

Survival of implementation TENS electric currents for glycemic control in type 2 diabetic patients out of control, captured in the CERTF (rehabilitation school clinic & physical therapy)

Pervivencia de implementación de corrientes eléctricas TENS para el control de glicemia en pacientes diabéticos tipo 2 descontrolados, captados en la CERTF (Clínica Escuela de Rehabilitación y Terapia Física)

LÓPEZ-MORALES, Guadalupe†*, VALENCIA-MELO, Stephany, LIRA-FUENTES, Nelly and PATRICIO-RAFAEL, Emmanuel

ID 1st Author: *Guadalupe, López-Morales*

ID 1st Coauthor: *Stephany, Valencia -Melo*

ID 2nd Coauthor: *Nelly, Lira-Fuentes*

ID 3rd Coauthor: *Emmanuel, Patricio-Rafael*

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Abstract

Diabetes Mellitus (DM) represents a health challenge, due to its high prevalence and the morbidity that it entails, but because of the costs that its treatment implies. Diabetes Mellitus is a chronic-degenerative disease characterized by defects in the action and / or production of insulin, which generates a hyperglycemic effect. The objective in the application of TENS is to decrease the glycated hemoglobin value by one percentage point with respect to its initial value through the application of external electrical currents TENS in uncontrolled type II diabetic patients. Electrostimulation is considered an alternative for the treatment of uncontrolled Type 2 Diabetes Mellitus, since it produces a temporary, metabolic, morphological transformation of fast fibers or slow muscle fibers. With this, glucose metabolism can be controlled by its plasma concentrations and by a large extent of glucose transport through the cell membrane, thus being a treatment option that does not generate side effects for the patient, and does not generate high costs in your application.

Uncontrolled Type 2 Diabetes Mellitus, TENS, HbA1c

Resumen

La Diabetes Mellitus (DM) representa un reto para la salud, por su alta prevalencia y la morbilidad que conlleva, sino por los costos que implica su tratamiento. La Diabetes Mellitus es una enfermedad crónico-degenerativa que se caracteriza por defectos en la acción y/o producción de insulina, lo que genera un efecto hiperglicémico. El Objetivo en la aplicación de TENS es disminuir en un punto porcentual el valor de hemoglobina glucosilada con respecto a su valor inicial a través de la aplicación de corrientes eléctricas externas TENS en pacientes diabéticos tipo II descontrolados. La electroestimulación es considerada una alterantiva para el tratamiento de la Diabetes Mellitus tipo 2 descontrolada, ya que produce una transformación temporal, metabólica, morfológica, de fibras rápidas o fibras musculares lentas. Con esto el metabolismo de la glucosa puede ser controlada por sus concentraciones plasmáticas y por una gran extensión del transporte de glucosa a través de la membrana celular, siendo así una opción de tratamiento que no genera efectos secundarios al paciente, y no genera costos elevados en su aplicación.

Diabetes Mellitus tipo 2 descontrolada, TENS, HbA1c

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* Correspondence to Author (Email: guadalupe.lopez@utxicotepec.edu.mx).

† Researcher contributing as first author.

Introduction

According to the World Health Organization (WHO), Diabetes Mellitus is one of the most common and dangerous diseases in Mexico, which is the second cause of mortality in all ages, reporting 87 thousand deaths in 2014 in a population over thirty years of age, derived from complications including diabetic neuropathy, diabetic foot, ulcers, amputations, diabetic retinopathy and kidney failure.

The Mexican Institute of Social Security (IMSS) reports for the Puebla delegation more than 4 thousand deaths per year from diabetes mellitus. It is therefore necessary to generate new techniques that allow better glycemic control to be carried out, which reduces the complications of type 2 diabetes mellitus, producing an impact on the intake of hypoglycemic drugs and their effects.

TENS is a type of electrotherapy that since its appearance in the field of Physical Therapy has been used as a successful modality in the attenuation of acute and chronic pain as well as being a non-invasive and painless technique; Although they are still being investigated, it is intended to demonstrate its metabolic effects with neuromuscular activation.

The School of Rehabilitation and Physical Therapy Clinic (CERTF) belonging to the Technological University of Xicotepec de Juárez provides care to the general public with different pathologies such as type 2 diabetes mellitus, therefore the importance of proposing and establishing intervention alternatives for patients diabetics, which contribute to their rehabilitation and glycemic control.

Justification

Diabetes Mellitus (DM) presents extraordinary challenges for health systems, not only because of its high prevalence and the mobility it entails, but also because of the complexity and costs involved in its treatment.

It is estimated that about 8.3% of the world's adult population has DM (about 366 million). This will increase to about 9.9% (552 million) by the year 2030¹. According to WHO data, 80% of deaths from DM occur in low- and middle-income countries².

The measurement of glycated hemoglobin is the standard criterion for the evaluation of glycemic control, which seeks to reduce or delay the appearance of micro and macrovascular complications, for this reason it is important to look for the control of percentage figures of glycemia³.

General purpose

Identify the parameters to decrease the glycated hemoglobin value by one percentage point with respect to its initial value through the application of external electrical currents TENS in uncontrolled type II diabetic patients.

Specific objectives

Know the management of glycemic indices in diabetic patients, through physiotherapeutic intervention.

Propose a treatment protocol with TENS current that reduces the consumption of hypoglycemic agents.

Theoretical framework

Background

Glycogen is the main storage carbohydrate in animals; corresponds to starch in vegetables; It is a branched polymer of α -d-glucose found primarily in the liver and muscles.

In studies applied in rats, it was observed that “the greater the decrease in muscle glycogen after exercise, fasting, electrostimulation or a low-carbohydrate diet, the GLUT4 concentration found in the sarcolemma was higher, and therefore greater glucose uptake after exercise. food intake”⁴.

In March 2015, an article was published on the effects of a comprehensive electrostimulation program in people with type 2 diabetes. The intervention consisted of 20-minute training sessions for 15 subjects with an average age of 61.7 years, twice a week. for 10 weeks⁵. The authors conclude that fasting blood glucose decreased significantly, as well as the HbA1c level, they mention that Comprehensive Electrostimulation (EMS) may be a new method to help patients overcome their lifestyle.

Furthermore, it was found that after the application of EMS currents in the muscles of the trunk, legs and arms, there was an improvement in glucose metabolism and functional performance in patients with DM2.

Another advantage of electrostimulation is that it can be an effective strategy to attenuate the loss of muscle mass, since these patients normally present an exacerbated sarcolemma, in a study carried out in six 70-year-old men with type 2 diabetes mellitus, it was concluded that Neuromuscular Electrical Stimulation (NMES) directly stimulate skeletal muscle protein synthesis rates *in vivo* in humans⁶.

It is important to consider case studies such as the one presented by MUEEN-ULLAN, Khan in 2012 in the Singapore Medicine journal: an 80-year-old man with type 2 diabetes mellitus came to the hospital with back pain, and a session was recommended of TENS (transcutaneous nerve electrostimulation) every 24 hours. When the improvement was observed, the dose was increased to 3 times every 24 hours, as a side effect the man suffered hypoglycemia, opposite effect when suppressing the treatment with TENS hyperglycemia was produced, but when restarting it again the response was hypoglycemic⁷. The authors' conclusions are aimed at explaining these episodes by effective pain control, decreased sympathetic stimulation, increased insulin sensitivity, or altered muscle metabolism.

Diabetes Mellitus II

Diabetes Mellitus is a chronic degenerative disease characterized by defects in the action and / or production of insulin, which generates a hyperglycemic effect. It is related to the condition of obesity and secondary to insulin resistance in conjunction with the deterioration of the B cell function of the pancreas, producing the ability to maintain glycemic concentrations, which leads to hyperglycemia, initially in post-prandial states. and then preprandial giving origin to the diagnosis of Diabetes Mellitus.

Diabetes Mellitus is related to obesity, therefore, the accumulated fatty tissue in adipocytes seems to initiate the pathophysiological process, adipocytes accumulate fatty acids in the form of triglycerides and adipokine signals, the adipocyte has the characteristic of changing its size according to the fatty acids that accumulate, fatty acids that fail to be stored in adipocytes tend to accumulate in skeletal muscle tissue and the liver, to which it is important to mention that skeletal muscle is the main target organ of insulin since it deposits the 80% of circulating glucose, the arrival of fatty acids blocks insulin signals, generating insulin resistance in skeletal muscle.

Damage to the B cell of the pancreas is related to genetic factors related to oxidative stress (glycogenolysis, B oxidation), decreasing transcription factors in the duodenum and pancreas, generating lipotoxicity.

The alteration in glucose transport is due to defects in the signaling pathway, this produces a deficient translocation of intracytoplasmic GLUT 4 of the cell membrane. GLUT4 is located in the cytoplasm stored in the form of vesicles, the translocation of GLUT4 vesicles or insulin response vesicles from the cytoplasm to the plasma membrane, is regulated by the action of insulin, as the GLUT4 vesicle of the cytoplasm translocates to the membrane, with subsequent glucose uptake, translocation is influenced by serine / threonine phosphatidylinositol3 kinase (AKT).

The deposition of diacylglycerol and ceramides in skeletal muscle alters the translocation of GLUT4, causing an inflammatory process that leads to insulin resistance present in Diabetes Mellitus, studies have shown that GLUT4 deficiency produces alterations in signaling in muscle and liver, decreasing the phosphorylation activity on the insulin receptor substrate.

Classification of Diabetes Mellitus

Gestational diabetes: it is the alteration in the metabolism of carbohydrates that is detected for the first time during pregnancy, this translates an insufficient adaptation to the insulin resistance that occurs in the pregnant woman.

Type 1 diabetes mellitus. There is destruction of beta cells of the pancreas, generally with absolute insulin deficiency. Patients can be of any age, almost always lean, and usually have an abrupt onset of signs and symptoms with insulinopenia before the age of 30 years.

Type 2 diabetes mellitus. It is manifested by insulin resistance and concomitantly a deficiency in its production, it can be absolute or relative. Patients are usually older than 30 years when the diagnosis is made, they are obese and have relatively few classic symptoms (Roberto de Jesús Sandoval Muñoz, 2016).

Other types of Diabetes.

- For genetic causes.
- Autoimmune.
- Medications.

Criteria for the Diagnosis of Diabetes Mellitus:

- Fasting blood glucose greater than 125 mg / dL. Fasting of at least 8 hours.
- 2h PG greater than 200 mg / dL in PTG test with 75g.
- A1c of 6.5% or more.
- HbA1c > 210-240 mg / dL.

With this, it is understood that the uncontrolled diabetic is one who is above these figures.

Transcutaneous Neuromuscular Electrostimulation (TENS)

TENS currents are a specialized form of electrical stimulation, designed to reduce pain. The pulses of the electrical currents can be square, rectangular or spiculated, conventional TENS is the most used in the practical field, it is highly effective in acute pain, in root syndromes, among other indications.

For conventional stimulation it is normally between 30 and 60 minutes, the application time is shorter (20 to 30 min) in the forms of motor stimulation for which tolerance is lower.

Electrical stimulation reverses this recruitment pattern, which is carried out from the fibers that are usually located more superficially, corresponding to large motor neurons that innervate the fast muscle fiber. Voluntary contractions do not produce muscle fatigue as early in the exercise period as induced electrical contractions do.

Each time the electrical stimulus is applied, the same motor units respond. Voluntary muscle contraction varies from one movement to another because some motor units are excited while others are inactive. However, this contractile synchrony can be favorable to train the muscles through the use of synchronized contractions that improve muscle strength and work.

Neuromuscular electrostimulation (NMES) has returned its interest in enhancing the healthy innervated muscle. It is a proven fact that NMES is effective in increasing muscle strength and increasing local circulation in contracted muscle.

Prolonged electrostimulation (more than 3 weeks) of low amplitude and high number of repetitions (series of 10 contractions) produces an increase in resistance and biochemical modifications in the muscle: increase in oxidative activity, myoglobin, mitochondria and the number of capillaries. That is, there is a temporary, metabolic and even morphological transformation of fast fibers or slow muscle fibers.

Physiology of muscle contraction

Muscle contraction is a highly regulated process, which depends on the concentration of free Ca²⁺ in the cytoplasm ([Ca²⁺]) and that in skeletal muscle is regulated primarily by the sarcoplasmic reticulum (SR) which functions as a store of high concentrations of Ca²⁺ (0.5 to 2 mM) since it participates as a calcium store as well as its participation in the regulation of the coupling-excitation-contraction process.

Muscle contraction is the result of the molecular interaction that occurs between (actin and myosin) in which the excitation-contraction sequence is activated in the muscle that is initiated by the propagation of an action potential along the plasma membrane and T tubules which detect changes in the membrane potential by the DHPR dihydropyridine receptors that activate the sarcoplasmic reticulum (RS) which when activated increases Ca concentrations in the cytoplasm and thus the activation of contractile filaments (actin and myosin) the power shock or contraction occurs.

Muscle contraction is a process activated by a nerve-type electrical stimulus that causes shortening of muscle fibers, this is displaced by motor neurons. In that sense, mention that the muscular work of 2 seconds needs a cellular deposit of 100 mmol, which corresponds to 4 kilojoules or kilocalories.

Argumentation

Based on the information collected within the physiotherapeutic modalities, TENS is a proposal for the control of glycemic indices in type 2 diabetic patients, since during its application there is a decrease in glucose through the muscular contraction generated by the electrical stimulus.

In the publication made by Khan in 2012 which is named: Does the application of TENS have a role in the control of diabetes mellitus in insulin-dependent patients? The effects of TENS in pain control were demonstrated, secondary to this it generated a hypoglycemic effect. (MUEEN-ULLAN, Khan)

Therefore, it is considered feasible to continue the studies of TENS and its effects in patients with uncontrolled type 2 diabetes mellitus, hoping to obtain favorable results in future applications.

Conclusion

Glucose metabolism can be controlled by its plasma concentrations and by a large extent of glucose transport across the cell membrane.

Because of their ability to generate muscle contractions and have few risks in their application, TENS is feasible to use in uncontrolled type 2 diabetic patients who attend the CERTF and thus propose a treatment strategy to lower their glycemic indices as well as the costs of Attention.

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Digital graphic organizers as a tool to foster reading comprehension

Organizadores gráficos digitales como herramienta para fomentar la comprensión lectora

FLORES-GONZÁLEZ, Norma†*, FLORES-GONZÁLEZ, Efigenia, ZAMORA-HERNÁNDEZ, Mónica and CASTELAN-FLORES, Vianey

Benemérita Universidad Autónoma de Puebla, Mexico.

ID 1st Author: *Norma, Flores-González* / **ORC ID:** 0000-0002-4967-8854, **Researcher ID Thomson:** S-6917-2018, **CVU CONACYT ID:** 957036

ID 1st Coauthor: *Efigenia, Flores-González* / **ORC ID:** 0000-0002-8340-9340, **Researcher ID Thomson:** S-5923-2018, **CVU CONACYT ID:** 333959

ID 2nd Coauthor: *Mónica, Zamora-Hernández* / **ORC ID:** 0000-0002-7012-4805, **Researcher ID Publons:** 3071599

ID 3rd Coauthor: *Vianey, Castelán-Flores* / **ORC ID:** 0000-0001-8687-2552, **Researcher ID Publons:** 3071615

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Abstract

Foreign language learners have difficulties understanding texts because they try to code and decode in their mother tongue; then, the necessity of looking for a strategy to help them is crucial. The objective of this research is to show how digital graphic organizers (DGOs) help students develop reading comprehension, especially in understanding the evolution of the English language. The review of different theories about DGOs guided to identify a proto-typed model of analysis and design digital activities to represent students' understanding of a text. Methodologically, an experimental design consisting of pre and post-treatment tests were applied in the control and experimental group, during fall 2019 in the English Language Teaching Bachelor at BUAP, on a sample of 60 subjects. A treatment phase (didactic intervention) to prove the suitability of the proposal took place by using DGOs as a tool to promote reading comprehension of texts and knowledge representation. The most outstanding results were a deeper understanding of facts, historical events, the ability to synthesize information with DGOs, and the motivation to read about historical events. In conclusion, this way of developing understanding and representation of the knowledge was perceived positively by the subjects.

Digital graphic organizers, Reading comprehension, Knowledge representation

Resumen

Los estudiantes de lenguas extranjeras enfrentan dificultades para comprender textos porque codifican y decodifican en su lengua materna; por ende, es crucial la búsqueda de una estrategia que subsane dicha problemática. El objetivo de esta investigación es mostrar cómo los organizadores gráficos digitales (OGDs) ayudan a los estudiantes a desarrollar la comprensión lectora, especialmente en la evolución del inglés. Se revisaron diferentes teorías sobre OGDs, obteniéndose un modelo de análisis prototipo a partir del cual se diseñaron actividades digitales para representar la comprensión de los estudiantes. Metodológicamente, se aplicó un diseño experimental consistente en pruebas pre y pos-tratamiento a un grupo control y experimental, durante el otoño de 2019 en la Licenciatura en Enseñanza del Inglés, BUAP, en una muestra de 60 sujetos. Para probar la idoneidad de esta propuesta, se diseñó un tratamiento (intervención didáctica) utilizando los OGDs como herramienta para promover la comprensión lectora de textos y la representación del conocimiento. Los resultados más destacados fueron una comprensión más profunda de los hechos y eventos históricos así como la motivación para leer sobre estos y la capacidad de sintetizar información con los OGDs. En conclusión, los sujetos percibieron positivamente la forma de desarrollar la comprensión y representación del conocimiento.

Organizadores gráficos digitales, Comprensión lectora, Representación del conocimiento

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* Correspondencia del Autor (Email: norma-fg@hotmail.com)

† Researcher contributing as first author.

Introduction

Speaking a foreign language like English is a process that requires different skills such as oral, written, reading, and listening. At this point, it is worth mentioning that one of the complex skills to foster in a student is reading. It implies a comprehension process where the learner requires not only to know the vocabulary or grammatical structures but also to read among lines, code, and decode written symbols into sentences and apprehend their meaning to be able to represent what they understood either orally or written, in a process called knowledge representation.

In addition to the above, students sometimes consider reading as complex while it should not be because the proficient reading skill leads to success; otherwise, they will have difficulties like an unsatisfied reading process, comprehension skills decline, and poor spelling and writing.

Other features that contributed to the perceptions of reading as complex are the students' feelings towards it and misconceptions like being described as a process that focuses on every single word, how it is pronounced, and what it means, read one-by-one loudly or read fast with the correct pronunciation.

There is a misunderstanding of what reading is and what the reading process is all about. Then, teachers should look for attractive ways to promote it in and outside the classroom like in this study since students have to read about the history of the language to understand how the English language has been changing from old English until the late modern English period, and comprehend the linguistic, phonological, and stylistic changes among other facts.

Due to all the above, the objective of the present study is to show how digital graphic organizers could help students not only to understand facts but also to grasp the evolution process of the English language.

The present study contributes to the teaching-learning process by providing an instructional model to promote reading comprehension for on-site sessions and virtual environments consisting of using digital graphic organizers as a means to represent their reading comprehension and knowledge from a given text.

It also provides ideas to innovate the teaching practice in terms of the development of collaborative work, reading strategies, and learning of the foreign language at the linguistic and discursive levels since students read said language in a historical context.

Literature review

It is necessary to define concepts related to reading, reading comprehension, graphic organizers, and knowledge representation to have a complete view of the study.

Reading

It should be clear that reading is more than pronunciation or a decoding activity even though when someone reads, he receives written symbols and uses his cognitive process to build up sentences and paragraphs to convey a message. Indeed, reading is a comprehension process that provides students with ways to represent what they understood from a text, either orally or written. Thus, reading classes should focus on providing strategies to recognize main ideas and supporting ideas to have a complete appreciation of a given text and do a mental representation of their knowledge.

Alderson (2000, p. 3) mentions that “the process is likely to be dynamic, variable, and different for the same reader on the same text at a different time or with a different purpose in reading”.

It supposes that in the reading process, readers expect to get new information depending on the type of reading they choose. According to Grellet (1981), they are scanning, skimming, extensive and intensive reading, and all of them interact in the reading act.

For the present study, reading is an active process that asks readers to recognize words to construct meaning based on the new information from the text and previous reader's knowledge to be able to represent that new accumulation of data.

As can be seen, reading needs some instruction and planning since it is not acquired naturally. According to Zuñiga (2001), reading in English as a foreign language demands not only to decode written symbols, know the vocabulary and grammatical structures but also to recognize the cultural background of that specific context to build up meanings.

The latter features show that reading is a complex process due to its multifaceted stages and different variables that take place in the reading comprehension process.

Reading comprehension

Reading in a foreign language asks for the implementation of strategies or models to carry out reading comprehension. According to Flores-González (2019, p. 45), "strategies are procedures used to regulate the activity of the reader within the process of reading comprehension".

Some authors like Alderson (2000), Sereno and Rayner (2003), Carrell (1998), and Goodman (1982) distinguish two models to extract meaning from a text during the reading comprehension stage: bottom-up and top-down processes. The former deals with decoding symbols into words, sentences, paragraphs, and even a complete reading (Carrell, 1998). The latter fixes attention on the relationship between the information from the text and the reader's linguistic, cultural, historical, and syntactic knowledge to get meaning.

A second model called the Interactive model of reading conceives it as a mix of the two previous models. That is why Hedge (2000, p. 188) mentions that "reading can be seen as a kind of dialogue between the reader and the text, or even between the reader and the author" where the first one uses morphological, sociocultural, topic, genre, syntactic and general world knowledge to make sense of the text.

Furthermore, Vaezi (2006), Liao in Hong (2013), Katheleen (1986), Djuwarsih (2006), Macleod in Abdelrahman (2014), and Fatmawati (2014) state that skimming, scanning, prediction, inference, and summary are the core of comprehension strategies and successful reading process.

At this point, McNamara, Boonthum, Levinstein & Millis (2009: 218) mention that "reading strategies are more useful and beneficial for learners who show lack of knowledge in the domain of reading, as well as those with lower reading skill, these kinds of learners are strongly needed to these strategies to achieve reading comprehension".

Besides, there are other strategies which can help learners to understand a text while interacting with it and develop reading comprehension in different environments or contexts such as brainstorming, comparison-contrast chart, question-answer, KWL (Know-Want-Learn), using prior knowledge (previewing), story maps, and graphic organizers among others. Thus, in the following lines, they are described in detail.

Brainstorming. It elicits students' ideas toward a specific topic. According to Arivananthan (2015, p. 1), "brainstorming is meant to stimulate or excite the brain into thinking about issues in a new way. It encourages people to arrest conventional, logical thinking and embrace spontaneity, originality, and imagination". Then, this technique promotes the activation of prior knowledge (linguistic, syntactic, cultural, historical, and social) to engage students in the main topic and focus their attention on the task goal so that they could corroborate or refute their assumptions once they read the text.

Comparison-contrast chart. It consists of analyzing the similarities and differences in given topics, people, and objects. Its format provides students a practical way to organize information into a meaningful representation of what they understood from a text and even summarize it demonstrating some relationships between concepts like cause and effect. Asking students to perform a comparative analysis based on that two criteria is a suitable strategy that guides them to show outstanding achievements in specific areas or contents (Marzano, 2007).

Question-answer. This strategy not only motivates students to ask and answer questions but also to focus on the meaning of a text. Using it in the reading comprehension process requires teachers to design a model of interaction by determining relevant questions to detonate participation and provide students with the ad hoc strategies to identify answers. According to Jones (2007), this strategy shows the relationship between the question and the answer. It makes the reader uses his previous knowledge and the information from the text to provide that answer.

It means that the strategy makes learners go through imbalance, accommodation, and assimilation to achieve reading comprehension. KWL (Know-Want-Learn). It comprises three steps what I know, what I want, and what I learn. In the first one, readers predict what the text or topic is about before reading it. In the second, readers express what they want to learn or corroborate based on what they already know, and finally, in the last step, they look for the answers of what they want to learn or what they wrote in the second stage. According to Ogle (1986), it is useful to approach reading in three phases that are prior, during, and after the reading act, using prior knowledge (previewing). Therefore, this strategy is suitable to accomplish knowledge representation.

Story maps. They are highly recommendable for describing historical themes or narrative genres due to the incorporation of specific features from a text such as setting, characters, plot, and them. Regarding Duman cited by Isikdogan and Kargin (2010: 4), "Story map is a schema construction technique that involves teaching the relationships of parts of a story to the reader and giving basic elements of the story in a schema in order to draw the attention of the reader".

Graphic organizers. They allow readers to elaborate representations of keywords from a text. The following section describes them broadly.

Graphic organizers

As it is well known, there is not a simple method or strategy to encourage reading more, developing reading comprehension and knowledge representation.

That is why there is too much interest in this field, and proof of this is the following facts. On the one hand, taking into account the difficulty of reading comprehension and considered as the final result of reading, it is a phenomenon studied from elementary until higher education levels (Au, 2000; Greenleaf et al., 2001; Balfanz, 2002; Moore et al., 1999; Ruddell et al., 1994). On the other hand, in the literature review, there are lots of studies that suggest a variety of methods, approaches, strategies, and techniques to teach reading meaningfully (Bender et al., 2009; Farris et al., 2004; Duffy, 2009, Grabe, 2009; Chesla, 2000; Beuhl, 2008, Flores-González, et al., 2018; Barzilai et al., 2020). Besides, they have been implementing in different fields like chemistry, biology, social sciences, and others.

Regarding the information above, the present study proposes digital graphic organizers as a strategy to develop reading comprehension and knowledge representation. At this point, it is essential to define and understand how to use them in the reading comprehension process.

Graphic organizers. They are strategic tools for the teaching-learning process to organize information into visual representations showing connections between concepts, facts, and terms in a historical sequence. According to Jones (2007, p.1), the organization of information follows different ways like

- According to main ideas, subtopics, and details.
- In sequence.
- To show the relationships between the different parts.
- According to the similarities and differences between two or more concepts.
- By its components, as in the elements of a story.
- ... and lots of other ways.

Besides, they are used before, during, or after reading to improve comprehension and help students understand text structure or arrange textual information in a way that makes recall information easier as in Bean and Steenwyk's study (1984).

Citing Coburn, graphic organizers are:

... diagrams that represent the relationships between facts, ideas, and concepts. They come in many forms, including flowcharts, webbing, concept mapping, and matrixes. They are not organized in a linear format according to a sequence like traditional outlines; instead, they convey relationships through a visual format that are linked and ordered through a conceptual framework (2003, p. 46).

There are different types of graphic organizers like mind and concept mapping, Venn diagram, timeline, and spider web organizers, among others, to represent knowledge from a text. For the present study, timeline, mind mapping, and spider web organizers were applied in a digital instructional design to grasp information from a written source.

Timeline. Based on various studies such as that of Arévalo (2015), students use different graphic organizers such as semantic networks, concept maps, synoptic tables, and timelines to systematize information to improve their reading comprehension. It is a schematic representation of events arranged chronologically for synthesizing information from reading comprehension and relating it to other ideas. Particularly, this organizer shows a summary of a historical event by identifying its crucial elements such as characters, setting, dates, main events taking place in the narration, causes, and effects.

Mind mapping. Its purpose is to recognize the main topic and establish conceptual relationships spontaneously from efficient reading comprehension. Regarding its characteristics, it demands the organization of knowledge from brainstorming, efficient retention of reading comprehension, and note-taking through drawings, images, and lines.

In other words, they are diagrams that enhance creative thinking through a hierarchy of sequence and logical scheme, and according to Mamani (2010), mind mapping is a way to face problems with reading comprehension.

Spider web organizers. It schematizes knowledge from reading comprehension in a hierarchical way by capturing the relationship of multiple categories with a category that represents the central nucleus. Taking into account Pimienta (2012), the spider webs are schemes that categorized data as topic and subtopics pointing out their characteristics.

How to use graphic organizers to develop reading comprehension?

During its usage, teachers should show how to do them with examples, and later, ask students to do their design with their guidance so that they work independently in due course.

Their implementation requires establishing at least two steps.

- Students' training is necessary for designing to develop some familiarity with formats and how to work with them.
- Teachers must accomplish some changes in guidance and feedback during the process taking into account the cycle of activities during the pre-while-post reading.

McTighe, as cited in Praveen and Premalatha (2013, p.156), proposed that before instruction, graphic organizers should be used to assess the level of the students in terms of understanding. During instruction, thinking is supported by graphic organizers allowing students to explore the content from a cognitive angle. After instruction, organizers help students to summarize the text and to assess their own improvement.

Finally, since reading is an interactive and active task, the implementation of graphic organizers could be applied in groups or pairs to develop collaborative or cooperative work.

Knowledge representation

There is not an agreement to determine why its name and how to evaluate it, but it is the process that allows learners to show information, knowledge, and in general, their comprehension from a source.

In the case of reading, it lets students demonstrate evidence of what they read by being able to represent the information in their own words, showing the connection between their previous knowledge and the new information gotten from the text as a result of the assimilation and accommodation processes. All in all, knowledge representation studies the mental images of cognitive processes where that mental depiction is appropriate if the information and visual knowledge contribute to the formation of a competent user.

In conclusion, students face difficulties when decoding words, sentences, paragraphs, and a complete text, which inhibit reading comprehension and knowledge representation. Then, the suggestion is to look for alternatives to avoid them.

Methodology

Regarding methodology, the study followed a longitudinal experimental quantitative design with a descriptive scope consisting of pre- and post-treatment tests to identify comparison parameters and find out what reading comprehension was like before treatment (didactic intervention) and what happened after it.

Its selection was due to the necessity of evaluating the instructional design that according to Shuttleworth (2014), this is an ad hoc way to approach this phenomenon because it provides the following analysis: a) compare the post-treatment test from the two groups and analyze the effectiveness of the treatment phase, b) offer a whole scope of the control and experimental groups' changes by comparing the pre and post-treatment tests and c) compare the scores from the pre-treatment test to be sure about the random assignment of both groups respectively.

The table below shows the instruments used to collect the data.

Stages	Instruments
Pre-treatment test	Questionnaire of 50 items. Its objective was to measure the subjects' reading comprehension.
Treatment (Didactic intervention)	Instructional design. It comprises digital graphic organizers as a tool to develop reading comprehension and knowledge representation from written sources.
Post-treatment test	Questionnaire of 50 items. (It was the same used in the pre-treatment test). Its objective was to measure subjects' reading comprehension after the treatment, in the case of the experimental group.

Table 1 Instruments used to collect data

Context. This research was done in the English Language Teaching Bachelor at the Benemérita Universidad Autónoma de Puebla on a sample of 60 subjects who were taking the Evolución histórica de la Lengua Inglesa during fall 2019. Control and experimental groups were randomly assigned to be part of the source to get data and analyze this phenomenon of study.

The study comprises three main stages with a total duration of four months.

Stage 1. Pre-treatment test. It was applied at the beginning of the course and consisted of a reading comprehension test of 50 items. The control and experimental groups took it to measure their reading comprehension level.

Stage 2. Treatment. It was a didactic intervention composed of an instructional design based on digital graphic organizers (mind mapping, timeline, and spider webs) as a tool to develop reading comprehension and knowledge representation. It is worth pointing out that the treatment phase was only applied in the experimental group and lasted 14 weeks.

Stage 3. Post-treatment test. In this stage, the test from the pre-treatment measured subjects' reading comprehension level to analyze if there was any change, especially in the experimental group, who learned with the instructional design.

After the application of the instruments, the gathered data provides the following results.

Results**Stage 1. Pre-treatment**

Pre-treatment test			
Subjects	Control Group	Subjects	Experimental Group
12	(8/50)	10	(7/50)
13	(9/50)	4	(11/50)
5	(4/50)	9	(4/50)
		7	(6/50)

Table 2 Subjects' reading comprehension level in the pre-treatment test

As the table shows, both groups got low scores. The main problems found were 1) subjects had a linear vision about the reading because they identified facts and elements in isolation. 2) There is no connection between the main idea and supporting ones, which avoids the general comprehension of the text. 3) They did not evidence a complete understanding of the given text when performing a task or solving an exercise because they did not recover the information, which reflected their poor comprehension. 4) They showed a lack of strategies to withhold information. 5) The answers they emitted reflected the lack of connections between the main concepts of the text due to the isolation reading process. 7) Besides, as they are narrative texts, subjects did not systematize the information, which inhibits the global understanding of a written source. 8) A literal reading is evidenced when the item demands an analysis. Indeed, the subjects presented a cognitive conflict because they expected to find the information explicitly in the text. 9) Finally, they spent an unsuccessful time reading, questioning, and retrieving information because they did not apply suitable reading comprehension strategies.

Stage 2

Treatment: instructional design based on the use of graphic organizers to understand narrative texts.

During the treatment, subjects from the experimental group used digital graphic organizers like mind mapping, timeline, and spider webs to represent their knowledge and comprehension of readings about the evolution of the English language for 14 weeks.

This cycle reading strategy used before, while, and after the interaction with a text allows the following:

- Have an interaction between the reader and the writer to present information visually
- Establish meaningful learning by implementing graphic organizers in reading framed in an instructional design according to the program of the subject
- Look for essential information in a text strategically
- Provide a way to graphically represent the relevant ideas of a text, their relationships (cause-consequence, a sequence of facts, and the structure of a written source.). In other words, the superstructure of the text
- Gradually build the meaning of the text to establish a mental model of facts and events described in it (knowledge representation)
- Identify the relationships established between the main ideas, the details that support them, and other items of information which build up the global understanding of a reading
- By structuring the information systematically in the graphic organizers, students easily remember the information that contributes to store it in the long-term memory, privileging their teaching-learning process.

One of the most distinguishable features of this stage was the subjects' motivation to read about historical events and positive perceptions toward the instructional design.

Stage 3

Post-treatment test. Evaluating subjects' reading comprehension level after the implementation of the instructional design.

At the end of the term, the post-treatment test was applied to both the control and experimental groups to identify if the last one showed any change regarding reading comprehension.

Subjects	Pre-treatment test	Subjects	Post-treatment test
12	(8/50)	13	(47/50)
13	(9/50)	7	(44/50)
5	(4/50)	5	(50/50)
		5	(41/50)

Table 3 Experimental group. Subjects' reading comprehension scores

Taking into account the information above, the experimental group demonstrated meaningful changes in their scores. These mean that the treatment, and in this case, the proposal of using digital graphic organizers, is suitable for the teaching of reading comprehension and knowledge representation.

Some of the most outstanding results were a deeper understanding of facts, historical events, ability to synthesize information with digital graphic organizers, and accurate completion of reading exercises with a higher level of difficulty.

Another dominant feature was that in the pre-test, they showed literal interpretations, and in this phase, they got an inferential level by using digital graphic organizers, which helped them to get high scores.

In the case of the control group, they showed some improvement too, but in comparison with the experimental group, the results from the last group were better.

Subjects	Pre-treatment test	Subjects	Post-treatment test
10	(7/50)	12	(27/50)
4	(11/50)	7	(23/50)
9	(4/50)	5	(15/50)
7	(6/50)	3	(21/50)
		3	(28/50)

Table 4 Control group. Subjects' reading comprehension scores

Subjects from this group showed some improvement; however, they still presented difficulties for understanding the superstructure of texts.

Even though they had on-site sessions where they learned about the historical evolution of the English language and had some theoretical background about the topic, this was not enough to face readings about that topic.

The above suggests the necessity of implementing a change in the teaching process, especially in the instructional teaching model. Thus, teachers should look for a strategy to gain reading comprehension that allows readers to show evidence of what they read and achieve knowledge representation. In doing so, teachers should prepare and engage readers before starting the reading process with the help of strategies and ad hoc activities for that purpose. Then, those readers will use that engagement during and after the reading act to reveal the way they approached the text.

Besides, taking into account the findings, it is noticeable that digital graphic organizers benefit reading comprehension and the representation of knowledge by allowing readers to depict the information from a written source visually.

The results from the experimental group in the post-treatment stage corroborated Jones' assumptions, which pointed out that graphic organizers systematize the information in such a way that it is beneficial for the establishment of relationships between concepts, ideas, and organization of reading as Merkle and Jefferies's study also did in 2000.

Moreover, this instructional design requires changes in the students' and teacher's roles. For the first ones, they consist of being an active learner, analyzing information, relating, and categorizing it into a scheme to learn how to learn. For the second actors, it deals with identifying content and designing the course (activities) according to such content in its implementation, and finally, monitoring and guiding learners while working in it.

In this study, the experimental group reported deeper comprehension in their results as well as information retention and retrieval. According to Griffin and Tulbert (1995), apprehension took place if appropriate strategies are applied for the representation of knowledge because they allow the understanding of the superstructure of a text that goes beyond a literal reading.

Undoubtedly, graphic organizers have their origin in cognitive theories of meaningful learning because they help learners to organize, process, categorize and remember new information, to be able to integrate it significantly with their previous knowledge based on the thought processes. However, there is a presumption among cognitive theorists that mental processes operate in an organized and predictable way and that the use of graphic organizers during the learning process improves the functionality of these processes, as well as the ability to understand information, and this study corroborated those assumptions since the experimental group showed significant understanding in the third face.

Additionally, the cycle activities used in this study do promote reading comprehension like Praveen and Premañatha (2013) state in their research. Indeed, it permits the evaluation of the process as well as understand the way students face a text.

Another crucial factor verified with the findings in this research is the fact that digital graphic organizers promote interaction as an essential element for the teaching-learning process, as pointed out by Egan (1999).

Conclusions

The study concludes that digital graphic organizers are suitable to promote reading comprehension in a short time with outstanding results because learners get more insight from the whole text at their own pace. These diagrams foster meaningful apprehension by breaking down larger or complex concepts into fundamental ideas. In this way, they let learners visualize or present information in a way that is easier to comprehend.

The results clearly show that the use of digital graphic organizers will be more useful in the development of reading comprehension only if the subjects practice it more since that practice will allow them to identify main and supporting ideas as well as their relationship between them to make a more accurate comprehensive visual representation of their understanding.

Another conclusion is related to the subjects' positive perceptions to work with this proposal and its effects.

Even though the objective of the study was to analyze digital graphic organizers for reading comprehension, the results of this proposal also identified the development of cognitive skills such as brainstorming, critical and creative thinking, categorizing and prioritizing content, as well as reflection and autonomy.

This study also provided teachers with a way to make learners activate their prior knowledge about a topic and quickly connect it to new information.

In conclusion, digital graphic organizers allowed students to represent their knowledge appropriately by working actively in their construction and proving their reading comprehension until reaching the meta-cognition.

Finally, this research contributes to breaking the traditional schemes, implement strategies to promote attention and interest in the readings addressed in different courses.

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Level of dependence on video games in adolescents from family and non-family homes in the South of Veracruz, Mexico

Nivel de dependencia a los videojuegos en adolescentes de hogares familiares y no familiares del Sur de Veracruz, México

OSORIO-PÉREZ, Dorian Jared† & BLANCO-ENRÍQUEZ, Francisca Elvira*

Escuela de Enfermería Gotinga, Headquarters Coatzacoalcos, Veracruz, Mexico.

ID 1st Author: *Dorian Jared Osorio-Pérez* / ORC ID: 0000-0002-4783-3021

ID 1st Coauthor: *Francisca Elvira Blanco-Enríquez* / ORC ID: 0000-0001-6802-7486, CVU CONACYT ID: 785171

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Abstract

The use of video games is a global problem that mainly involves young and adolescent population. Methodology: Study with a quantitative approach, non-experimental design, cross-sectional, descriptive type. Universe: 885 adolescents. Sample: 264 students. Sampling: stratified random. Instruments: Personal and Sociodemographic Data Card (CDPS) and the Video Game Dependence Test (TDV) (Chóliz and Marco, 2011). The study adhered to the provisions of the General Health Law on Health Research. For data analysis, it was used the SPSS 25. Results: 83.3% said they played video games in the last year, while 16.7% denied. Of the current players, half (50.4%) of the young people who have played in the last year mention playing alone, mainly from a non-family home. The cell phone is the most used device for video games, with a little more than half (52.7%) of participants who reported their use, of which all belong to a family home. In terms of dependence on video games, 43.2% was light, 35% medium, 17.7% abuse, and 4.1% pathological. Pathological gamblers belong to family homes.

Resumen

El uso de videojuegos es un problema mundial principalmente en población joven y adolescente. Metodología: Estudio de enfoque cuantitativo, diseño no experimental, corte transversal, tipo descriptivo. Universo: 885 adolescentes. Muestra: 264 estudiantes. Muestreo: probabilístico, aleatorio estratificado. Instrumentos: Cédula de Datos Personales y Sociodemográficos (CDPS) y el Test de Dependencia de videojuegos (TDV) (Chóliz y Marco, 2011). El estudio se apegó a lo establecido en la Ley General de Salud en Materia de Investigación para la Salud. Para el análisis de datos se utilizó el SPSS 25. Resultados: El 83.3% afirmó haber jugado videojuegos en el último año, mientras que 16.7% lo negó. De los jugadores actuales, la mitad (50.4%) de los jóvenes menciona jugar solo, principalmente de un hogar no familiar. El celular es el dispositivo más utilizado para los videojuegos, con un poco más de la mitad (52.7%) de participantes que reportaron su uso, de los que todos pertenecen a hogar familiar. En nivel de dependencia a los videojuegos, 43.2% fue ligero, 35% medio, 17.7% abuso y 4.1% patológico. Los jugadores patológicos pertenecen a hogares familiares.

Dependence on video games, Adolescent, Home

Dependencia a los videojuegos, Adolescente, Hogar

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* Correspondencia del Autor (Email: franblancoe@hotmail.com)

† Researcher contributing as first author.

Introduction

In recent years, the use and abuse of Information and Communication Technologies (ICT) is a subject that arouses enormous interest among the world population. Technologies such as the internet, mobile phones and video games represent very useful tools in everyday life, however, there are also certain drawbacks, in which their own design is likely to affect control capacity, which, along with other Personal and environmental factors, facilitate its abusive or inappropriate use, generating the so-called "behavioral addictions", related to various problems for the health of the affected person and those around him (Marco and Chóliz, 2017).

In disorders due to addictive behaviors, the World Health Organization (WHO) in its new edition of the International Classification of Diseases (ICD-11), includes video game disorder for the first time. Video game use disorder can be diagnosed when, over a period of at least 12 months, a behavior characterized by loss of control over the time spent playing is displayed, the highest priority that the game acquires over other interests and activities and the continuation of this behavior despite its negative consequences (WHO, 2019).

Studies indicate that the prevalence of video game use disorder in ranges between 1% and 10% in Europe and North America (WHO, 2019). In Europe, more than 206 million video players are reported, in a population of more than 367 million people with internet access. In Spain, 16.8 million video gamers are present, people of all ages and with an increasing presence of women (Asociación Española de Videojuegos, 2018).

In the United States, the Entertainment Software Association (2020), reports that more than 214 million people in the United States play video games for an hour or more per week. 75% of all American households have at least one person who gambles. 64% of American adults and 70% of those under the age of 18 play video games regularly.

In Latin America, Mexico is reported as the first consumer of video games and worldwide it occupies the 12th place, an important phenomenon in the Mexican Republic, since it is estimated that half of the population uses them, in the country the use of video games is considered a space for junk food advertisers, although it could also be a tool to promote healthy habits (Universidad Nacional Autónoma de México [UNAM], 2020).

The 2018 National Audiovisual Content Consumption Survey, reports that 21% of those interviewed said they play video games, with the cell phone being the most used device with 58%. Regarding the use of the network and video games, 37% used to play online games. About who they play with, 43% play alone. 11% of the participants have a video game console (Instituto Federal de Telecomunicaciones [IFT], 2018).

In the National Survey on the Availability and Use of Information Technologies in Homes (ENDUTIH), it was reported that 6.2% of internet users, according to the connection device, connect through a video game console (Instituto Nacional of Statistics and Geography [INEGI], 2018).

For its part, the Government of the State of Mexico (2017), indicates that the statistics of video game addicts reflect a higher prevalence of young men, between 10 and 35 years of age. In general, they suffer from difficulties in social integration and interaction. Although online games allow sharing and competition, the virtual world leads them to protect themselves more and preserve isolation.

In this sense, video games, with certain visual and auditory qualities, are attractive mainly for young people, as they include multiple entertainment functions and even the possibility of interacting with several players simultaneously from any device (Andrade, Carbonell & López, 2018).

The adolescent population is considered highly vulnerable to dependence on video games, since these are characterized by "catching" those who make use of it, and that is where it is necessary to consolidate the personal and social identity of each person to a greater extent. Individual, being necessary to promote critical and reflective thinking around the use of this technology, with which users can see themselves projected onto some of the people in which they interact in the video game (Ameneiros and Ricoy, 2015).

Likewise, the use of video games among adolescents can affect school performance when, due to playing, the completion of schoolwork is neglected, hours of sleep are sacrificed or they are exposed to too many hours in front of the video game without respecting the necessary rest periods. In other words, it seems that the behavior involved in video games can become pathological depending on the intensity or frequency invested in it and the degree of interference in the family, social and / or school relationships of the people involved (Fuentes and Pérez, 2015).

In recent years, the number of works on video games in adolescents has increased significantly, involving mental health and social environment variables, due to the development and search for identity and personality that characterizes the adolescent. The research on the use of video games that analyzes the home and the family possibly allows to know more about the dynamics of interaction of the adolescent according to his self-realization as an individual.

It is worth mentioning that the use and abuse of video games among the adolescent population is considered an emerging problem recognized by the entire scientific field, although the nursing professional is of great importance for the care and prevention of addictions, which can contribute to reducing the problem by promoting preventive actions so that young people know the effects and consequences of the different uses of video games, identifying the possible benefits of a controlled use, as well as its contrasts with the mental repercussions that affect the addict, his family and community

Objective

Determining the level of video game dependence in adolescents from family and non-family homes in southern Veracruz, Mexico.

Methodology

The study was of quantitative approach, non-experimental design, cross-sectional, descriptive type. The universe was composed of 885 adolescents from a public high school belonging to family and non-family homes in southern Veracruz, Mexico.

The sample was 264 adolescents, calculated with the statistical package STATA. The sampling was of probability class, of stratified random type, in which all the individuals had the same opportunity to be chosen according to each segment of the population (grade and group).

The participating adolescents were found enrolled in a public high school in the South of Veracruz, in the February-July 2020 school period, of any sex, who agreed to participate in the study during the month of February when the corresponding research instruments were applied.

A Personal and Sociodemographic Data Card (CDPS) was used, prepared by the authors of this study that included exploratory questions on age, sex, religion, marital status, occupation, shift, semester, type of household, history of video game use and alcohol consumption.

For the present study, the types of household proposed by the National Institute of Statistics and Geography of Mexico [INEGI] (2015) were considered, which states that the nuclear home is where the father, mother and children or only mother live either the father with children, or a couple who live together and have no children also constitutes a nuclear home; the extended home is made up of a nuclear home plus other relatives (uncles, cousins, brothers, in-laws, etc.); a composite household is one made up of a nuclear or extended household, plus people who are not related to the head of the household; the one-person household is one made up of a single person; and the co-resident household is made up of two or more unrelated people.

Likewise, the Video Game Dependence Test (TDV) was applied, prepared by Mariano Chóliz and Clara Marco in 2011, a diagnostic instrument for video game dependence based on the main DSM-IV diagnostic criteria for substance dependence disorder. It consists of 25 items, with a response scale from 0 to 4. It has four dimensions: abstinence, abuse and tolerance, problems caused by video games and difficulty in control (Marco and Chóliz, 2017).

The instrument is scored according to the level of dependence on video games: Light use (1 to 25 points) Medium use (26 to 50 points) Abuse (51 to 75 points) Pathological use (76 to 100 points). It reports a Cronbach's alpha of 0.94 in other investigations, so it can be considered an instrument with satisfactory psychometric characteristics (Marco and Chóliz, 2017).

When analyzing the internal consistency of the instrument applied in this study, the TDV presented a Cronbach's Alpha of $\alpha = 0.954$, which is acceptable according to Hernández, Fernández and Baptista (2014).

This research adhered to the provisions of the General Health Law on Health Research, Last Reform DOF-2014 (Congress of the Mexican Union, 2014).

For data analysis, the Statistical Package for the Social Sciences (SPSS) version 25 was used to obtain descriptive statistics data such as frequencies and percentages.

Results

In sociodemographic data of the participating adolescents (Table 1), 51.9% were women and 48.1% men, with a mean age of 16.21 years ($SD = 0.958$), with a minimum of 15 years and a maximum of 19 years. Regarding the marital status, 63.6% were single, followed by 32.6% in a courtship, 2.7% married and 1.1% common-law union. In religion, more than half of the young people reported being Catholic with 64.4%, followed by 22.8% who did not profess any religion, 6.8% Christian and 6% from any other religion. Regarding occupation, 93.6% of young people dedicated themselves exclusively to studying, while 6.4% study and work.

	f	%
Gender		
Male	127	48.1
Female	137	51.9
Marital status		
Single	168	63.6
Engagement	86	32.6
Married	7	2.7
Free Union	3	1.1
Religion		
Does not profess any religion	60	22.8
Catholic	170	64.4
Christian	18	6.8
Jehovahs Witness	4	1.5
Pentecost	1	0.4
Presbyterian	3	1.1
Mormon	4	1.5
Adventist	3	1.1
Protestantism	1	0.4
Occupation		
Exclusive dedication student	247	93.6
Study and work	17	6.4

Table 1 Sociodemographic data

Source: CDPS

Regarding the school data, 58.3% of the participants were from the morning shift and 41.7% the afternoon shift, distributed in three current semesters, 36.3% second, 34.5% fourth and 29.2% sixth.

According to the type of household, in the first place 54.2% were found with a nuclear home, in second place, 42% of the extended one, third with 2.3% composite, fourth with 1.1% in a one-person household and lastly 0.4% corrcident.

When asked about the use of video games in the last (current) year, there was a higher percentage of young people who claimed to have played video games with 83.3% ($f = 220$), while 16.7% ($f = 44$) denied it. The average of hours dedicated to the use of video games in a typical day of current players was 3.28 hours ($SD = 2.91$), with a minimum of 1 hour and a maximum of 24 hours. In alcohol consumption, half of the current players (50%) affirmed the consumption of alcohol in the last year, and the other half (50%) denied it.

Regarding the data on video game use of current players, when asked about game days, the total of adolescents reported playing primarily every day with 35.5%, followed by 23.6% one day a week and 18.6% two days. When analyzing by type of household, of the adolescents who play every day, 40% belong to a composite family home, subsequently 37.3% nuclear, and with the same percentage the players from an extended family home and non-family one-person, with 33.3% in both.

Regarding the main reason for using video games, the total of players in the last year mainly referred to playing for entertainment with 39.5%, 22.7% fun and 15.9% distraction. By type of household, in the main reason for gambling for entertainment, all (100%) of adolescents belong to a non-family home, followed by 60% to a composite family home and 41.7% to the extended family.

Regarding the main place of video game use (Table 2), close to the total of current adolescent gamers (95.9%) indicated the home as the first place to play, with 100% of young people who are a composite family home and a co-resident non-family, followed 96.9% of extended family home.

In relation to who frequently plays video games with (Table 3), half (50.4%) of all young current players mention playing alone, in second place 26% with school friends and in third place 13.6% with family members. Of the adolescents who frequently play alone, the highest percentages are from a non-family home, with 100% co-occurring and 66.7% one-person, while 60% are from a composite family home.

Regarding the primary device where video games are used (Table 4), a little more than half (52.7%) of the total of participants who have played in the last year reported using the cell phone for the game, followed by 29.1% the console and 15 % computer. Of the young people who mainly use cell phones for video games, all belong to a family home, 80% composite, 55.7% nuclear and 50% extended.

When analyzing the level of dependence on video games (Table 5), of the total number of current adolescent gamers, 43.2% had a slight level of dependence, followed by 35% medium, 17.7% abuse and 4.1% pathological. By type of household, the pathological players belong to family households, 6.1% nuclear and 2.1% extended; abused players have a higher percentage in non-family homes, with 100% in co-resident; In terms of dependence on medium video games, the highest percentage is young people from a non-family home, with 100% one-person.

Place	Nuclear		FAMILY: Extended		Compound		NON FAMILY: One-person		NON FAMILY: Co-resident		Total	
	f	%	f	%	f	%	f	%	f	%	f	%
Home	110	95.6	93	96.9	5	100	2	66.7	1	100	211	95.9
Cyber-cafe / internet	2	1.7	1	1	-	-	1	33.3	-	-	4	1.7
Job	1	0.9	-	-	-	-	-	-	-	-	1	0.5
school	1	0.9	2	2.1	-	-	-	-	-	-	3	1.4
Friends house	1	0.9	-	-	-	-	-	-	-	-	1	0.5

Table 2 Main place of video game use
Source: CDPS, TDV

Who he plays with	Nuclear		FAMILY: Extended		Compound		NON FAMILY: One-person		NON FAMILY: Co-resident		Total	
	f	%	f	%	f	%	f	%	f	%	f	%
Alone	55	47.8	50	52	3	60	2	66.7	1	100	111	50.4
Family	16	13.9	14	14.6	-	-	-	-	-	-	30	13.6
School friends	31	27	21	21.9	2	40	1	33.3	-	-	55	26
Community friends	4	3.5	6	6.3	-	-	-	-	-	-	10	4.5
Virtual friends	9	7.8	5	5.2	-	-	-	-	-	-	14	6.4

Table 3 With whom you frequently play video games
Source: CDPS, TDV

Device	Nuclear		FAMILY: Extended		Compound		NON FAMILY: One-person		NON FAMILY: Co-resident		Total	
	f	%	f	%	f	%	f	%	f	%	f	%
Computer	19	16.5	13	13.5	-	-	-	-	1	100	33	15
Cell phone	64	55.7	48	50	4	80	-	-	-	-	116	52.7
Tablet	3	2.6	4	4.2	-	-	-	-	-	-	7	3.2
Console	29	25.2	31	32.3	1	20	3	100	-	-	64	29.1

Table 4 Primary device where video games are used
Source: CDPS, TDV

Dependency level	Nuclear		FAMILY: Extended		Compound		NON FAMILY: One-person		NON FAMILY: Co-resident		Total	
	f	%	f	%	f	%	f	%	f	%	f	%
Light	52	45.2	42	43.8	1	20	-	-	-	-	95	43.2
Medium	39	33.9	32	33.3	3	60	3	100	-	-	77	35
Abuse	17	14.8	20	20.8	1	20	-	-	1	100	39	17.7
Pathological	7	6.1	2	2.1	-	-	-	-	-	-	9	4.1

Table 5 Level of dependence on video games
Source: CDPS, TDV

Discussion

In the present study, it was found that 83.3% of adolescents claimed to have played video games in the last year, a figure higher than that investigated nationally in the Mexican Republic by the Federal Institute of Telecommunications (2018) in the National Survey of Audiovisual Content Consumption 2018, which reported 21% of respondents who said they play video games, a worrying fact due to the high percentage of young people who found themselves as current players in the present research, which perhaps suggests an increase in the prevalence of the game in this vulnerable population.

It should be noted that it coincides with the study by García, Piqueras and Marzo (2017) in Spanish adolescents from Alicante who claimed to play video games with 82.9% and was similar to that found by Gómez, Devís and Molina (2020) in young Spanish adolescents with 96.8% who claimed to play.

On the days of play per week, in the first place 35.5% of adolescents indicated playing every day, a higher percentage than that reported by Restrepo, Arroyave and Arboleda (2019) in adolescents from the municipality of La Estrella- Antioquia in Colombia, with 26% saying that they use video games every day, a finding that stands out for the possibility of creating a daily habit of using video games.

Regarding the preferred place to play, 95.9% of the participants prefer home, which is similar to that reported by Restrepo, Arroyave and Arboleda (2019) in Colombian adolescents who point out that the use of video games is done almost exclusively at home with 81.49 %, which is striking as it is the place where adolescents can spend most of their free time if they are not involved in extracurricular or recreational activities that promote health-promoting behaviors.

Regarding who plays video games with, mainly 50.4% of young people mention playing alone, similar to that reported by the Federal Telecommunications Institute (2018) in the National Survey of Audiovisual Content Consumption, with 43% of those interviewed playing alone , which is worrying because video games allow the possibility of interacting with multiple people at the same time and even with people from other countries, so perhaps the adolescent can be reflected and improve their social identity through video games.

The preferred device for the use of video games was the cell phone with 52.7%, which coincides with the Federal Telecommunications Institute (2018) in the National Survey of Audiovisual Content Consumption that refer to the cell phone as the most used device with 58%, which could perhaps increase the use of video games among adolescents because cell phone use is sometimes a trend among young people.

When analyzing the level of dependence on video games of current players, 43.2% was found to be light, 35% medium, 17.7% abuse and 4.1% pathological, which agrees with the study by Alave and Pampa (2018) in an educational institution state of Lima East of Peru, which reported a higher percentage of dependency of adolescents with low dependency with 45.5%.

However, the percentage of young people with pathological dependence on video games in this study is higher than that found in adolescents by Andrade, Carbonell and López (2018) in Ecuador, Montero, Bogas, Barradas, Gómez and Chacón (2019) in Spain and by Oflu and Yalcin (2019) in Turkey, with 1.13%, 2% and 1.6%, respectively.

Conclusions

Participating adolescents showed a high prevalence of current video game use, which they refer to doing mostly every day at home, a place that may be common in the daily life of young people in development and in search of identity and personality, which increases the possibility of unlimited use where users can see themselves projected onto some of the people with whom they interact in the video game.

When asked about with whom they frequently play video games, half of the young people play alone, which mainly belong to non-family households, that is, that their household is made up of a single person or by two or more people without family relationships. worrying because video games have the possibility of interacting with several players simultaneously, which can be dependent for the user.

The primary device for the use of video games is the cell phone, where young people who use it refer to being from family homes, whether it is a nuclear, extended or compound home, that is, despite being surrounded by various people at home, the game Through this device, it perhaps offers greater practical entertainment qualities, which are visually and aurally attractive.

Regarding the level of dependence on video games, adolescents were reported in the four patterns, with a higher proportion in light use, although a pathological level and abuse were found among the participants. Young people with a level of pathological dependence belong to family homes, a worrying fact since this level may cause problems and family or couple discussions, decreased academic or personal performance, social isolation, anxiety and depression.

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