



Design and Manufacture of the Stand Rollick: Moving to Stationary Bicycle Converter

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Abstract

The purpose of this research was to design and manufacture various sports equipment, including cardiovascular system strengthening devices, which holds great significance in the public health. Special mechanical parts were used for the design and manufacture of the stand rollick device. This device consists of two general parts with different fragments: A. The front part and B. The rear part including two rollers, metal structure, front wheel stopper, movable arms and its movable forks, stopper belt, machine wings and fixed shaft were used. The base of the stand rollick has the ability to be adjusted for all types of mobile bicycles, due to the fact that the chassis of this device is sliding and can be easily enlarged and reduced. Due to the lightness and simplicity of the designed stand rollick, it can be easily adjusted in any place and any mobile bicycle can be placed on it. According to the results of the study, it can be concluded that the designed and manufactured device can improve physical fitness, especially the cardiovascular system, at any time and in any place especially in the cold and rainy weather, where outdoor exercise training is difficult for all people in all age groups. This device can be a good alternative to moving bicycles in critical times such as an outbreak of a viral disease.

Key Words: Sport Equipment, Cardiovascular System, Stand Rollick, Manufacture.

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INTRODUCTION

Designing and manufacturing of various sports equipment, including cardiovascular system strengthening devices, holds a great significance in the public health [1]. In fact, cardiovascular fitness is one of the most important factors in health [2 – 5]. Researchers invent different tools to strengthen this important factor. Due to the importance of the issue, the present study aimed to design and manufacture the stand rollick that converts a moving bicycle into a stationary one which is applicable in order to strengthen the cardiovascular system.

Cardio-respiratory capability is one of the most important indicators of health related fitness and is used as a criterion for evaluating the efficiency of the cardiovascular system [6-8]. Maximum oxygen consumption is the best index for evaluating aerobic capacity in endurance activities [9], this index is accepted by all sports scientists as an important parameter for estimating cardio-respiratory fitness [10 – 12]. In other words, aerobic fitness is the ability to absorb, transport and consume oxygen, and the maximum oxygen consumption is expressed as O₂ consumption per minute for each kilogram of body weight in milliliters [13].

It should be noted that aerobic capacity is affected by many variables such as diseases, diet, lactic acid tolerance threshold, physical activity level, genetics and body composition [14, 15]. Since improvement of the cardiovascular system is essential for health and quality of life, neglecting it can lead to cardiovascular diseases. Therefore, performing aerobic exercises and using sports equipment such as the designed stand rollick, has gained special importance and necessity.

Since the cycle ergometers is mainly used for aerobic exercises [16], the designed stand rollick provides an opportunity to perform both aerobic and anaerobic exercises easily for athletes as well as non-athletes [17, 18]. Due to the conditions such as rainy and cold weather or spread of a viral disease like Covid-19, where physical activity was not possible in public places [19], the use of stand-rollick device as a decent replacement of the bicycle can help people improve cardio-respiratory fitness. Therefore, the purpose of this research was to design and manufacture a stand rollick device.

METHODOLOGY

Description of different parts of the device

The designed and manufactured iron device consists of two total parts with different fragments (A. The front part and B. The rear part) which are set on these two parts and form the stand rollick device made of iron.

A. The front part of the device

The front part of the device consists of three parts, including the front chassis, stopper and stopper belt. The stopper is attached to the chassis in a folding form, which is to keep the front wheel, and the stopper belt is connected to the back of the stopper, which secures the front wheel to the stopper on the chassis when the bicycle is mounted on the device (Figure 1).

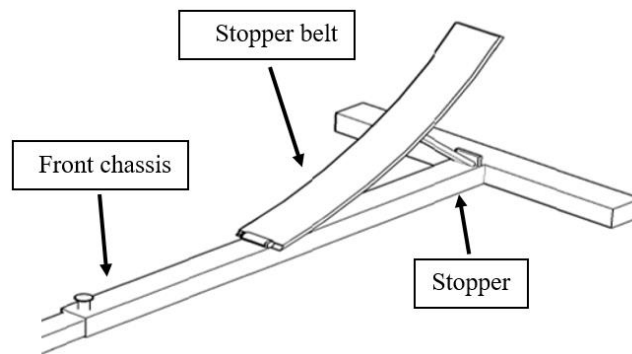


Figure 1. The front part of the device

B. The rear part of the device

The rear part of the device consists of 10 parts, all of which can be separated from the device, except for one part that is permanently attached to the device. The parts include movable arms and two movable branches. The movable arms and two movable branches, provide the ability to separate and adjust the height for all types of bicycles. The part which the arms of the bicycle receiver are connected and permanently connected to is the shaft. The shaft is made of iron because it supports a lot of weight. The next part are the rollers, which give the bike the ability to rotate and lock the rear wheel with diameter and length of 4 and 20 cm. The next part is the movable wings that adjust the balance of the device. This piece is designed to balance different bikes and it allows the device to maintain balance when heavy people use it. The last piece is the rear chassis which all these 9 manufactured parts are connected to and mounted on. It should be noted that the

front and rear chassis can be connected and separated with one screw. This feature has made it possible to adjust the length of the device for all types of bicycles and easy to move the device.

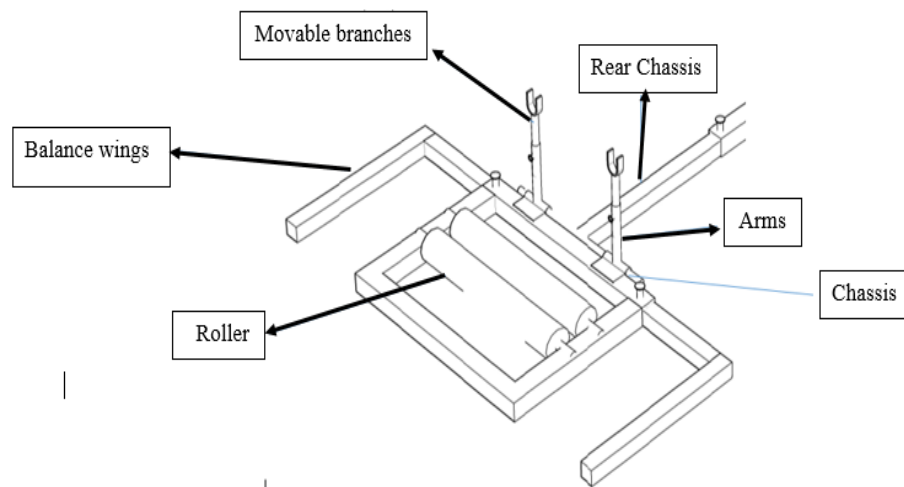


Figure 2. The rear part of the device

RESULTS

Results and operation of the device

A chassis is used to convert a moving bicycle into a stationary one. All equipment of the stationary bicycle is installed on the chassis. The rollers are installed on the back of the chassis. The rear wheel of the bicycle is placed in the middle of the rollers, and the moving arms are attached to the left and right trunks of the bicycle to restrain the bicycle. The front wheel of the bicycle is connected to the front stopper, and the front wheel stopper belt is tightly tied to the stopper so that the bicycle maintains its balance while riding the bike and pedaling. Due to the restraint of the bicycle by the arms and the stopper, the conversion of the moving bicycle into a stationary one is designed in such a way that the bicycle continues to operate in a standing position while pedaling and rotating the rear wheel rollers.

This device can be adjusted for all types of bicycles. The device is designed in a way that it establishes and keeps the balance by the arms, stopper and wings in a stationary position easily after activation of the bicycle. The base of the stand rollick has the ability to be adjusted for all types of mobile bicycles, due to the fact that the chassis of this device is sliding and can be easily enlarged and reduced. Due to the lightness and simplicity of the designed stand rollick, it can be

easily adjusted in any place and any mobile bicycle can be placed on it. In addition, different parts of the device can be separated and transferred to any place and used (Figure 3).



Figure 3. Overview of the stand rollick device

DISCUSSION

The purpose of this research was to design and manufacture a Stand Rollick device where the moving bicycles converted to stationary ones. The device is designed and manufactured in a way that can be used easily in any place. Due to the spread of viral diseases such as Covid-19, influenza, etc. being very dangerous for people of different age groups -especially the elderly- [20-21], physical activities in public places and open spaces increases the chances of getting infected by these diseases [22], Therefore stand rollick would be a good alternative for mobile bicycles. This device can be used in the conditions such as hot and cold weather or the spread of the virus where it is difficult to ride a moving bicycles.

This device is designed in a way that all part of the society including men and women of all age groups are able to use it. However, it should be noted that the loading pattern of the bicycle pedal should not be the same for different people with different physical fitness levels [24]. This issue

can be discussed in the future. In other words, the device must be designed and manufactured in a way that the loading pattern of the pedal changes according to the subject's physical fitness level. Another point that should be noted in the production of this device is the possibility to create an electricity production and storage system. In addition, a monitor can be used to show and calculate heart rate, the amount of distance covered and the amount of calories burned. The mentioned items can be taken into consideration in the future studies.

According to the results of the study, it can be concluded that the designed and manufactured device can improve physical fitness, especially the cardiovascular system, at any time and in any place especially in the cold and rainy weather, where outdoor exercise training is difficult for all people in all age groups. This device can be a good alternative to moving bicycles in critical times such as an outbreak of a viral disease.

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طراحی و ساخت دستگاه استند رولیک: مبدل دوچرخه متحرک به ثابت

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چکیده

طراحی و ساخت تجهیزات مختلف ورزشی از جمله دستگاه‌های تقویت کننده سیستم قلب و عروق از اهمیت ویژه‌ای در حوزه سلامت افراد جامعه برخوردار می‌باشد. هدف از اجرای پژوهش حاضر، طراحی و ساخت دستگاه مبدل قابل حمل دوچرخه متحرک به ثابت بود. این دستگاه از دو قسمت کلی: الف- بخش قدامب و ب- بخش خلفی که شامل دو غلتک، سازه فلزی، درپوش چرخ جلو، بازوهای متحرک و شاخک‌های متحرک آن، تسمه درپوش، بال‌های ماشین و شفت ثابت تشکیل شده است. پایه استند رولیک به دلیل کشویی بودن شاسی به راحتی قابلیت تنظیم برای انواع دوچرخه‌های متحرک را دارد. به دلیل سبکی و سادگی دستگاه استند رولیک، پایه طراحی شده را می‌توان به راحتی در هر مکانی تنظیم کرد و هر دوچرخه متحرکی را روی آن قرار داد. با توجه به نتایج این تحقیق می‌توان نتیجه گرفت که دستگاه طراحی و ساخته شده می‌تواند آمادگی جسمانی به ویژه سیستم قلبی عروقی را در هر زمان و در هر مکان به ویژه در هوای سرد و بارانی که تمرین ورزشی در فضای باز برای آن دشوار است، بهبود بخشد. همه افراد در تمام گروه‌های سنی می‌توانند از این دستگاه به عنوان جایگزین مناسب در مواقع حساس مانند شیوع یک بیماری‌های ویروسی استفاده نمایند.

واژگان کلیدی: تجهیزات ورزشی، سیستم قلبی عروقی، استند رولیک، تولید و ساخت.