TITLE PAPER

**ABSTRACT**

**CCS Concepts**

**• Information systems~Multimedia information systems   • Computing methodologies~Virtual reality • Information systems~Multimedia information systems   • Human-centered computing~Graphical user interfaces • Applied computing~Life and medical sciences.**

**General Terms**

Design, Experimentation, Performance.

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**Keywords**

Virtual Rehabilitation; Rare Diseases; Physical Therapy; Numbness; Tingling; Range-of-motion; Grip strength.

# INTRODUCTION

Public and private health institutions have expressed the main objective of "ensuring conditions in which people can be healthy," generating solutions if unexpected or persistent health problems or environmental factors appear that put large populations at risk [1].

Health institutions work with professionals from different areas to investigate the causes that put the lives and health of the populations at risk in order to prevent, mitigate or suppress the inconveniences generated [1]. However, this action does not happen with diseases known as rare or orphan diseases, which affect few subjects and are dispersed in the world with a variety of disorders and symptoms due to genetic variations or the stage of appearance in the subject [2]

Rare diseases are defined as such, depending on the prevalence in each country. The European Union considers a rare disease if 1:2,000 subjects has that disease [3]; in Norway 1:10,000 subjects have this diseases (Helsenorge, 2016); in Taiwan 1:10,0000 subjects (mediographic, 2015); in Italy 1:20,000 subjects (mediographic, 2015); in the United States 1:5.000 subjects (Cortés, 2015; Genetic and Rare Diseases Information Center, 2017a); in Japan 1:2,500 subjects (Cortés, 2015); apparently the patients are few, scattered all over the world and distributed in the 5,000 to 8,000 registered rare diseases (Alonso, Hawrylak, & Gómez, 2010; Boycott et al., 2013; Institute of Medicine National Academies of Sciences, 2010).

The 80% of rare diseases are genetic origin and the difference is due to bacterial or viral infections, environment factors or allergies [4], [5].

Patients with rare diseases, in addition to facing the symptoms of their pathology, must experience: 1) lack of knowledge and experience of clinical experts; 2) limitations of access to health systems; 3) low availability of drugs; 4) lack of interest of researchers [6]; these drawbacks have led to delays in diagnosis, inadequate or experimental treatments and even harmful treatments [7].

Rare diseases are often life-threatening diseases, or the physical or mental conditions of the subject [8] such as Huntington's disease, spina bifida, Fragile X syndrome, Guillain-Barré syndrome, Crohn's disease, cystic fibrosis, Duchenne muscular dystrophy and amyotrophic lateral sclerosis [1], [9]. The most frequent rare diseases in infants are osteogenesis or osteogenesis imperfecta, phenylke tonuria, oculocutaneous albinism, achondroplasia and the less common rare diseases are epilepsy and epileptic encephalopathy.

Although rare diseases are a common cause of neurological and intellectual disabilities, they are compatible with a good quality of life if diagnosed early and treated optimally [10].

Epileptic encephalopathy is a large, heterogeneous group of epilepsies that contribute to severe cognitive and behavioral impairment or regression in subject development[11].

Encephalopathies include many age-related electroclinical syndromes with specific types of seizures, EEG characteristics and neurological characteristics such as Ohtahara syndrome, West syndrome, Dravet syndrome, Lennox-Gastaut syndrome, Landau-Kleffner syndrome [12].

Epileptic encephalopathy has a genetic panorama, which depends on inheritance mechanisms, biological pathways and genetic mutations associated with neurological disorders and epilepsy, to generate new types of rare diseases[13].

Thus, epilepsy syndromes associated with a gene can range from a benign seizure disorder to an epileptic encephalopathy, exemplified by several of the ionic channel genes (e.g., KCNQ2, SCN1A, SCN2A)[11].

Tareas alocentricas y egocentricas

DESIBICACION DE OBJETOS DE UN SUJETO

MEMORIA ESPACIAL A CORTO PLAZO.

LEY DE FITTS PARA aplicar en el desarrollo.

Common of rare diseases in childhood (different paragraphs)

Symptomatology of epileptic encephalopathy

Traditional rehabilitation techniques of epileptic encephalopathy.

Physical rehabilitation (one paragraph)

Sensory rehabilitation (one paragraph)

Cognitive rehabilitation (one paragraph)

# RELATED WORK

Examples of Virtual Rehabilitation in patients with neurological disorders.

Examples of Virtual Rehabilitation in childhood with disorders (children with Cerebral Palsy, children with Autistic spectrum disorders, etc)

Técnica de perffeti con las 2 etapas que tiene, describiendo las 2 etapas, pasado en el correo de Sergio.

Rehabilitacion virtual donde se ha aplicado la técnica perfetti, pasados en el correo.

There are no studies of technological systems based on virtual Rehabilitation for children with epileptic encephalopathy by using the perfetti method.

# METHODS

## The Participants

1. Grupo de control de niños de 5 años. Grupo experimental de niños de 9 y 10 años (10 niños) Muestras independientes por tener edades diferentes. Niños sin ningún tipo de lession sin desordenes.
2. Analizar de la varianza ttest SPSS o R. Graficas de Barras percentiles
3. Reacción a nivel kinematico Tiempos de reacción, Tiempo para completar la tarea.
4. Memoria espacial a corto plazo.
5. Validar en base a la ley de Fitts. En función del grado de complejidad que quieres alcanzar un obejtivo, te custa mas ti
6. Los tiempos para completar una tarea son mayores en función dela edad de un niño.
7. seran

## The System

Our technological system is comprised of

## VR exercises

# PROCEDURE

Before the first session, the therapist tested all the participants

Figure 2. Participant using the system.

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# RESULTS

# DISCUSSION AND CONCLUSIONS

# ACKNOWLEDGEMENTS

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