internet use (Chung et al., 2019).

Regarding the intervention on video game addiction, our results show statistical and practical differences among the groups, with greater addictive use of video games in the control group compared to the experimental group that benefited from the prevention program. We consider that the changes observed in the experimental group result from the technological addiction prevention program aimed at raising awareness and training in identifying the triggers of the desire to play, as well as providing the student with strategies for self-control and problem-solving skills. As reported by some researchers, cognitive behavioral intervention-based strategies are more efficient in reducing problematic or addictive use of video games (Marco & Choliz, 2014; Torres-Rodríguez & Carbonell, 2015). In the same vein, Taquet et al. (2017) point out that it is crucial to help problematic or addicted video game players better understand their emotional and physical functioning, and the negative consequences of gaming, and provide them with tools to manage their cognitions and game-directed behavior to move away from video game addiction.

We also observed changes in the problematic use or addiction to cell phones. The data show statistical and practical differences among the groups, with greater addictive use of cell phones in the control group as opposed to the experimental group, which showed a significant decrease in addiction to cell phones due to the effect of the intervention program. Cell phone addiction intervention studies are scarce probably because the addictive behavior is very similar to alcoholism, and due to its daily use, its presence in people's lives has been normalized, leading to not perceiving its risks early. As stated by Roberts et al. (2014), we are facing an invisible addiction. Among the few intervention studies, we find that of Carbonell et al. (2010) who reported no success in reducing cell phone addiction in the adolescent population; this is probably, as some researchers refer, because technological addictions have a significant presence of comorbidity, which would make treatment difficult (Echeburúa & Requesens, 2012; Torres-Rodríguez & Carbonell, 2015).

Finally, as an effect of the program, the results evidenced favorable changes in the perception of academic efficacy and academic engagement in university students as statistically significant and practical differences were found between the experimental group and control group, resulting in positively favoring the experimental group. This is essential because one of the strategies to maintain the change is to strengthen the protective factors and enhance self-control as pointed out by specialists in the area of behavioral addictions (Echeburúa & Requesens, 2012; Carbonell, 2014; Chung et al., 2019; Matute & Vadillo, 2012).

Despite having achieved the objectives outlined, the study has some limitations of a methodological nature, required by experimental studies of greater rigor. Given the context of COVID-19 and the difficulties of face-to-face access to the student population, it was not possible to have a random sample, a procedure that is crucial to ensure the internal and external validity of the study. Likewise, regarding the nature of the data collection instruments, since they were self-reports, i.e., in which the subjects make observations about themselves, the complete sincerity of their answers, biases, motivation, and/or social desirability, if applicable, was not controlled. It would have been more appropriate to supplement the self-reports with direct observations. However, compared to the few applied studies of preventive or early intervention of technological addictions, this study is relevant because it not only fills a knowledge gap but also provides the scientific and professional community an online early technological addiction intervention pilot program for the university population, inviting researchers to possibly replicate the intervention program to reinforce with evidence the validity and efficacy of the program and strengthen an early technological addiction intervention model.

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