

## MOTIVATIONS AND USE OF VIDEO GAMES IN ENGINEERING STUDENTS

Rosa Núñez-Pacheco<sup>1</sup> , Osbaldo Turpo-Gebera<sup>1</sup> , Aymé Barreda-Parra<sup>1</sup> ,  
Elizabeth Vidal<sup>1</sup> , Eveling Castro-Gutierrez<sup>1</sup> , Ignacio Aguaded<sup>2</sup> 

<sup>1</sup>Universidad Nacional de San Agustín de Arequipa (Peru)

<sup>2</sup>Universidad de Huelva (Spain)

[rnunezp@unsa.edu.pe](mailto:rnunezp@unsa.edu.pe), [oturpo@unsa.edu.pe](mailto:oturpo@unsa.edu.pe), [vbarredapa@unsa.edu.pe](mailto:vbarredapa@unsa.edu.pe), [evidal@unsa.edu.pe](mailto:evidal@unsa.edu.pe),  
[ecastro@unsa.edu.pe](mailto:ecastro@unsa.edu.pe), [aguaded@uhu.es](mailto:aguaded@uhu.es)

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### Abstract

The use of video games has increased exponentially worldwide, mainly among the youth population. The main objective of this article is to evaluate the consumption habits and motivations of engineering students to play video games. To this end, an instrument to measure the use of video games and a scale of motivations were administered to 633 students enrolled in different academic engineering programs at a Peruvian public university. It was found that 91.3% of students play video games, compared to 8.7% who have never played them; it was also found that their use is greater among male students (95%) than among female students (73.4%). Likewise, it was found that these students prefer strategy video games, and that they mostly play them for escape and entertainment, and for socioemotional activation. It is concluded that consumption habits and motivations are related, since the greater the consumption of video games, the greater the motivation is for young people to play them.

**Keywords** – Video games, Engineering, Motivation, Higher education.

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## 1. Introduction and Related Works

Video games have become one of the main options for entertainment and leisure activities among the population, especially in the case of young people. The boom of digitization and the subsequent industrialization of gaming have contributed to their growing expansion around the world. Their evolution is controversial and, for some, even superfluous; however, a powerful cultural industry has been created that is present in different areas of human life. The truth is that it arouses adverse reactions in different areas; for many people, video games do not generate any benefits for their users. However, their use extends from businesses to the academic world. Among those knowledgeable about the topic, there is no great resistance or negative reactions; on the contrary, video games are viewed positively, given the

potential to develop various skills in demand in today's world (Romero & Turpo-Gebera, 2015), mainly through their application and use in the different levels of the field of education.

In 2020, the video game industry and interactive media experienced important growth around the world. This industry had average profits of \$139.9 billion; of which, \$73.8 billion correspond to mobile games; \$33.1 billion to computer games; \$19.7 billion to console games; \$9.3 billion to video content about games; and \$6.7 billion to virtual reality games (SuperData, 2020). During this pandemic era, video games have played an important role, since they have constituted a tool of support to survive the harshness of confinement and social distancing (Gabbadini, Baldissarri, Durante, Valtorta, De Rosa & Gallucci, 2020; Sultan, Khushnood & Awan, 2020; Riva, Mantovani & Wiederhold, 2020); even the WHO (2020) recommended the use of active video games in their official Twitter account at the start of the pandemic.

In addition to the above considerations, we can add that the video game industry has been constituted as the top audiovisual leisure activity, with economic revenues that greatly exceed those of the cinema and music industry. The video game industry currently represents a cultural asset (Morales, 2012) that has become a cultural product with greater projection for growth around the world (Desarrollo Español de Videojuegos - DEV, 2018). The consumption of video games continues to increase, and they are positioning themselves as one of the best leisure options across various segments of the population, but much more so in those under age 14 than in adults (García-Carrizo, 2016). In terms of sales, the world video game and console market is led by China, followed by the United States, Japan and South Korea; on a European level, Germany stands out, with a consumption of more than €3.7 billion, followed by the United Kingdom and France, with Spain occupying the ninth place worldwide (SuperData, 2020).

This era is marked by the technological advance that has occurred, with dramatic changes and a global orientation towards connectivity, through interactive communication that has given rise to the emergence of cyberspace and, as a result, to the emergence of virtual social communities. Increasingly more events occur in this space, in which it is becoming more and more common to spend considerable amounts of time. Such changes transform the ordinariness of the various actions, while providing for greater virtual socialization, becoming a space conducive to its own continuity. Games are not foreign to these processes; moreover, they are the most natural alternative to traditional spaces. The growing presence of the virtual games is evidence of the significance of digital environments, which are essentially three-dimensional video games (Osorio, Álvarez & Peinado, 2018). Users feel the need to integrate into a virtual community, generating the disappearance of the customary public spaces in the real world (Rheingold, 1996).

Likewise, It can be said that the video games “trap” their users, causing them to relinquish large amounts of time in order to immerse themselves in the maelstrom that they arouse, by adopting yet another form of leisure and entertainment in front of a screen (Herruzo & Jiménez, 2021). The participation of the users in video games triggers senses and emotions that allow them to be “transported” to other worlds. Motivation is essential for turning to video games, according to Wolf and Perron (2005); they should not be viewed simply as the recreation of a new form of entertainment, their essential nature lies in the irreducibility of the video game. This fact makes it difficult to define them, not only in relation to what should be, but also in terms of what exactly they are. Algorithms, player activities, interfaces and graphics all form part of their structuring, which attempts to meet needs through the graphic images that are developed or through a hardware device that facilitates interaction with a virtually-constructed environment. Playing video games involves various motivations, some which go beyond leisure or fun, and even involves a method of work, travel, competence, social interaction, etc.

Along these lines, it can be said that video games have had a varying impact on users, especially those that are associated with the world of education. There are studies on the positive impacts of video games and serious games for young users, mainly related to knowledge acquisition, content comprehension and the affective and motivational results (Connolly, Boyle, MacArthur, Hainey & Boyle, 2012), as well as the positive impact of commercial video games in higher education (Barr, 2017) and their use and motivations in the university population (Núñez-Pacheco, Barreda-Parra, Guillén-Chávez & Aguaded, 2021). The positive effects of playing video games can be seen from four aspects: cognitive, motivational, emotional

and social. From a cognitive perspective, video games develop spatial skills, problem solving skills, and lead to greater creativity. Likewise, certain game environments can develop a persistent and optimistic motivational style. From an emotional perspective, video games can develop positive emotions, but also negative ones, such as frustration, anger, anxiety and sadness. Finally, from the social side, video games develop social skills that are manifested in the capacity to organize groups and lead people that have like-minded ideas regarding social causes (Granic, Lobel & Engels, 2014).

Similarly, research has been done on the perceptions that students and teachers have concerning the risks and benefits associated with video game use (Aranda Juarez, Sánchez-Navarro, Martínez-Cerdá & Meneses, 2018) and the competences that they develop, such as the development of creativity, thinking and critical analysis, intellectual skills, tolerance of frustration, eye-hand coordination, teamwork, quick thinking, English language learning, electronic and computer skills, facility of reading and writing and managing communication systems and the reflection on the consequences of actions (Martínez, 2019, Soto-Ardila, Melo, Caballero & Luengo, 2019), as well as the development of the intercultural and sociocultural literacy (Shliakhovchuk & Muñoz-García, 2020). In other words, video games have an enormous potential to become effective educative tools. Generally speaking, playing makes it possible to explore and learn about imaginary worlds, take a break from daily problems through entertainment and distraction; test the player to go up against other players or the game itself, and finally, it allows for social interaction (González-Vázquez & Igartua, 2018). A society that does not play is deprived of developing its imaginative and creative capacities.

From a social perspective, satisfaction and induction to video games resides in the capacity for the interaction among players, generating mutual benefits, even among users that do not know one another (Yee et al., 2012; Fink et al., 2015). The pro-social behaviors that are promoted can benefit others, without the performer obtaining anything in return. Thus, it is a conduct primarily geared toward people who did not know each other, without any binding ties. For Martela and Ryan (2016), relationships among video game players who do not know each other tend to improve one's self-esteem and quality of life, given the increase in gratitude, which has an impact on the executive functions. According to Mengel (2014), there is a positive relationship between the hours dedicated to video games and the increase in cooperative actions; while for Verheij, Bleize and Cook (2020), there is no relationship with the time dedicated to these games; but there is one between the online and offline pro-social activities. Bowman, Schulheiss and Schumann (2012) indicate that under the influence of an attachment to the character, the motivation of the video game player oscillates between pro- and antisocial behavior in online games. Pro-social play is more prevalent in older players.

Other works examined the motivations for playing video games (Hamari, Keronen & Alha, 2015; Abeysekera & Dawson, 2015; Sjöblom & Hamari, 2016; Cabeza-Ramírez, Sánchez-Cañizares, & Fuentes-García, 2020; González-Vázquez & Igartua, 2018); similarly, other research deals with the amount of time dedicated to playing, the attitudes towards the game, the experience scales, etc., as well as the acceptability of the games in the higher education (Kim & Ross, 2006; Karakus, Inal & Cagiltay, 2008; Hilgard, Engelhardt & Bartholow, 2013; Alfageme & Sánchez, 2003; Martín-del-Pozo, García-Valcárcel-Muñoz-Repiso & Hernández-Martín, 2019; Oceja & González-Fernández, 2020). There are different types of motivations for the uses and the perspective of the bonuses in video games: cognitive, affective, personal integrative, social integrative and tension relief (Sjöblom & Hamari, 2016). In a similar study on the use of video game streaming platforms, three types of motivations were found: informative, entertainment and social (Cabeza-Ramírez, 2020). Similarly, a scale of motivations for playing video games has been proposed, based on four dimensions: fantasy, escape and entertainment, competition and challenge, and socio-emotional activation (González-Vázquez & Igartua, 2018), which we have considered for the present work.

The interaction generated by video games leads to motivations for the selection of certain products above other options (Vorderer, Bryant, Pieper & Weber, 2006). The selection of motivations takes into account the perceptions that the users have of themselves (for example, whether they consider themselves to be

extrovert or introvert), the knowledge of the video game contents and genres (for example, multiplayer or strategic video games), as well as the response to certain specific personal needs (for example, social interaction or the search for entertainment) (González-Vázquez & Igartua, 2018). Thus, it can be said that the players' motivations depend on certain factors related to personal character, but also to sociocultural factors.

Leisure activities, such as video games, have different underlying reasons and motivations. While these activities are chosen, the decisions are imposed according to certain aspects. Among the decisive factors, personality and the context of the experiences are the most important (Iwasaki & Mannell, 1999), since at the end of the day, it is the players who decide what video games to play, according to their preferences and needs. In addition, the participative nature of video games is taken into consideration, in both a cooperative and a competitive manner (Chen & Pang, 2012). The limitations resulting from the context of participation lead to a range of interactions, which are usually perceived as an opportunity for social satisfaction in certain age groups, from 26 to 84 years; this is either because of the range of objectives or by the relationships that are established or maintained (Schwab & Dustin, 2017). Similarly, they recognize those between 16 and 49 years as “active players”; in different European countries, the average age of the active video players ranges from 16 to 29 years, with a predominance of males and with an emergent female representation (López, 2011). In this context, the prevailing motivations are that they induce the search for friendships or rivalries, and even intergenerational exchanges (de la Hera, Loos, Simons & Blom, 2017).

Video games, as entertainment-oriented technology, also contribute to the development of the quality of life of today's society, despite the problems that can arise in connection with gaming addiction, as well as a sedentary lifestyle, due to the resulting physical inactivity (Espejo, Chacón, Castro, Martínez, Zurita & Pinel, 2015) as the result of incorporating video consoles, smartphones, computers, mobile phones and other Internet-enabled devices (Duque & Vázquez, 2013). Sedentary behaviors induce the subjects to remain seated, contributing to them being overweight and having other physical ailments and discomfort, such as social isolation (Tejeiro, Pelegrina del Río & Gómez, 2009). It is during adolescence when the addiction to video games take shape, which later becomes a habit (Estévez, Herrero, Sarabia & Jáuregui, 2014). From this perspective, video games constitute a risk associated with ICTs, leading to probable dependence. For Young (2004), in this way, an addiction is generated without drugs, created by a repetitive behavior that is pleasant, and that could cause a loss of control, seriously interfering with the social, work and family-related aspects of daily life (Labrador & Villadangos, 2010).

In video games, motivation is central to the decisions made by the subjects. In extrinsic motivation, obtaining results is most important, unlike in intrinsic motivation, which is more oriented to the satisfaction, pleasure or value obtained through their participation (Osorio et al., 2018). In extrinsic motivation, different stages are observed, according to the externally motivated conduct. Its measurement depends on the level of self-determination, as well as the specific regulatory style, the locus of perceived causality and the regulatory process associated with the style. Meanwhile, intrinsic motivation reflects the subject's tendencies, through the simple pleasure or enjoyment of the behavior. These manifestations emerge from the subjects themselves and are associated with the search for novelty, challenge, exercising of their own capacities or exploration and learning, among others. For Deci, Koestner and Ryan (1999), all tangible reward expectations reduce intrinsic motivation; this is also true of threats, deadlines or imposed goals. According to Muros-Ruiz, Aragón-Carretero and Bustos-Jiménez, (2013), the senses aroused by the motivations and behaviors of the video games promote networked socialization, oriented towards pleasure seeking, entertainment, maintenance of social ties, and continuous stimulation in use.

Video game users are mainly male, representing 56% of the worldwide consumption. In fact, they represent those who play with the greatest frequency, in terms of a certain amount of time within all the activities that they perform (Ameneiros & Ricoy, 2015). Likewise, they show a greater level of competence, in terms of both positive attitudes and better access to video games (Escofet & Rubio, 2007). On the one hand, they have developed competences that evidence skills related to hand-eye coordination,

attention and spatial concentration, as well as the capacity to solve problems and make decisions (Okagaki & Frensch, 1994). On the other hand, they have boosted their emotional skills, essentially, sensations related to the progress of the game, such as those related to victories and defeats in competition. Finally, they progress in terms of the social skills that the gamer adopts as a role on a team with which they interact during the game and beyond (Frome, 2007; Tejeiro & Gómez, 2020).

Finally, the research conducted evaluates the role of motivation in the behaviors assumed by video game users, essentially, university students in the field of engineering. In this sense, the need arises to recognize the relationship that exists between young university engineering students at one public Peruvian University, as potential video game players, and the video games; basically, in terms of their use and motivations. Given the context of the study, the objectives of this research are oriented toward evaluating the gaming habits, recognizing the genres of most commonly played video games, and identifying the motivations that the engineering students at a public Peruvian university have to turn to video games as a means of entertainment.

## **2. Methodology**

### **2.1. Design**

The research follows a quantitative descriptive and cross-sectional design; at the same time, it also fulfills the purpose of complying with the study objectives. In this order of proposals, it corresponds to a structured, detailed and meticulous plan that compares the characteristics of the study subjects (engineering students), for the purpose of determining the student preferences in terms of video game use.

### **2.2. Participants**

The data were collected during the first academic semester of 2021. A total of 633 students participated who were enrolled in different academic programs in the field of engineering at a public Peruvian university, corresponding to majors in Telecommunications Engineering, Industrial Engineering, Mine Engineering, Geophysics Engineering, Geologic Engineering, Sanitation Engineering, Civil Engineering, Electronic Engineering and Mechanical Engineering. 82.8% are male ( $n = 524$ ), and 17.2% are female ( $n = 109$ ), all between the ages of 16 and 51 ( $M = 20.09$  and  $DS = 5.23$ ). The majority of the participants are first-year students (81.7%), and the rest are second to fifth year students (18.3%). On a similar note, 68.2% of the participants study and 31.8% study and work at the same time.

### **2.3. Instruments**

For this research, we employed the Reasons for Playing Video Games Scale proposed by González-Vásquez and Igartua (2018), which has been especially adapted for Spanish-speaking areas. This scale consists of four factors: Fantasy (3 items), Escape and entertainment (4 items), Competition and challenge (3 items) and Socio-emotional activation (6 items). According to the authors, fantasy refers to the ability to play according to the objective of exploring and finding out about imaginary worlds and characters (“I like to play because I can do impossible things, things that I cannot do in real life”). Escape and entertainment are connected to the use of video games as an outlet or a means of escape from daily problems through the entertainment and distraction that they provide (“I play to kill time”). Competition and challenge are related to a motivation focused on testing the player’s skills as they face off against other users and on the difficulty of the video game itself (“I like to play video games to demonstrate to my friends that I am the best”). Finally, socio-emotional activation groups all those elements that involve excitation or enjoyment of playing a video game in and of itself, thanks to the content that it offers or the possibility to interact with other people (“Video games are a stimulus for my emotions”).

This study employed the factor analysis technique and the structure of 4 factors of the Scale was confirmed. The Kaiser-Meyer-Olkin test was performed, with a result of 0.898, which is close to 1, indicating that it is possible to carry out the factor analysis. Likewise, the Bartlett spherical test showed a level of significance of 0.001, which is less than 0.05, thus validating the application of the factor analysis.

The Scale consists of 16 Likert-type items with 5 options (1 = Totally disagree and 5 = totally agree). There is adequate internal consistency, with a Cronbach's alpha of .897 for the overall scale.

Regarding video game consumption habits (Espejo et al., 2015), only 3 questions were considered regarding the frequency and the number of video games that they play ("For how long have you played video games?", "How often do you play video games?" and "Number of video games that you play"). Likewise, two questions were adapted from Oceja and González-Fernández (2020) pertaining to the genre of video games: "What is your favorite genre of video games?" and "What is the name of your favorite video game?".

## 2.4. Procedure

Participants were invited by means of a link sent to their institutional email accounts. Data were collected by means of a Google Form in June 2021. Students did not receive any benefit for their participation in the study, which was voluntary and confidential, upon informed consent.

Data were analyzed using the IBM SPSS Statistics 25 program. A descriptive analysis was carried out using frequencies and percentages. Non-parametric Mann-Whitney and Kruskal-Wallis U tests were used for independent samples. Cronbach's Alpha was also calculated to measure the reliability of the motivation test.

## 3. Results

The results are shown according to the following sequence: playing habits, video games genre and motivations. The description and explanation synthesize the characteristics and factors related to the established relationships regarding the process as it is experienced by engineering students. It involves evidencing the codes known and shared by video game users, which in essence portray the dynamics that they not only share, but also their emotional singularities.

### 3.1. The Gaming Habits of Engineering Students

Habits in terms of video games presuppose what is understood to be an essential activity in the subjects' everyday life, an action to which they dedicate a large part of their free time, with the sole objective of having fun. In this case, the time spent playing and other characteristics are manifested as repetitive situations that can induce pleasure, at the same time that they lead to the neglecting of responsibilities. In this section, the answers given by the study subjects interviewed about their gaming habits are presented according to the questions asked.

Regarding the question, "For how long have you played video games?", most of the engineering students (61.3%) have played for more than 4 years; 30.1% have played for less than 3 years, and 8.6% have never played. With regard to the frequency with which they play video games, a third of the sample (33%) play on weekends, 23.7% play once a month, 19.3% play 3 or 4 days a week, 14.8% play every day and 9.2% answered that they never play. With regard to the number of video games that they have played, it was found that more than a third (34.6%) have played 1 or 2 video games; 27.3% have played as many as 10 video games; 33.3% have played more than 20 video games and a small percentage (4.7%) have played no video games whatsoever. The results on the gaming habits of engineering students evidence frequent use, 91.3% as opposed to 8.7% who have never played. It can also be stated that their use is more prevalent in male students (95%) than in female students (73.4%).

### 3.2. Regarding Gender and the Use of Favorite Video Games

The information about gender and the use of favorite video games was organized according to socio-demographic data and video game consumption habits.

Figure 1 shows that the most commonly played genre of video games by male students is Strategy (39.1%) and Shooters (21.0%), with the rest falling below levels of 10%. Women most often play games in the

Strategy genre (22%), followed by the Shooters (18.3%) and Adventure (14.7%) genres (see Figure 1). According to the classification used by Oceja and González-Fernández (2020), students chose their genre according to its use. The main characteristic of Strategy games is the omniscient position that the player has to execute actions affecting characters and elements; Shooters is a shooting game, generally including realistic war games; finally, according to the authors, the Adventure games played by the female subjects in this sample are characterized by managing a character throughout a narrative system.

With regard to favorite video games, it was found that Dota2 is the game preferred by male students (24.8%), followed by Free Fire (5.3%) and Call of Duty (5%); while female students prefer Free Fire (10.1%), Among Us (5.5%) and Mario Bros (4.6%). Likewise, more women (26.6%) than men have commented that they do not have a favorite video game (3.8%) (see Figure 2). *Dota 2* (Ancestors defense 2), preferred by males, is a real-time action strategy game. It belongs to the fantasy genre. Two teams of five players face off against each other on a map. Each player chooses a particular hero (Font & Mahlmann, 2019). On the other hand, *Fire Free*, the preferred video game by females, is a multiplayer mobile game. It belongs to the action and adventure genre. The objective is to survive on an island, together with 50 other players (Macedo & Kurtz, 2021).

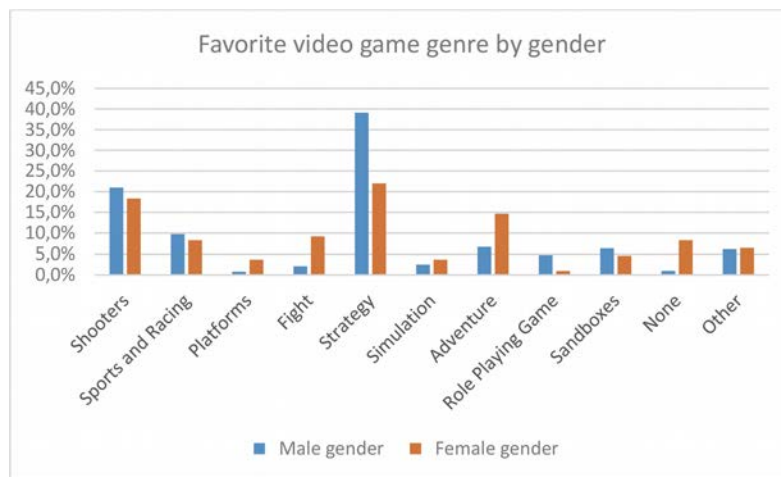


Figure 1. Favorite video game genre

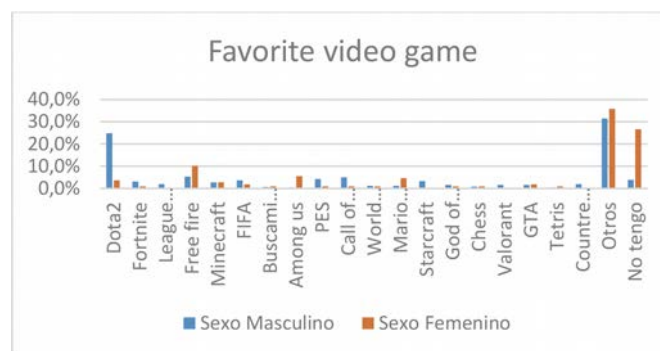


Figure 2. Favorite video game by genre

### 3.3. Regarding the Motivations to Play Video Games

In order to compare the motivation subscales to genre, the Mann-Whitney U test was applied. The result is that in the first factor, fantasy, there are no differences between the genders; men and women both obtained a score above 9; on the other hand, there are moderate differences in the three remaining factors. More male students use video games as an outlet and a source of entertainment, competition and challenge and for socio-emotional activation (see Table 1). On the fantasy scale, which obtained similar

scores, both women and men refer to “playing with the objective of exploring and finding out about imaginative worlds and characters” (González-Vázquez & Igartua, 2018: page 138).

Motivation	M (n = 524)	F (n = 109)	U	p	Hedges' g
	Mdn/R	Mdn/R			
Subscales					
Fantasy	9(12)	9(12)	27584	.573	
Escape and entertainment	14(16)	12(16)	18371	.000	0.704
Competition and challenge	8(12)	6(12)	17571	.000	0.671
Socio-emotional activation	19(24)	15(22)	17291	.000	0.714
Total scale	51(64)	42(56)	17131	.000	0.735

Note: M = Male, F = Female, Mdn = Median, R = Range

Table 1. Comparison between the motivation and video game genre

Motivation	Study (n = 432)	Study and work (n = 201)	U	p	Hedges' g
	Mdn/range	Mdn/range			
Subscales					
Fantasy	10(12)	9(12)	39012	.039	0.183
Escape and entertainment	14(16)	13(16)	37180	.003	0.255
Competition and challenge	8(12)	8(12)	41479	.363	
Socio-emotional activation	18.5(24)	18(24)	40489	.171	
Total scale	50(64)	48(64)	39846	.095	

Note: M = Male, F = Female, Mdn = Median, R = Range

Table 2. Comparison between the motivation and occupation scales

Motivation	Never	Months	1 year	2-3 years	More than 4 years	
	(n = 55)	(n = 46)	(n = 44)	(n = 100)	(n = 388)	H
	Mdn(R)	Mdn(R)	Mdn(R)	Mdn(R)	Mdn(R)	
Subscales						
Fantasy	16(255)	24(317)	15(268)	49(315)	205(332)	12.261
Escape and entertainment	3(127)	18(289)	17(305)	47(318)	189(348)	72.564
Competition and challenge	13(220)	16(280)	14(272)	43(318)	172(340)	26.590
Socio-emotional activation	9(165)	15(261)	15(246)	55(339)	209(348)	61.424
Total scale	8(159)	17(270)	17(255)	53(326)	214(350)	61.909

Table 3. Comparison between motivation and the length of time the students have played video games

In relation to the students' occupation (Table 2), significant differences were found ( $p = .001$ ) between students who studied and those who studied and worked at the same time. The differences were minor (0.183 and 0.255 for Hedges' g) for the fantasy and escape and entertainment factor, respectively. The data reveal that students who only study play video games more for reasons of fantasy and escape and entertainment.

In the comparison among the motivation factors and the video game habits, the data reveal that the differences are significant: with more years of gaming comes greater motivation. Students who have played more than 4 years (61.3%) are highly motivated by video games across all four factors; they are followed by those who have played for 2 to 3 years (15.8%), as compared to students who have played for less than one year and who have never played video games (see Table 3).

Table 4 shows that there is greater motivation to play video games in students who play on weekends (33%).



Motivation	Never	Once a month	Weekends	3 or 4 days	Everyday	H
	(n = 58)	(n = 150)	(n = 209)	(n = 122)	(n = 94)	
	Mdn(R)	Mdn(R)	Mdn(R)	Mdn(R)	Mdn(R)	
Subscales						
Fantasy	19(268)	53(262)	111(331)	66(334)	60(381)	31.825
Escape and entertainment	4(142)	49(258)	93(322)	70(367)	67(442)	123.134
Competition and challenge	14(222)	39(244)	87(322)	55(355)	63(432)	83.528
Socio-emotional activation	10(176)	40(217)	104(337)	82(389)	67(425)	134.563
Total scale	10(171)	43(221)	109(334)	75(376)	72(447)	140.479

Note: M = Median, R = Range, H = Kruskal Wallis Test

Table 4. Comparison between the motivation and gaming frequency scales

Motivation	None	1 or 2	Up to 10	10-20	More than 20	H
	(n = 58)	(n = 150)	(n = 209)	(n = 122)	(n = 94)	
	Mdn(R)	Mdn(R)	Mdn(R)	Mdn(R)	Mdn(R)	
Subscales						
Fantasy	0	57(249)	64(298)	42(337)	68(377)	47.814
Escape and entertainment	0	77(255)	85(308)	40(326)	78(361)	32.342
Competition and challenge	0	75(259)	77(316)	35(318)	63(347)	23.998
Socio-emotional activation	0	83(246)	87(303)	44(327)	83(381)	50.476
Total scale	0	75(238)	82(304)	45(334)	86(389)	63.828

Note: M = Median, R = Range, H = Kruskal Wallis Test

Table 5. Comparison between the motivation and number of video games played

Related to the number of video games, students who play more than 20 (19.7%) do so for fantasy reasons, while those who play as many as 10 (27.3%) are doing so as a form of escape and entertainment, competition and challenge and socio-emotional activation (see Table 5). Playing more video games is related to activities involving the exploration of imaginary worlds, while playing fewer video games in some ways evidences that the games are used to evade problems, test your competences as a player or to have the opportunity to interact with other people.

In the comparison between motivational factors and the technological device that is used to play video games, the data reveal that the differences are significant ( $p = .001$ ). Students who use a computer (41.9%) are more motivated than those who use mobile phones (29.4%), gaming laptops (17.2%) or video game consoles (11.1%). Tablets were the device least frequently reported (0.5%). Consoles created to play video games are not commonly used in this sample; most students use portable and desktop computers, and a smaller percentage use portable gaming platforms, such as mobile phones and tablets. The advantage of using a console is that it allows players to create hyper-realistic spaces and characters due to its graphic powers; computers, on the other hand, have boosted the use of specific strategy, graphic adventure and flight simulator games; mobile phones and tablets, on the other hand, facilitate the use of causal - and many times free - games, as well as innovative games (Oceja & González-Fernández, 2020).

Socioeconomic factors may also possibly determine the choice of technology devices, since gaming laptops and video game consoles represent a higher cost as compared to mobile phones or simple computers. We must also bear in mind that in the Peruvian context, and in the Latin American context in general, there are public Internet booths where young people meet to play video games for hours on end at a very reduced cost.

#### 4. Discussion and Conclusions

Video games are commonly present in the lives of engineering students, although their use is more prevalent in males than in females. Other studies also corroborate that the consumption in the university male population is greater than that in the female population, although not only in engineering majors (Oceja & González-Fernández, 2020; Núñez-Pacheco et al., 2021). Consumption habits and motivations are strongly related, since the greater video game consumption is, the greater the motivations are that young people have for their use. (Connolly et al., 2012; Granic, 2014; Barr, 2017). The positive effects of playing video games are recognized in terms of cognitive, motivational, emotional and social aspects, and primarily in higher education. However, in a similar study on video game consumption habits in university young people, it was found that the majority showed a low profile, which would lead us to think that video game use is more common in younger people, in other words, interest decreases with age (Espejo et al., 2015). In this regard, “active players” are considered to be subjects between 16 and 49 years of age, with an average age of 33 years, with players traditionally being male, and where women represent an important proportion of the video game consumer market (López, 2011).

In terms of preferences regarding the most commonly played video game genres, our results are similar to those of other studies, which found that the majority of men prefer role-playing, strategy and sports games, while women prefer casual, strategy, role-playing, adventure and simulation games (Oceja & González-Fernández, 2020; Connolly et al., 2012; Espejo, 2015). The preferences of engineering students range from recognizing the importance of exploration and achievement as skills related to their academic training; this involves the very purpose of exploring and investigating spaces that lead to the discovery of new realities. Experiences that contribute to developing skills through video game use lead to establishing social relations, based on the participation in communities, based on the fostering of autonomy and the development of related emotions in association with the video games.

According to our study, the two main motivations that the engineering students have to play video games are the factors of escape and entertainment, and socio-emotional activation. Escape and fantasy allude to playing in order to explore and getting to know imaginary worlds and characters (González-Vázquez & Igartua, 2018), and it is common to both men and women. These results are corroborated by other studies in which video games are used for purposes of entertainment and to kill time, and not necessarily for a specific purpose (Ardila-Muñoz, 2019; Muros-Ruiz et al., 2013). Other studies rather indicate the factors of competence and challenge and socio-emotional activation are those which motivate young people to consume video games (González-Vázquez & Igartua, 2018). One recent study provided additional information, indicating that the motivation of affiliation was a predictor of altruism in collaborative games, i.e., people who use them for purposes of social integration will show pro-social cognitions (Pérez-Sánchez, Giusti-Mora & Soto-Chavarría, 2020). Affiliation is similar to socio-emotional activation, which implies enjoyment due to the possibility of playing with other people, as was the objective that was proposed by the authors of the scale applied in this research.

This study also shows that it is necessary to associate video games with teaching-learning processes, given the high degree of consumption by young engineering students. In general, the use of video games has allowed upper-level students to develop skills in different areas (Barr, 2017; Ardila-Muñoz, 2019). Among the benefits that stand out are the interactive and competitive potential and the sense of autonomy that the person experiences who plays the games (González-Sancho, 2020) or their motivating and entertainment value, by developing logic, critical thinking and problem solving skills (Soto-Ardila et al., 2019). It can be assumed that the association with video games in education is a voluntary process by students; it therefore implies an intrinsic motivation on the part of students, which is associated with self-realization (Abeysekera & Dawson, 2015; Herruzo & Jiménez, 2021) and the granting of rewards in recognition for achievement.

In this sense, video games deserve a place at the university, given their use by the majority and the preference that young people have today, and especially because video games develop a cross-sectional competence, such as the use of Information and Communication Technologies (TIC), which is essential

in 21st century education. Along the same lines, the emergence of serious video games opens up the possibility of introducing them in the classroom, which in turn would enhance learning based on games as an educational strategy for future engineers. Some works have shown that there is a correlation between the enjoyment of gaming and comprehension and the will to pursue engineering studies (Carvalho, Rodríguez, Nistal, Hromin, Bianchi, Heidmann et al., 2018). For this reason, the engineering educational community should explore this possibility (Bodnar, Anastasio, Enszer & Burkey, 2016). Likewise, it can be considered that the use of video games in the educational processes poses a challenge, as it requires educational agents with capacities to design and execute attractive activities that develop capacities such as critical thinking, scientific thinking, the search for alternative solutions and perseverance, as well as the recognition of others, self-knowledge, self-control, autonomy, work-related competences, cooperative work and decision-making (Ardila-Muñoz, 2019).

Future works must investigate how video games have been used in the field of engineering, either for the purposes of teaching a particular subject, the development of some kind of software or application of other technologies, such as the artificial intelligence, in the development of video games and gamified platforms. Likewise, the results obtained in this work will serve as a reference to create an academically-oriented gamified platform for engineering students. The study has allowed us to recognize the importance that video games have for young university students, involving a complex structure that demands creativity and knowledge. With this intent in mind, educational mediation would encourage students to participate in educational environments that rely on entertainment in the promotion and acquisition of knowledge about themselves and others.

Finally, it is relevant to mention some limitations to the present study; basically, associated with the difficulties in the distribution and the process of completing the questionnaires with engineering students, and also, in the determination of the sample, based on access, due to the COVID-19 pandemic. In this sense, in order to improve the data collection processes, and thereby the study, it would be recommended to expand the sample size, and to increase the number of interviewers. In the same way, it is open to the possibility of including and analyzing other variables of a personal, academic and social nature, which would make it possible to have a better profile of the study subjects, in order to establish the necessary ties between motivations and habits with regard to video games. In this line of possibilities, comparisons could be established between the different fields of engineering, as well as with other similar fields of training.

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The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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