Designing a Web-Based Therapy Aid Model for Non-Pharmacologists Stroke with Muscle Strength Disorder

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ABSTRACT

This research will discuss a web-based stroke therapy model to display examples of online therapeutic movements. This therapy is expected to help the patient's attendant to perform the therapy independently. The attendant must consult with a physiotherapist/doctor to determine the appropriate therapy. This research is motivated by the results of focus group discussions with physiotherapy to get a positive response and an acceptable value of > 80%. Results of focus group discussions suggest for mobile-based development of the model. Based on these suggestions, the design of the model in this study will be developed based on the web. A web-based application is expected to simplify the distribution process of expert system models for non-pharmacological stroke therapy tools.

I. Introduction

The recovery process after a stroke and prevention of stroke risk factors will reduce the mortality rate and reduce the risk of disability after a stroke. In general, better clinical outcomes will be achieved when post-acute stroke patients receive coordinated multidisciplinary evaluation and intervention. The multi-disciplinary team consists of doctors, nurses, physical therapists, occupational therapists, kinesiotherapists, speech and language pathologists, psychologists, recreational therapists, patients and family members/caregivers [1]. The use of an expert system can help the recovery process after a stroke. An expert system is a system that seeks to adopt human knowledge into computers so that computers can solve problems as practiced by experts [2].

Non-pharmacological stroke therapy in this study discusses cases of decreased muscle strength. The design of the expert system model of non-pharmacological stroke therapy aids is expected to help the families of stroke patients to conduct independent therapy. This model is designed based on web technology to expand the distribution of applications and make it easier for users because it can be accessed via a Smartphone. The design of an expert system in this research is in the form of an example of motion therapy in the form of video/animation. One obstacle to conventional therapy is the limitations of the patient's family to take the patient to the hospital. By using this helper software, the therapy can be done independently. The stroke therapy expert system model was designed using a decision tree. The decision tree is processed into structured questions that can be used as a means to identify the scale of muscle strength. This stroke therapy expert system model is designed to only help paramedics not to replace it. Before using this stroke therapy model the patient's family is advised to consult with physiotherapy.

This research is motivated by the results of focus group discussions with physiotherapy to get a positive response and an acceptable value of> 80%. One of the suggestions from the focus group discussion was the development of a mobile-based assistive model to increase the number of users and make it easier to use. Based on these suggestions, the design of the development in this study will be developed based on the web, which can be accessed using a mobile device. The formulation of the problem in this research is how to design an expert system of web-based stroke therapy aids that are user-friendly. The purpose of this study is to design an expert system of web-based stroke therapy aids to increase the muscle strength of stroke patients.

II. Related Research

Research on designing non-pharmacological stroke therapy aids with multimedia-based impairment in muscle strength has been conducted in several other studies. One of them uses a finite state machine to describe the flow of actions in the system. Finite state machines are used to build a recommendation based on historical data of patients who experience impaired muscular strength [3].

Other studies discuss the model of non-pharmacological stroke therapy aids based on the results of discussions with physiotherapy. The results of the study are recommendations for training in a 2-dimensional animated format. The advice given by physiotherapy is the development of animation into 3 dimensions to be more easily understood by users. Therapeutic movements for the top view need to be added and the use of other application platforms, such as mobile-based applications, can be used for further development [4].

Future research on multimedia-based nonpharmacological stroke therapy aid models is an expert system-based study. This study discusses expert system models to help stroke therapy specifically for patients who experience impaired muscular strength. The expert system model has been evaluated by physiotherapists through focus group discussions. From the results of the expert FGD system model of stroke therapy aids, the value of physiotherapist acceptance reaches more than 80%. This research was discussed at ICET4SD 2015 and the journal was published in 2016 [5].

Other research on the design of interactive aids supporting the activities of companion post-stroke human beings was conducted in 2014. Someone who has had a stroke, or commonly called a Post-Stroke Person (IPS), will generally have neurological abnormalities such as reduced motor ability in limbs and muscles significantly cognitive, visual and coordination. This causes the emergence of post-stroke human dependence on others in carrying out activities of daily life. Interactive tools supporting the activities of companion activities after stroke are designed to help companions of post-stroke human beings adapt to daily care activities [6].

The book with the title Kembali Aktif Pasca Stroke written by experts in the field of medical rehabilitation aimed to help stroke patients can perform therapeutic exercises independently with the help of a family member to do some post-rehabilitation movement stroke Video. In this book, there is a guide to self-therapy in the form of a CD containing movements for rehabilitation after a stroke in cases of minor strokes and advanced former stroke without paralysis. Some exercises for post-stroke activities such as wearing clothes, buttoning clothes and others [7].

A game tool for post-stroke patients was developed on the basis of a pinboard that can be used as a game tool in stroke rehabilitation. Value engineering is used as a method in recording the creative process during the development of pinboards into game tools. Value engineering uses FAST tools as an approach to map the functional process flow from the main product and expected product. The results of this study are game instruments in the form of snakes and ladders, with a basic board-shaped game with the characteristics of multi-player games [8].

III. Research Methods

Research methods by means of literature study and data collection results from focus group discussions with physiotherapy. A literature study is done by collecting and studying information from books, journals, previous research, and other reading sources. The results of focus group discussions with physiotherapy are used as data for the development of expert systems for non-pharmacological stroke therapy tools. This study is related to previous research in an expert model of a non-pharmacological stroke therapy device with a multimedia-based impairment in muscle strength that has been evaluated by physiotherapy. Some suggestions from physiotherapy include the development of 3D animation, some additional views on motion-based and mobile-based animation to expand the user. Based on these suggestions for developing mobile-based, this study focuses on designing web-based development.

Designing the development of a non-pharmacological stroke therapy aid model with web-based muscular strength disorders. The expert system model in this study uses a decision tree in the form of structured questions. The design of the development of a stroke therapy aid model can be seen in Figure 1 below.

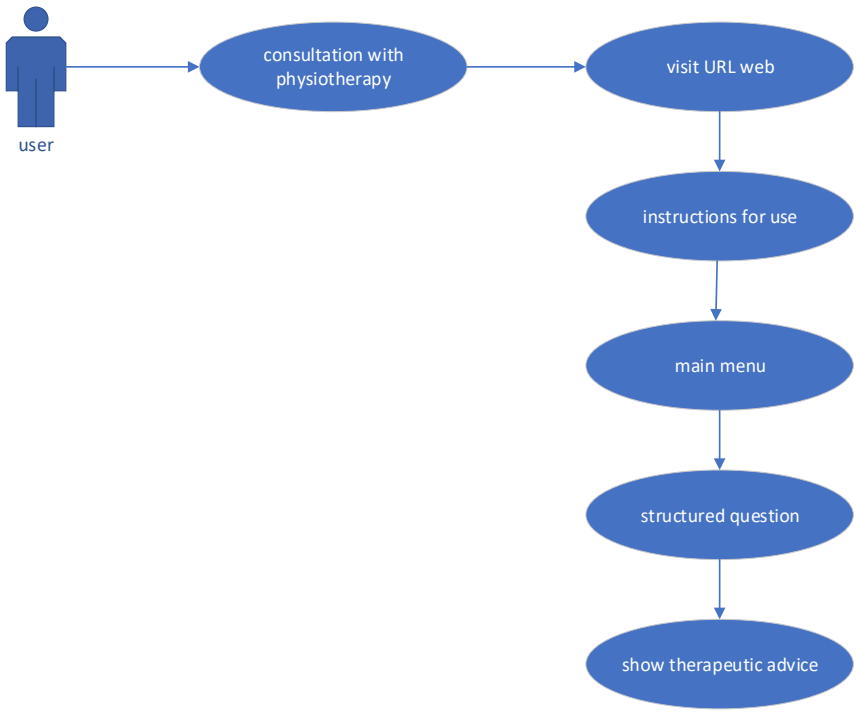

Fig 1: General description of the design of web-based stroke therapy aid models.

IV. Expert System Design of Stroke Therapy Aid Model

Expert system design in this study using data from a paper multimedia-based therapy model for non-pharmacological stroke with decrease impaired muscle strength. To diagnose muscle power stroke patients with impaired muscle strength decline in this study using a structured question. After going through a structured question the obtained results the diagnosis of muscle strength of each part of the limb so that it can be used to determine the therapy solution [5].

Structured questions can be seen in the decision tree Figure 2 below :

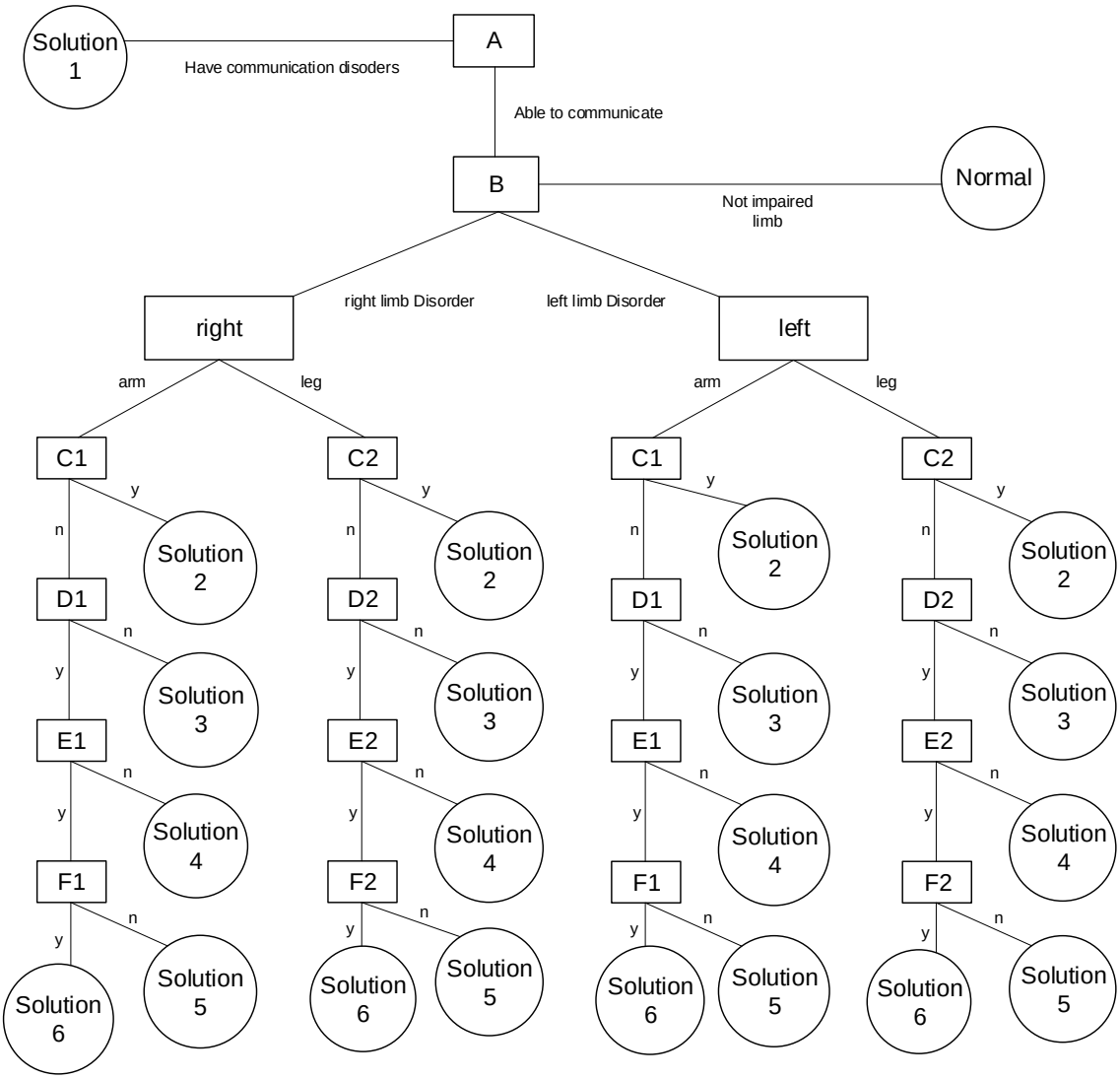

Fig 2: Decision tree.

y = yes
n = no
A = Does the patient have communication disorders?
B = Does the patient impaired limb?
C1, C2 = Does the patient have a total muscle paralysis?
D1, D2 = Does the patient can perform the movement without against gravity?
E1, E2 = Does the patient able to do movement against gravity?
F1, F2 = Does the patient can perform movement against gravity with mild loads
Solution 1 = Can not be treated with this application due to special handling needs in terms of communication
Normal = Normal, does not need to do therapy
Solution 2 = Can not be treated with this application because paralyzed muscle strength (muscle strength 0)
Solution 3 = Can not be treated with this application because muscle strength is flicker movements only (muscle strength 1)
Solution 4 = Solution therapy with a sliding movement to the right and to the left (muscle strength 2)
Solution 5 = Solution therapy with movement up and down without load (muscle strength 3)
Solution 6 = Solution therapy with movement up and down with the load (resistance) (muscle strength 4) [5].

The design of the application model of a non-pharmacological stroke therapy tool with web-based muscular strength disorders can be seen in Figure 3 below:

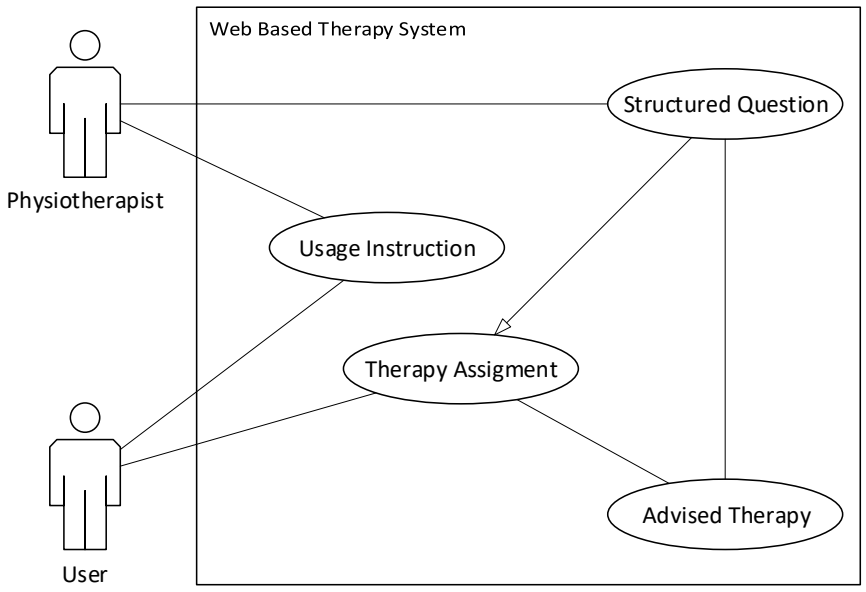

Fig 3: Web-based therapy system design.

Explanation of the design drawing above:

1. Physiotherapy and User (patient's family) read the instructions for using the expert system model of non-pharmacological stroke therapy tools with impaired web-based muscle strength reduction.
2. Physiotherapy can access all therapy menus through structured questions.
3. Users (family of patients) consult with physiotherapy.
4. Physiotherapy determines and provides instructions for therapy.
5. The system will display therapeutic suggestions in the form of examples of therapeutic movements according to the patient's condition.

V. Conclusion

The results of the discussion through focus group discussions with physiotherapy need further development to expand and improve the model of non-pharmacological stroke therapy tools with multimedia-based muscular strength disorders. Three main focuses need to be developed including 3D animation, additional views and need to be expanded on a mobile-based basis.

The focus of this study is on the mobile-friendly web application design. This web-based development is expected to expand the usage of this application. The web-based application can be accessed using a smartphone. The web-based application used relatively low hardware requirements, so the patient's family does not need to use a computer.

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