Przebieg zachorowania na COVID-19 w odniesieniu do smysłu węchu, smaku i wzroku
The SARS-CoV-2 virus contributes to disorders of the sense of smell, taste and vision by attacking many important structures in human body

Znaczenie systematycznej rehabilitacji na przestrzeni 45 lat pacjentki z rozwójową dysplazją stawu biodrowego
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– ze sprzętu w Polsce korzysta wiele oddziałów rehabilitacji i OIOM
BIOMAGNETOTERAPIA W WYROBACH MEDYCYNYCH „ORT BUTTERFLY”

- BEZ BÓLU, STRESU I BEZ TABLETEK!
- LECZYŚ ŹY SIE NATURALNIE
- ŚPIĘ, PRACUJĘ, WYPOCZYWAJĘ...
- USUWAM BÓL I JEGO PRZYCZYÑĘ!
- TERAPIA STARA JAK ŚWIAT!
- SPRAWDA SIĘ I DAJE RADĘ W NIERÓWNIEJ WALCE Z PANDEMIĄ – COVID 19!

REGULARNA BIOSTYMULACJA MAGNECYZNA!

Ogromny potencjał Natury w zwalczaniu smogu energetycznego
i autoeksydacyjną, będącej główną przyczyną wszystkich chorób cywilizacyjnych!

Najstarsza Terapia Świata wspomagająca każdą formę leczenia!

Uważa się do dziś, że bez niej nie da się wyleczyć żadnej choroby do końca!

Naturalna Terapia Magnetyczna Twoje Zdrowie, Twoja Uroda, Odporność
i Sprawność do późnej starości! Wypróbuj – gdy zawiodły już inne terapie!

Biomagnetoterapia inicjuje ożywienie komórkowe, oczyszcza i „czysta” krew,
podnosząc wartość całego organizmu, który uruchamia intuicyjne procesy obronne,
umożliwiając komfort powodowany bólem, urazem lub stresem,
bez konieczności ostrej dawki leków chemicznych...

DLACZEGO CHORUJEMY?

Napięcie sztucznych pol elektromagnetycznych... zwiększyło się 100 tys. razy! Naturalne pola
magnetyczne Ziemi zmniejszyło swą moc o połowę!

Biomasztosystem – jako antyoksydant, jedyne i labobadowane na koncentrację, ekspozycję
„smogu energetycznego”

ZŁOTE LOGO

Międzynarodowych Targów Rehabilitacji
Lódź IX/2007

Jestem osobistym królikiem doświadczalnym! I żyję – realizując 25 lat wciąż
nowe i śmiesze pomysły w wykorzystaniu tej boskiej energetii naturalnych
magnesów! Dzięki nim pokonuję dziś niezliczone przeszkody i przeciwności
losu z nieznaną mi przedtem energią i determinacją! To moja pasja i przeznaczenie!

Najnowsza opinia klienta:

Komentarz ten jest moim osobistym świadectwem zadowolenia z produktów biomagnetycznych „Ort Butterfly”, których używam od 20 lat. Zastanawiam się, zwłaszcza pod fenomenem poduszki (określenie nie jest przypadkowe) zwyczajnie; nie wyobrażam sobie snu i wypoczynku bez magnetycznej „Ort Butterfly” – pod głowę jej ergonomiczny, przyjazny dla głowy i szyi kształt sprawia, że wysypiam się „po królewsku”. Zabieram ją również ze sobą w bliszą i dalsze podróże! Czyś gdyby była to zwyczajna poduszka, fundowalbym sobie dodatkowy bagaż? Wychwalam więc ją od zarania, polecam i rekomenduję, bo jest tego warto! Bez niej nie wyobrażam sobie prawdziwie relaksacyjnego snu i błagiego, wypoczynku! Dziękuję, że ją Panie stworzył!

J. Szw. Działdowo (maj 2020)

PS Poduszki „Ort Butterfly” to prawdziwe aryżdziełka robione z wyczuć i sercem… jak rzeźby Michela Aniela… Polecam wszystkim!

Zapraszamy do zapoznania się z opiniemi użytkowników i ekspertów jakie pojawiały się na przestrzeni ostatnich 10 lat: www.butterfly-mag.com → opinie klientów.
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8-9 grudnia 2023
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<table>
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Developing wheelchair as a tool to promote recovery for stroke survivors

Opracowanie wózka inwalidzkiego jako narzędzia wspomagającego powrót do zdrowia osób po udarze mózgu

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1Department Of Coaching Faculty of Sport Science, Universitas Negeri Padang, Indonesia.
2Department Of Physical Education, Health and Recreation, Universitas Negeri Padang, Indonesia

Abstract
Study Purpose. Principle of recovery for stroke patients is based on supportive activities that promote mobility functions and muscle movement. This situation requires attention to develop recovery aids as physical exercise for stroke survivors to regain the lost functions through rehabilitation. The aid is designed as an adapted wheelchair that is used both for strength training and as a means of transportation for stroke patients.

Material and Methods. Borg and Gall’s model of research and development consisting of 10 steps were adopted. 15 experts were used to evaluate the design of a wheelchair treadmill, and the criteria for their selection are licensed, authorized, and competent in their respective fields. Closed questionnaire on Likert scale with 5 optional answers was used to collect responses. Three aspects assessed were the mechanical, load intensity, and safety design. The data was in form of an expert’s judgment, which will be calculated to obtain the mean score.

Results. Results showed that machinist’s average score was 77.50%, placing it in the appropriate category. Average score obtained from sports coaching experts was 83.50%, and its usage is also appropriate. Furthermore, average score obtained from physiotherapists’ assessment was 69.82% and should be majorly repaired before use. In conclusion, the design was 76.94% which indicates that the expert assessment is on “proper to use” criteria. However, the aspect of patient safety still needs to be improved.

Conclusions. Data analysis concluded that the wheelchair design developed can be used as a therapeutic tool and as a mode of transportation for mild-severe stroke patients.

Keywords
wheelchair, stroke recovery, stroke rehabilitation, recovery aids, stroke patients

Streszczenie
Cel. Zasada rekonwalescencji pacjentów po udarze opiera się na działaniach wspomagających, promujących funkcje ruchowe i ruch mięśni. Sytuacja wymaga zwrócenia uwagi na opracowanie środków wspomagających powrót do zdrowia, takich jak ćwiczenia fizyczne dla osób po udarze mózgu, aby mogły odzyskać utracone funkcje poprzez rehabilitację. W ramach badania opracowano odpowiednio przystosowany wózek inwalidzki, który służy zarówno do treningu siłowego, jak i jako środek transportu dla pacjentów po udarze mózgu.


 Wyniki. Wyniki pokazały, że średnia ocena wydana przez mechanika wyniosła 77,50%, co ocenia urządzenie jako nadające się do użytku. Średnia ocena ekspertów w zakresie treningu sportowego wyniosła 83,50%, co również ocenia urządzenie jako nadające się do użytku. Średni wynik uzyskany w ocenie fizjoterapeutów wyniósł 69,82% ze wskazaniem, że urządzenie powinno zostać gruntownie usprawnione przed użyciem. Podsumowując, projekt uzyskał 76,94%, co wskazuje, że ocena ekspertów opiera się na kryteriach „nadający się do użytku”. Jednak aspekt bezpieczeństwa pacjentów wciąż wymaga poprawy.

Wnioski. Analiza danych wykazała, że opracowany wózek inwalidzki może być używany jako narzędzie terapeutyczne i jako środek transportu dla pacjentów po łagodnym lub ciężkim udarze mózgu.

Słowa kluczowe
wózek inwalidzki, rekonwalescencja po udarze, rehabilitacja po udarze, środki wspomagające powrót do zdrowia, pacjenci po udarze
Introduction

Stroke is a diseased condition where brain cell death occurs due to the interruption of blood vessels that supply oxygen to the brain. The location and extent of brain cell damage affect the severity of motor, sensory, emotional, and cognitive function disorders. [1] Globally, it is one of the leading causes of death and can be recovered through rehabilitation by promoting physical condition, in terms of therapy. The main therapy involves the restoration of the patient's condition to move independently. Even though there is no guarantee that stroke can be fully recovered, it is recommended to conduct physical therapy which encourages mobility function and muscle movement to speed up the recovery. Furthermore, aerobic, neuromuscular, and muscle strengthening exercises should be conducted to improve function and fitness as secondary prevention.

To improve the function of mobility, 3-6 months of physical therapy is needed to regain balance and independence. At all stages of recovery, the most highly recommended therapy is physical activity and exercise. [2, 3] However, patients are likely to lose stamina, experience mood swings, and prolonged sedentary behavior. Therefore, it is always necessary to prescribe appropriate physical activity, as it can increase performance by 20% and prevent the risk of repeated stroke. [3] Furthermore, the suffers show higher oxygen consumption than normal people at submaximal levels, therefore, they will show fatigue more easily. Besides, they have limitations in conducting daily activities because of the nerve deficits that cause paresis, spastic motor function disorders, poor balance, and extremity coordination. Therefore, when assessing their physical capacity, more specific attention should be given to the equipment used, its modification, as well as the safety and security of the patients. [3] It is conducted since all comorbidities should be considered when doing exercise. This includes treatment received that may affect response to exercise, to prevent worsen cardiovascular and musculoskeletal function. The physical condition of stroke patients will be weaker and the potential for future complications will be greater when the situation becomes worse. [4]

Physical exercise gives a positive response to recovery, [5] and it is focused on using the walking method to train cardiorespiratory, balance, and motor control. Besides, actual physical exercise can also be conducted using an ergometer bicycle, which has a kinematic similarity to walking. [6] This is consistent with the concept of learning to achieve good results when supported by appropriate media or tools. [7] Furthermore, the exercise using a bicycle ergometer will train flexion and extension as well as the coordination of the agonist and antagonist muscles of the hip, knee, and ankle. The bicycle ergometer can train cardiorespiratory, muscle strength, and motor control in stroke patients at the same time. Another advantage is that it can be used in stroke patients with balance disorders and spinal injuries. [8] Furthermore, the results of physical exercise on stroke outpatients using a bicycle ergometer showed improvements in cardiovascular function and fitness by improving their walking ability. [6], [9] In addition, the use of a bicycle ergometer during exercise was found to be quite safe for stroke patients, [10] however, it is limited to physical therapy. Therefore, these recovery aids cannot help the patients to move independently and freely from one place to another.

In contrast, the use of wheelchairs for stroke patients has been widely known. There are lots of reasons for using wheelchairs as a positive part of rehabilitation. They assist the patients to sit out of bed in a good position, and this encourages recovery. The most important thing for using a wheelchair is to help the survivor to sit comfortably and as a medium of transportation to freely navigate different places. However, wheelchairs have not been used as a therapeutic tool for stroke since they are only used for sitting and as a means of transportation. Therefore, a multifunctional wheelchair was developed as a mode of transportation and physical therapy or rehabilitation aid for stroke patients. This study aims to develop a mechanical design of a wheelchair that can be used as a rehabilitation aid and a mode of transportation based on expert review.

Research Methods

Procedure

The 10 steps developed by Borg and Gall was adopted as the approach of this developmental study: (1) Conducting research and gathering information (2) Planning (3) Developing the initial product form (4) Conducting testing initial field (5) Conducting revisions to the main product (6) conducting main field tests (7) conducting product revisions (based on suggestions and results of main field trials) (8) large group field testing (9) final product revisions and (10) Finalization of the product (13). Furthermore, this study involved 15 experts from various expertise. They include mechanical engineering, sports coaching, and Physical Therapy experts. The expert assessed the validity of the mechanical design developed on 3 aspects, namely the mechanical design aspect of the wheelchair, the design of load intensity, and therapeutic suitability. Meanwhile, they were chosen following their license, authorities, abilities, and competencies in their respective fields. The following stages were conducted in this study (Figure 1).
Data Analysis
The data collected were experts’ assessments of the wheelchair design, and the instrument used was a closed questionnaire. The technique of data collection was conducted by demonstrating the wheelchair that had been successfully developed to be assessed by experts. Each expert was given questions according to their respective specifications. The final result determined whether the developed design can be used for stroke patients as a medium for physical exercise/recovery therapy. Furthermore, the questionnaire was developed using a Likert scale with 5 options as answers, and data was calculated to obtain the mean score.

Results
The wheelchair design developed was based on the needs of stroke patients, and the basic concept of this design is a combination of mobility and treadmill equipment that functions as one of the recommended forms of exercise. Furthermore, the wheelchair is used as a means of transportation and therapy exercise. Three aspects were considered while designing the wheelchair. These include mechanical design, safety, and load intensity/muscle recovery aspects. In addition, another aspect that was considered was the easiness to obtain the required components and materials. Therefore, it is easy for patients to make their wheelchair without having to spend a lot of money based on the developed design. The materials used in the development of this design consist of:

BMX Handlebar
BMX handlebar was chosen because it is higher than the usual handlebars of other mountain bikes since it is more comfortable and more efficient to use.

Bicycle frame
This is the core part of a bicycle, and it is the point for attaching various parts. The swing arm was only used by the team.

Tires/Wheels
The wheel on the bicycle is very important because it supports the entire weight and transfers power and braking force to the road surface. The design was developed with 2 tires, where the main tire functions as a support in the middle while the others are located in the front as steering control. The Wheel diameter is 26 X 1.75 with a pressure weight of 240–450 Kg.

Pedal
It assists the movement of the bicycle and permits pedaling by stroke patients.

Bearing
Bearing is a device used to reduce friction when the wheel rotates, or to keep the axle of the tire to allow the wheel to rotate smoothly.

Axle
The axle connects the wheels to the bicycle and is useful as a bearing when the wheel is spinning. Furthermore, it is also useful as a component of suspensions, and it provides excellent support since it is made of steel. In this study, the axle is 50 cm in length made from solid iron material.

Crankset/Chainset
This component directly connects the front gear on a bicycle that is connected to the pedal, and it functions as a driving medium.

Sprocket
A sprocket is a serrated wheel that is attached to a chain, track, or another long object. It is different from gear, and two sprockets can never come in contact.

Bicycle Chain
It is a system of pins that are interconnected by discs and rollers which allows the transmission of power from the front sprocket to the rear.

Disc Brake
It is a tool used to stop or slow down a bicycle. Furthermore, a disc brake was used for the back of the wheelchair.

Shifter
It controls the gear shift mechanism allowing free movement to any degree. In addition, a grip shifter was used because it is more efficient in its use just by turning it or the same as gas on a motorized vehicle.

Derailleur/group set
It is an arrangement of levers activated by a cable, which moves the chain between the sprockets over the chainring arrangement.

Figure 2. Wheelchair design for stroke sufferers
The data collected was in the form of expert responses to the designs developed. The experts involved in this assessment were 5 mechanical engineering experts, 5 sports coaching and 5 physical physiotherapists experts. The selection was based on the team's analysis regarding the expertise of each validator. The following is the analysis and discussion of data from each validator.

### Mechanical Design validators/experts

The validators involved were 5 people that were practitioners and academics in the field of machinery. Indicators assessed were functionality, convenience, completeness of components, and mechanical design models. Furthermore, there were 8 questions developed from these indicators. The following table is a tabulation of the data obtained.

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<thead>
<tr>
<th>No</th>
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<th>Criteria</th>
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</tr>
<tr>
<td>2</td>
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<td>6</td>
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<td>7</td>
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</tr>
<tr>
<td>Mean</td>
<td>77.50</td>
<td>Good</td>
</tr>
</tbody>
</table>

The distribution of data can be seen through the following histogram (Figure 3).

The developed design can be used by stroke sufferers for various purposes, such as a transportation tool and as a post-stroke recovery aid. The smallest value is 72.00 on convenience and design model indicators. From the assessment, the designs should be reconsidered in terms of the easiness of using the wheelchair. Besides, they suggest developing the design even better. However, the average score shows the recommendation that the wheelchair can be used as a physical therapy medium with an average value of 77.50 (good criteria). The following is the overall data distribution from the validators (Figure 4).

![Figure 3. Response on items histogram](image)

![Figure 4. Validators data of mechanical design](image)

### Sports Coaching Validators/Experts

The validators were 5 practitioners and academics in the field of sports coaching. The indicators assessed were the principles of load intensity, functionality, loading models, standards for special training facilities, components, and mechanical design models. Furthermore, 8 questions were developed from these 5 indicators. The following table is a tabulation of the data obtained:

<table>
<thead>
<tr>
<th>No</th>
<th>Validity Value/Item</th>
<th>Criteria</th>
</tr>
</thead>
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</tr>
<tr>
<td>Mean</td>
<td>83.50</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
The distribution of data can be seen in the following histogram (Figure 5).
These data showed that the highest value is 100 (excellent criteria) and was obtained on functionality and principle of training load indicators. Therefore, it can be concluded that the design of the wheelchair as a treadmill is recommended for stroke sufferers as a recovery aid from the side of load exercise. The recovery can be conducted by providing training load [12, 13] and exercise can improve muscle function [14]. The increase in exercise capacity can be measured by sports technology [15, 16]. In contrast, the smallest value of 72.00 was obtained on the working principle of body movement mechanics indicator which still needs to be improved and developed. In addition, the effectiveness should be tested first, and the average value of sports coaching experts was 83.50 (Excellent criteria). Therefore, the wheelchair design developed can be used as a post-stroke recovery aid in terms of exercise loading. The following is the overall distribution of data from validators (Figure 6).

**Physical Physiotherapy Validators/Experts**
The validators involved 5 practitioners and academics in the field of physical physiotherapy. Furthermore, the indicators assessed were the suitability of the therapeutic media, functionality, principles, the patient's safety, and comfort, as well as the anatomical and physiological structures. From these 5 indicators, 11 questions were developed. The following table is a tabulation of the data obtained.

<table>
<thead>
<tr>
<th>No</th>
<th>Validity Value/Item</th>
<th>Criteria</th>
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</tr>
<tr>
<td>Mean</td>
<td>72.00</td>
<td>Good</td>
</tr>
</tbody>
</table>

The distribution of data can be seen in the following histogram (Figure 7). These data showed that the highest score is 76.00 with good criteria. This value is obtained on the design functionality indicator which was developed as a therapeutic tool in recovery for stroke sufferers. Furthermore, the score seems insufficient compare to other validators, but it is still within the criteria that can be used. The lowest value is 64.00 on the therapist accuracy indicator of anatomical and physiological functions. The design should be adapted to different anatomical and physiological structures of humans. Generally, the average value of the physiotherapist is 69.82 which is in Good criteria. Therefore, it can be concluded that the design of a wheelchair as a treadmill is recommended for stroke patients as a recovery aid following the assessment of a post-stroke physical therapist. The following is the overall distribution of data from validators (Figure 8).
Generally, the question items given to the experts consisted of 25 questions. The calculations showed that the highest score was obtained from sports coaching experts (83.50 / Excellent criteria). In contrast, the lowest score was obtained from physiotherapists (69.82 / good criteria).

**Table 4. Tabulation of data**

<table>
<thead>
<tr>
<th>No</th>
<th>Validator</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mechanical</td>
<td>77.50</td>
</tr>
<tr>
<td>2</td>
<td>Sport Coaching</td>
<td>83.50</td>
</tr>
<tr>
<td>3</td>
<td>Physiotherapy</td>
<td>69.82</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>230.82</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>76.93939394</td>
</tr>
</tbody>
</table>

From the values above, the average response of the experts shows a figure of 76.94%. It can be concluded that the opinion of experts on the development of wheelchairs as a therapeutic medium is in good criteria. Therefore, the use of a wheelchair designed as a therapy tool is highly recommended for stroke patients not for massage[17]. The distribution of responses from experts is given below.

This study provided new ideas in the use of wheelchairs as a physical therapy tool for stroke sufferers. In terms of education, the results can be used as a reference in the use of wheelchairs as an effective and low-cost learning medium for recovering physical conditions. However, some basic improvements are needed before being used as a therapeutic tool in terms of safety, mechanical design, and procedures for use. Furthermore, it is necessary to conduct serious field trials before being applied to stroke patients to test the effectiveness of the product, and it is one of the weaknesses. In addition, this study is only limited to testing the validity of experts but not the effectiveness of the product. Therefore, it is necessary to reaffirm the specifications of the muscles that are trained in the use of this wheelchair.

**Conclusion**

The data analysis concluded that the wheelchair design developed can be used as a therapeutic tool and as a mode of transportation for mild-severe stroke patients. However, the average score obtained has not been optimal, therefore, the mechanical design, the loading composition, and safety aspects should be improved.

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**Piśmiennictwo/ References**


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