Extended summary

Introduction

Chronic pain is a major health problem globally. It is often defined by the duration of pain, which may take weeks, months or even years to persist. The original cause of this pain may be due to an injury or an infection. There may be a continuing cause of pain, as it would be in the case of arthritis or cancer. There are other cases in which the cause is not clear. In addition, there is a possibility that it will be worsened due to environmental and psychological factors. It is a disease that generates high economic costs and quality of life.

The prevalence of this disease is 31%, it should also be noted that the rates are higher among women than among men; as well as, that women are twice as likely to report pain as men. Regarding specific pain conditions, the following prevalences stand out: 6-9% for chronic upper and lower lumbar pain, 5% for chronic neck pain, 13% for wide pain without fatigue, 6% , 7% for extensive pain with fatigue and 2.9% for fibromyalgia.

In terms of treatments that stand out when treating this disease, there are two types: those treatments that use analgesics and medical treatments that do not use them. In the latter stand out above all acupuncture, physical therapy or surgery, among others. In addition, today those treatments focused on the use of new technologies are booming. Among these, especially those that use virtual reality and augmented reality stand out. In the field of treatments focused on the use of these last two, nowadays they are used in combination with other types of treatments. However, it is expected that they can be used as individual treatments and that their use be normalized.

Objetive of the project

The objective of this project is to find out if the treatment of chronic pain with virtual reality and augmented reality obtains significantly positive results in the studies carried out on the subject until now, to know the effectiveness of this type of treatments.

Methodology

Regarding the methodology followed in this systematic review, it is worth highlighting different things. First, the PRISMA guidelines were followed for systematic reviews at the time of carrying it out. It started by establishing the keywords that were to be searched in the different databases and establishing the selection criteria for the articles that would later be included in this review. The selection criteria established are the following: (1) it must be studies, (2) it must be well-researched research on the use of virtual reality and / or augmented reality in the treatment of chronic pain, (3) the participants they must be in adulthood, and, (4) they must be original studies. In addition, it was established that the articles should be written in English.

Once the terms and criteria were established, the databases where the searches would be carried out were selected; these were: Scopus, MEDLINE, PsycNET and PubMED. The pertinent searches were then carried out; there were two in each of

the databases, in the first, the terms "chronic pain", "treatment" AND "virtual reality" were searched, and in the second, the following were searched: "chronic pain", "treatment" AND "Augmented reality". The terms were searched in the title or in the abstract of the articles.

Once the results of the different searches were obtained, a first screening was carried out according to the title and the abstract. Those whose title or abstract indicated that they did not meet one or more of the previously established selection criteria were rejected. With the articles that were selected, they were included in a folder in Mendeley depending on the database from which it was obtained. When this first screen was finished, those items that were duplicated (which had resulted in several of the databases) were eliminated. After this, all the remaining articles selected were read, eliminating those that were found not to meet any of the selection criteria.

After the selection process of the articles, it was happened to carry out the collection of the pertinent information of each one of them. In order to make a synthesis of all the information, a table was created that included: the authors and the year of publication, the number of participants and their nationality, the age range of these participants, the type of chronic pain in the The focus of the study was the number of sessions held, the variables studied in each study and, finally, a short summary of the results obtained in each of them. At the end of this process, an analysis of the results obtained was carried out.

Results

As a result of the searches in the databases, 170 articles were obtained, and through the bibliographies of other systematic reviews, another 2 articles were found. Of these 172 articles that were obtained in total, after eliminating those that were duplicated, they subtracted 146. Of these, a revision of the titles was carried out and those that did not meet one or several of the established selection criteria were eliminated, leaving a total of 100 possible items to be included in the review. The abstract of these 100 articles was reviewed and 30 were discarded for various reasons, including: they were not articles (n = 10), the participants were not in adulthood (n = 7), they were not about pain chronic (n = 5), did not talk about the treatment (n = 6), and, did not have projection (n = 2). For this, there were 70 possible articles to include. These were read complete and another 30 were discarded for various reasons: they were not articles (there were 1 conference report, 5 systematic reviews and 3 protocols), they were not focused on virtual reality or augmented reality (n = 4), they had projection (n = 12), and, the participants were not in adulthood (n = 5). For this, the articles that were included in the qualitative synthesis were 40 and those that were included in the quantitative synthesis 22. All this was outlined in a flow chart.

Of the 22 articles that were finally selected for this review, a synthesis table of its main characteristics was made. This included the following sections: the authors of the article and the year of publication, the number of study participants and nationality, the age range of the participants, the type of chronic pain that has been studied, the number of sessions of the treatment, the variables that have been studied in each one, and, the results obtained in each of the studies. As a result of this it was observed that there was a greater amount of articles coming from the United States (n = 6), as well as, a greater number of studies focused on the

treatment of specific ailments such as the phantom limb syndrome (n = 4) or fibromyalgia (n = 3).

After carrying out the synthesis of the main characteristics of each study, the analysis of the results obtained was carried out. It was observed that the majority of the studies obtained positive results, there was a significant reduction of the pain levels comparing them with the baseline. Yes there were some articles in which the results obtained were inconclusive or even negative. In addition, an analysis of the risks of bias that were indicated in each of the studies and whether they were corrected in some way was also carried out.

Conclusion

After the analysis of the characteristics and results of the studies selected for the review, several conclusions were reached. First of all, it was seen that this is a very novel type of treatment, which has been in operation for a short time, and that is why there are not the same amounts of studies as there may be on other treatments that are already more established. This implies that the results that have been obtained can not be considered as conclusive as those obtained in investigations of other treatments that take more time. In addition, it has been seen that there is a greater amount of research focused on specific ailments, so that the results can not be considered as generalized to all types of chronic pain. For all this it is considered that it is necessary to have a greater amount of research on the subject and that these are oriented towards different types of ailments.

After all the analyzes performed, it is concluded that the treatment of chronic pain with the use of virtual reality and augmented reality is recommended, but used in combination with other types of treatments, depending on the specific characteristics of each case.

El uso de la realidad virtual y la realidad aumentada en el tratamiento del dolor crónico en adultos: una revisión sistemática.

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Introducción

· El dolor crónico es un grave problema de salud pública porque afecta a aproximadamente el 20% de la población
· Las nuevas tecnologías como la **realidad virtual (RV)** o la **realidad aumentada (RA)** pueden ser alternativas al tratamiento farmacológico

Objetivo

· Revisar la literatura sobre el uso de RV y RA en la evaluación y el tratamiento del dolor crónico

Método

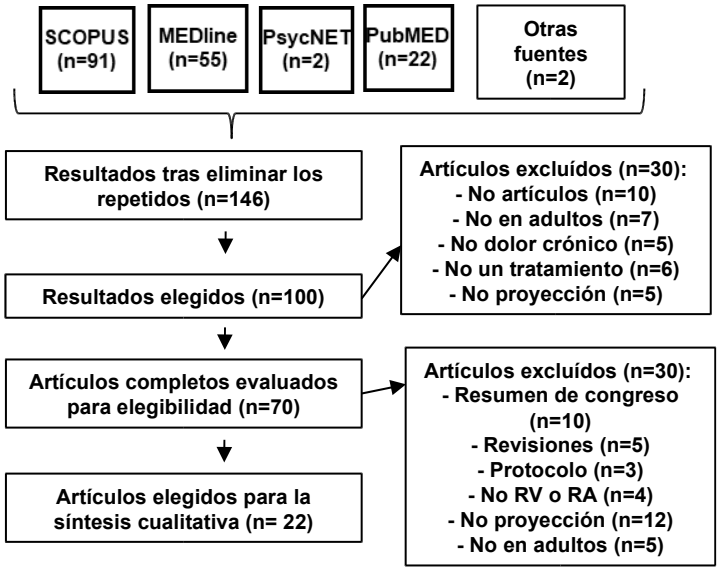
Guías PRISMA

Criterios de selección:
- Artículos científicos originales
- Tema central: VR/AR y dolor crónico
- Pacientes adultos

Bases de datos empleadas:

SCOPUS	MEDLINE
PsycNET	PubMED

Resultados



Resultados de RV

Artículos	Tipo dolor	Muestra	Sesiones	Uso de la RV	Resultados
10, 11, 18	Miembro fantasma	5-14	5-12	Replicar el movimiento del miembro sano (18, 11, 10)	Mejora dolor y movilidad (18) Mejora en dolor que no perdura tras sesiones (11, 10)
2, 6, 13	Lumbalgia	44-68	3-10	Distracción del dolor (2, 6, 13)	Sin cambios (6, 13) Menor dolor/discapacidad (2)
3, 15, 17	Fibromialgia	1-61	3-4	Distracción del dolor (15, 17) Representación del dolor (3)	Menor dolor (3, 15) Sin cambios (17)
12, 16, 19, 21, 22	Heterogéneo	10-30	1-12	Percepción de dolor (12) Distracción (16, 19, 21, 22)	Menor dolor (12, 16, 19, 22) Mayor dolor (21)
1, 4, 5, 7, 14, 20	Otros	1-14	1-33	Distracción (14) Ejercicios (4) Muestra dolor reflejo (7) Hipnosis (1,5) Comunicar dolor a terapeuta virtual (20)	Menor dolor (1, 4, 5, 7, 14, 20) Mejor funcionalidad, calidad de vida (4) y ansiedad (5)

Resultados de RA

Artículos	Tipo dolor	Muestra	Sesiones	Uso de la RA	Resultados
9	Heterogéneo	22	5	Muestra dolor reflejo	Mejora dolor (9)
8, 10, 11	Miembro fantasma	1-14	5-12	Retroalimentación visual del dolor reflejo	Mejora dolor (8) que no perdura tras sesiones (11, 10)

Conclusiones

· Descenso significativo de los niveles de dolor tras el tratamiento con RV/RA, pero no siempre duraderos.

· Limitaciones: tratamientos costosos que deben usarse en entornos relativamente especializados.

· La RA/RV deben usarse en combinación con otros tratamientos de primera línea (p.ej. farmacológicos o terapia cognitivo-conductual).

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