Published in the Slovak Republic
European Journal of Physical Education and Sport
Has been issued since 2013.
E-ISSN: 2409-1952
2020, 8(2): 42-50

DOI: 10.13187/ejpe.2020.1.42
www.ejournal7.com

Articles

Training Devices: New Solutions

Yuriy Kabanov [a, *], Petr Gulidin [a], Vladimir Trushchenko [a], Vadim Losev [a], Valentina Koloshkina [a]

[a] Vitebsk State University named after P.M. Masherov, Vitebsk, Republic of Belarus

Abstract

At present, it is impossible to imagine the physical development of a person without the introduction of modern technologies aimed at the maximum realization of his biological abilities, which are inherent in him from birth. The use of new training devices in the educational or training process allows you to effectively form new motor skills, to develop and improve human movement abilities. The development of training devices is a creative and rather complicated process, since many different fitness equipment which allow to selectively influence various muscle groups of a person have already been created Taking this into account, the development of training devices by us was carried out in two directions: the first is the creation of fundamentally new devices; the second is the improvement of the already created devices. Some of them can be used not only for the development of motor abilities, but also for rehabilitation in medicine. In recent years, teachers of the Faculty of Physical Culture and Sports of Vitebsk State University named after P.M. Masherov (Belarus) have received 11 patents for inventions and utility models in the field of physical culture and sports and sports medicine, which have certain fundamental differences compared to traditional sports equipment and devices. In the article we discuss the features of new technical solutions used in training devices.

Keywords: physical development, training devices, movement abilities.

1. Introduction

The aim of the work was the development and improvement of training devices for the development of human movement abilities. The article offers you a description of the training devices developed by us: a device for training the muscles of the upper body, a hand expander, a gymnastic bench, a sports weight, a tennis simulator, a device for training basketball players, a gymnastic ladder, a device for developing human power abilities, a device for training muscles of the lower extremities of a person, a device for measuring strength indicators of various muscle groups of a person, a device for restoring mobility and training ankle muscles.

2. Material and methods

Research material – training devices for the development of human movement abilities; research methods – patent search, analysis of scientific and methodological literature on the research problem.

* Corresponding author
E-mail addresses: kfvis1947@mail.ru (Yu.Kabanov)

3. Discussion

Preservation of essential life values, the main one of which is human health, is assuming ever greater importance in today's world. The deterioration of the ecological situation, irrational and unhealthy diet, sedentary lifestyle, bad habits, stress – all these lead to decreased quality of human life and, in turn, affect life duration. Scientists from various subject areas have to solve more and more issues related to preservation and strengthening of human health. The developers (Vodlozerov, 2003; Evseev, 2003; Shukshunov, 2001) of various gym machines and systems designed for development and improvement of human motor skills do not stand aside from solving these issues. Some works consider the use of exercise equipment in the development of students' motor abilities (Skripko et al., 2013; Sharafeeva, Popova, 2014); others consider the use of training devices during the training process of sportsmen (Zelenin, 2014; Zelenin, Kanaev, 2015). Since 1997, a group of authors from the Faculty of Physical Culture and Sports at Vitebsk State University named after P.M. Masherov (the Republic of Belarus) has been addressing these issues. Our main objective is to help a person unlock their motor potential using various gym machines and devices. In the section of the article "Study results", a description of the gym machines designed by us in the recent years is brought to your notice.

4. Results

4.1. A device for training the muscles of the upper body of a person (Patent BY 3975 C1, 2001).

The invention is intended to improve the effectiveness of training by dosing physical activity, depending on the level of physical fitness of the trainee. This object is achieved by the fact that in the device for training the muscles of the upper body of the person containing the traverse and mounted on the traverse means for grabbing hands made in the form of a drum, the outer surface of which is formed on the traverse with the possibility of rotation, and the handrails are installed at an angle of 45-90 ° to each other and performed trapezoidal. In addition, to expand the functional capabilities of the device, drums with different angles between the handrails are mounted on the traverse sequentially (or mutually perpendicular to each other), and the device can be made portable.

The device comprises a traverse with a means for gripping with hands mounted on it, made in the form of a drum. The outer surface of the drum is formed by symmetrically arranged trapezoidal handrails. The drum is mounted on a traverse with the possibility of rotation through bearings.

To dose physical activity, depending on the level of physical fitness of the trainee, you can increase or decrease the number N of the drum handrails, setting them at different angles α with respect to each other. The larger the angle α and the smaller the number of handrails N, the greater the effort a student must expend to rotate the drum. The optimal number of handrails N is from 8 to 4, with α = 45 ° - 90 °. The maximum load is achieved with the number of handrails N = 4 and α = 90 °. With the number of handrails equal to three (N = 3) and α = 120 °, the trainee will not be able to reach the next handrail, and the exercise will become impossible.

To expand the functionality of the device, as well as to provide simultaneous training of several people and increase the motor density of the occupation, traverses are installed drums with different angles between the handrails, for example, with α1 = 45 ° and N1 = 8; α 2 = 60 ° and N2 = 6; α 3 = 90 ° and N3 = 4.

Moving from one drum to another, the trainee can increase or decrease the load. The drums are installed on the traverse sequentially one after another (or mutually perpendicular to another friend). Any combinations of installing drums are possible, the device can be made portable and mounted on a gymnastic wall or the like.

The device operates as follows. The trainee is in the initial position in the hang, holding the handrail with his hands. Then, taking first with one hand, and then with the other hand the next handrail of the drum, the practitioner causes the drum to turn and again finds itself in its original position. Since the drum rotates with each subsequent interception by hands, the trainee will return to the original position.

Increasing the speed of the exercise, dosing the number of interceptions and the number of revolutions of the drum per unit of time, physical activity is dosed. The invention improves the efficiency of strength training of the muscles of the upper body of a person by dosing physical

activity depending on the level of physical fitness of the trainee, and also extends the functionality, increases the motor density of the occupation due to the simultaneous training of several people.

4.2. Carpal expander (Patent BY 8486 C1, 2006).

A disadvantage of the known hand expanders is that their action is aimed only at training a group of muscles that perform the function of extending the fingers to the sides and bringing them to their original position. The load on the extensor muscle group is absent.

The hand expander developed by us contains a ring, to which 4 springs (elastic elements) are sequentially attached at one end, and which is worn on the phalanx of the thumb. The second end of the springs is attached to the rings worn on the distal phalanges of the remaining fingers. The diameter of the rings is adjusted depending on the size of the distal phalanges of the fingers. In the working position, when the fingers are extended and extended, the springs are stretched and the extensors of the fingers of the hand create a load on the muscles. When the fingers are bent, the springs of the carpal expander come to their original position. Hand expander is made of metal or plastic. The carpal expander allows you to effectively train the muscles and joints of the hands, has a simple structure, is easy to use and can be manufactured industrially.

The carpal expander can be used for the rehabilitation of constituent elements (muscles, ligaments, tendons) of the hand and extensor (abducting) fingers of the hand (forearm) damaged as a result of injuries or operations, as well as patients who have suffered an acute cerebrovascular accident with peripheral damage nerves of the upper extremities, for training paretic and weakened muscles, for the education of differentiated movements in the joints of the affected limb.

4.3. Gymnastic bench (Patent BY 9569 C1, 2007).

The invention relates to sports equipment, in particular, to devices for training coordination of movements. Known sports equipment used to train coordination of movements – gymnastic bench. A gymnastic bench is used as a simulator for coordinating human movements in two positions: seat up and seat down. Sports equipment ensures safe exercise. A disadvantage of the well-known gymnastic bench is that, due to the static nature of the device, high training efficiency is not achieved.

The problem to be solved is improving the design of the gymnastic bench in order to increase the efficiency of the exercises for training coordination of movements. The problem is solved in that in a gymnastic bench including a seat, legs, a bar, the latter is installed with the help of metal rods fixed at its ends and can be swung relative to its horizontal axis and slide using bearings fixed in the bar along the surface of U-shaped nests made in legs while in the holes of the U-shaped sockets there are limiters for adjusting the angle of rotation of the beam.

To achieve higher training efficiency, the gymnastic bench is set to the seat down position. The beam is mounted movably relative to the horizontal axis to the legs using metal rods located at the ends of the beam and rotating in the bushings of the legs. When a person moves along the gymnastic bench, the beam makes swinging movements in U-shaped nests using bearings. The angle of rotation of the beam is regulated by limiters.

Training coordination of movements is as follows. Depending on the complexity of the exercises performed, the gymnastic bench is used in 2 positions: seat up and seat down. The greatest effect of training is achieved when performing exercises in the 2nd position of the gymnastic bench. When a person moves along the working surface of the beam, an uneven load on the projectile occurs, causing oscillating movements of the beam relative to its horizontal axis. In this case, a man, trying to maintain balance, trains coordination of movements. Depending on the person's fitness, the angle of rotation of the beam can be adjusted with the help of limiters, thereby complicating the exercises. Gymnastics bench is industrially applicable, as it is manufactured on standard equipment using available materials.

4.4. Sports kettlebell (Patent BY 5035 U, 2009).

Sports kettlebell refers to sports equipment, in particular, to devices for training the muscles of the body. Sports kettlebell can be used for the development of power, speed-strength, coordination abilities of a person.

The problem to be solved is the improvement of the design of sports weights in order to reduce injuries and increase the effectiveness of the exercises when training a person's strength abilities. The problem is solved in that in a sports gear containing a body and a handle, the central part of the handle is movably with the possibility of horizontal axial rotation.

A kettlebell is composed of a body and a handle. The handle has a fixed base and a movable central part, which is fastened with a screw and washers to the base of the handle. Training of a person's power abilities occurs when performing exercises with an upper or lower grip for a rotating handle from various starting positions. When performing motor actions, the wrist and wrist remain in a static position, which leads to a decrease in injuries and an increase in the effectiveness of the exercises by increasing their number and training in general.

4.5. Tennis simulator (Patent BY 5660 U, 2009).

Tennis simulator refers to sports equipment, and can be used in training sessions when playing table tennis, for practicing attacks in a specific predetermined area of the tennis table.

The task to be solved is to improve the design of the tennis table in order to increase the effectiveness of the training when practicing attacks in a specific predetermined area of the tennis table. The problem is solved in that in a tennis simulator containing a game table consisting of two parts separated by a grid, one of the table parts is separated from the second one, makes up one fourth of its area and can move relative to the second part within the boundaries of the area of the tennis table.

The mobile part of the tennis simulator is installed anywhere within the boundaries of the technical table area where one of the players will purposefully send a tennis ball with a racket to practice attacks.

The device helps to improve the accuracy and speed of reaction when performing attacks in different areas of the tennis table, which allows to improve the technique and tactics of the game, enhances the training effect of the training session.

4.6. A device for training basketball players (Patent BY 6426 U, 2010).

A device for training basketball players relates to sports simulators, namely, devices for training basketball players and can be used to correct movements in violation of a person's motor function.

The task at hand is to simplify the design of a device for training basketball players, expand its functionality and reduce manufacturing costs. The problem is solved in that in the device for training basketball players containing a support and guides, the elements are pivotally interconnected with the possibility of changing the position of the guides.

A device for training basketball players contains a support with which the guides are mounted on the crossbar of the gymnastic stairs. The support and the guides are interconnected to change the position of the guides depending on the movement practiced: throwing into the basket, passing the ball.

The device is used as follows. After installation on the gymnastic staircase, using the support, the position of the guides is adjusted depending on the method of throwing. The student becomes his back to the gymnastic ladder, while one of his hands with the ball is between the guides. The movement of the hand is limited by guides that specify the path of the hand. The exercise ends by throwing the ball into the ring or to the partner taking the pass. Repetition of certain movements allows you to form and stabilize the technique of performing special movements and throw accuracy in basketball players and in people with impaired movement functions.

4.7. Gymnastic stairs (Patent BY 6425 U, 2009).

Gymnastic ladder refers to sports and medical equipment, in particular, to devices for training the muscles of the body and correction of deformation of the spinal column of a person. The gymnastic staircase can be used to equip gyms, medical physical culture rooms, rooms adapted for physical education and sports.

The problem to be solved is improving the design of the gymnastic ladder in order to increase the efficiency of the exercises for training various muscle groups and correcting the deformation of the human spinal column. The problem is solved in that in the gymnastic staircase, including vertical racks and crossbars, the latter can move in the horizontal plane along the grooves and be fixed in them by motionless locking elements within the boundaries (front and rear sides) of the vertical racks. To achieve higher training efficiency, the crossbars can be horizontally moved in grooves and fixed in them by stopping elements along the entire length of the gymnastic ladder relative to the vertical plane.

Training of body muscles and correction of human spinal column deformities can take place depending on their individual anatomical abilities. The practitioner is in the initial position – bangle with his back to the gymnastic ladder, a grip on the upper crossbar. The crossbars in the

upper half of the gymnastic ladder are installed in accordance with the anatomical profile of the human spine, or taking into account the adjustment of a certain part of the spinal column. In this position in the hanging (static mode) or when performing movement actions (dynamic mode), the necessary effect on the spinal column of a person occurs to correct posture. The starting material for the manufacture of gymnastic stairs is wood and metal.

4.8. Device for the development of human power abilities (Patent BY 6881 U, 2010).

The simulator relates to sports equipment, in particular to devices for the development of human power abilities.

The training device for the development of human power abilities, contains a frame, an axle with a load, a retractable handle, supports made in an arc, while increasing or decreasing the load on the trained muscle groups occurs by lengthening the handle and moving the load along the axis. The technical result is achieved by the fact that, by changing the load, by lengthening the handle and moving the load, in various initial positions, training of all muscle groups of a person occurs.

A device for the development of human power abilities consists of a frame with supports having an arc shape, on which the limiters of movement of the supports are movably mounted. In the middle part of the frame is the axis along which the load is moved. A handle is attached at the ends of the supports, the position of which can be changed by moving along the grooves of the handle mounts.

You can use the device for the development of human power abilities in the following options – *A, B, C, D, E, F, G, H*.

In option *A*, the trainee assumes the initial position lying on his back on the bench, legs straight, heels touching the top of the handle of the device. By bending and straightening the legs at the knees, making movements down and up, the biceps femoris and calf muscles are trained. When performing the exercise, the load decreases when moving the weight along the axis and lengthening the handle; load increase – when moving from the training load along the axis and shortening the handle.

In option *B*, the trainee assumes the initial position standing facing the device, legs apart, grasping the handle with straight arms from above. When lowering and raising straight arms up and down, training of the pectoral, deltoid, triceps muscles and muscle groups of the forearm occurs. When performing the exercise, the load decreases when moving the weight along the axis and lengthening the handle; load increase – when moving from the training load along the axis and shortening the handle.

In option *C*, the trainee assumes the initial position lying on his back on the bench, the legs below are bent at the knees, the feet are brought under the handle. When straightening the legs and returning to the starting position, the training of the straight, tailor, wide muscles of the thigh occurs. When performing the exercise, the load decreases when moving from the training load along the axis and lengthening the handle; load increase - when moving to the training load along the axis and shortening the handle.

In option *D*, the trainee assumes the initial position, facing the device, legs apart, grasping the handle with straight arms from the bottom (reverse grip). When raising arms forward and up and returning to the starting position, the biceps and deltoid muscles of the shoulder are trained. When performing the exercise, the load decreases when moving from the training load along the axis and lengthening the handle; load increase – when moving to the training load along the axis and shortening the handle.

In option *E*, the trainee assumes the initial position, sitting on a chair, his hands in focus at the back, the legs are bent at the knees and pulled to the chest, the feet are located on the handle from above. When legs are straightened and returned to their original position, the muscles of the anterior surface of the thigh, the muscles of the lower leg and the foot are trained. When performing the exercise, a decrease in load occurs when moving to the training load on the axis, and lengthening the handle; load increase – when moving from the training load along the axis and shortening the handle.

In option *F*, the trainee takes the initial position, facing the device, legs apart, grasping the handle with his hands on top. When bending forward (arms straight or bent), and returning to the starting position, the trapezoid, latissimus dorsi muscles are trained. When performing the exercise, the load decreases when moving the weight along the axis and lengthening the handle; load increase – when moving from the training load along the axis and shortening the handle.

In option *G* the trainee assumes the initial position standing facing the device, half-inclined forward, legs apart. The handle is on the shoulders of the trainee, the hands are located on the handle on top.

In option *H*, the trainee assumes the initial position, sitting on a chair, arms at the back, legs straight, feet brought under the handle. When lifting straight legs up and returning to the starting position, abdominal muscles are trained. When performing the exercise, the load decreases when moving from the training load along the axis and lengthening the handle; load increase – when moving to the training load along the axis and shortening the handle.

In all cases, the stops limit the trajectory of the device in accordance with the trajectory of the trainee during the exercise. The training device allows you to increase the effectiveness of training various muscle groups of a person.

4.9. A device for training the muscles of the lower extremities of a person (Patent BY 7594 U, 2011).

The utility model relates to sports equipment, devices for training the muscles of the human body, in particular, for training the muscles of the lower extremities. The device can be used to equip gyms.

The problem to be solved is the development of a training device in order to increase the efficiency of training speed-power abilities of a person, namely, muscles of the lower extremities. The problem is solved in that the device for training the muscles of the lower extremities of a person contains a control panel, a platform, an electric motor, a gearbox, adjustable racks, platforms with crossbars. The technical result is achieved in that the crossbars can move in a circle at different speeds in the horizontal plane.

Speed-strength training of the muscles of the lower extremities of a person occurs as follows. The device is installed on the floor. The practitioner assumes the starting position – a stand in front of the crossbar. When you turn on the crossbar from the control panel of the electric motor, the rails installed on the gearbox platform begin to move in a circle, and the student jumps over them. When performing jumps through rotating rungs, an increase or decrease in physical activity can occur due to a change in the speed of rotation of the rungs, a change in their number from 1 to 4, adjustment of the height of the platform with adjustable racks and adoption of different starting positions by the practitioner. Up to 4 people can train using the device at the same time. When performing jumping exercises, the speed-power abilities of a person are improved, due to the training of the muscles of the lower extremities involved in motor actions in various sports: athletics, gymnastics, acrobatics, etc.

4.10. A device for measuring the strength index of various muscle groups of a person (Patent BY 8765 U, 2012).

The device relates to means for sports measurements and can be used to measure the strength of various muscle groups of a person. The device can be used as a technical tool for measuring the strength indicator of various muscle groups of a person in the educational and training process for "physical education".

The problem to be solved is the development of a device for measuring the strength index of various muscle groups of a person. The problem is solved in that the device for measuring the strength index of various muscle groups of a person contains a platform with guides fixed on it, on which vertical racks with crossbars are mounted with the possibility of movement, on one of which is a sliding clip with a hook for attaching a dynamometer with a belt; at the same time, the measurement of the indicator of muscle strength occurs when the subject performs the traction movement applied to the belt of the dynamometer in various initial positions.

The technical result is achieved by the fact that by moving the racks and the crossbeams of the device, changing the position of the dynamometer when performing vertical or horizontal traction, the measurement of the strength of the muscles of the body in various initial positions of the test subject.

A device for measuring the strength index of various muscle groups of a person consists of a platform with guides on which vertical racks with crossbars are movably mounted. A sliding clamp with a hook for attaching a dynamometer with a belt is installed on one of the crossbars depending on the measured indicator of muscle strength and the initial position of the subject's body.

You can use the device to measure the strength indicator of various muscle groups in a person in the following variants – *A, B, C, D, E, F, G, H, J, K, L, M. N*. In all cases, the test subject is

inside the device, changing the position of the body depending on the measured indicator of muscle strength. In option *A*, the subject assumes the initial position while standing on the supporting leg, the other leg is raised forward and bent at the knee joint. The dynamometer is attached at one end to the hook of the sliding clamp on the horizontal bar below the hip of the bent leg, the second end of the belt from the dynamometer is fixed on the thigh of the raised leg near the knee joint. The subject performs a pulling movement of the bent leg up. In this case, the strength of the muscles of the hip flexors is measured.

In option *B*, the subject assumes the same initial position as in option *A*. The dynamometer is attached at one end to the clamp hook on the bar above the hip of the bent leg, with the other end the belt from the dynamometer is fixed under the hip of the raised leg near the knee joint. The subject performs a pulling movement of the bent leg down. The strength of the muscles of the extensors of the thigh is measured.

In option *C*, the subject assumes the initial position while standing on a supporting leg, the other leg is bent back at the knee. The dynamometer is attached at one end to the clamp hook on the horizontal bar below the ankle joint of the bent leg, the second end of the belt from the dynamometer is fixed on top of the ankle joint of the raised leg. The subject performs a pulling movement of the bent leg up. The strength of the muscles of the flexors of the lower leg is measured.

In variant *G*, the subject assumes the same initial position as in variant E. The dynamometer is attached at one end to the clamp hook on the bar above the leg of the bent leg, and the second end of the dynamometer is fixed below the leg of the bent leg. The subject performs a pulling movement of the bent leg down. The strength of the muscles of the extensors of the lower leg is measured.

In option *H*, the subject assumes the initial position, standing on two legs, one arm pressed to the body along the body, the other bent forward in the elbow joint. The dynamometer at one end is attached to the clamp hook on the crossbar installed at the knees from below under the bent arm, the second end of the belt from the dynamometer is fixed on top of the wrist joint of the bent arm. The subject performs the pulling motion of the bent arm up. The strength of the muscles of the flexors of the forearm is measured.

In option *J,* the subject assumes the same initial position as in option I. The dynamometer is attached at one end to the clamp hook on the bar located above the bent arm above the hand, with the second end the belt from the dynamometer is fixed from below under the wrist joint of the bent arm. The subject performs a pulling movement of the bent arm down. The strength of the muscles of the extensors of the forearm is measured.

In option *K*, the subject assumes the initial position, standing on two legs, one arm pressed to the body along the body, the other raised forward and bent upward in the elbow joint. The dynamometer is attached at one end to the clamp hook on the crossbar mounted at the level of the knees from below under a bent arm, with the second end the belt from the dynamometer is fixed on top of the shoulder near the elbow joint of the bent arm. The subject performs the pulling motion of the bent arm up. The strength of the muscles of the flexors of the shoulder is measured.

In option *L*, the subject assumes the same initial position as in option *K*. The dynamometer is attached at one end to the clamp hook on the crossbar located in front of the subject at chest level, with the other end the belt from the dynamometer is fixed at the level of the chest of the subject. The subject performs a pulling movement, tilting the body back. The strength of the muscles of the extensors of the body is measured.

In option *M*, the subject assumes the initial position while sitting on the gymnastic bench, one leg is straightened and located on the bench, the other is bent at the knee and lowered down, hands are arbitrary. The dynamometer is attached at one end to the clamp hook on the crossbar located in front of the test subject at the foot level, the second end of the belt from the dynamometer is fixed on top of the foot in its upper part. The subject performs traction with the foot, bending it toward himself. The strength of the muscles of the flexors of the foot is measured.

In option *N*, the subject assumes the same initial position as in option *M*. The dynamometer is attached at one end to the clamp hook on the crossbar behind the subject's back at the level of the belt, with the other end the belt from the dynamometer is fixed to the back surface of the foot in its upper part. The subject performs the traction movement, the foot unbending it from himself. The strength of the muscles of the extensor of the foot is measured.

A device for measuring the strength index of various muscle groups of a person allows you to measure the strength of various muscle groups of a person to obtain informative indicators of the effectiveness of the training process.

4.11. A device for restoring mobility and training the muscles of the ankle joint (Patent BY 12176 U, 2020).

The simulator relates to sports equipment, in particular to devices for training the muscles of the ankle joint and restoring its function (mobility) after injuries and operations.

A training device for restoring mobility and training ankle muscles contains a frame, a control panel, an electric motor, a gearbox, a disk, spherical joints, a platform for the foot, a locking element, while the disk has a groove in which the spherical joint is movably mounted, movably associated with the platform for the foot, and the locking element is made in the form of a screw with a lamb.

The technical result is achieved by the fact that when the disk is rotated, the platform is movably connected to it, on which the practitioner's foot is located, while adjusting the locking element of the spherical hinge can be moved along the groove, the platform connected to it, from the center to the disk to its edge and back, increasing (or decreasing) the amplitude of movement of the foot in the ankle joint, depending on the individual characteristics of the practitioner. A spherical hinge located on the side of the foot platform opposite from the gearbox is fixedly fixed in the center of the gearbox shaft on the device frame.

A device for restoring mobility and training the muscles of the ankle joint consists of a frame, located on it: a control panel, an electric motor, a gearbox with a disk, a platform for the foot. In the groove on the disk there is a spherical hinge, which is movably connected to the platform for the foot, and when moving it can be fixed in the groove of the disk with a lamb. A foot platform is connected by a hinge to the frame. From the control panel, the speed of rotation of the disk and the associated foot platform are varied.

A device for restoring mobility and training the muscles of the ankle joint allows you to adjust the speed and amplitude of the foot (when moving the platform for the foot from the center of the disc to its edge and back) in the ankle joint, depending on the individual characteristics of the student.

5. Conclusion

Our gym machines are designed for development and improvement of human motor skills (power, speed-power, coordination). Some of them can be used in medicine. Thus, for example, a wrist exerciser is used for rehabilitation of injured muscles, ligaments, tendons of the hand; gymnastic bench – for recovery of the function of movement coordination while walking; gymnastic ladder – for posture correction (spinal column). In addition, a device is used for medical purposes to restore mobility and train the muscles of the ankle joint. All gym machines devices can be manufactured using standard equipment and available materials.

References

Evseev, 2003 – *Evseev, S.* (2003). Trenazhery v gimnastike. [Exercise machines in gymnastics], Moscow, 254.

Patent BY 12176 U (2020) – National Center and Intellectual Property of the Republic of Belarus “Device for restoring mobility and training ankle muscles”.

Patent BY 3975 C1 (2001) – National Center and Intellectual Property of the Republic of Belarus “Device for training the muscles of the upper body”.

Patent BY 5035 U (2009) – National Center and Intellectual Property of the Republic of Belarus “Sport Weight”.

Patent BY 5660 U (2009) – National Center and Intellectual Property of the Republic of Belarus “Tennis Simulator”.

Patent BY 6425 U (2009) – National Center and Intellectual Property of the Republic of Belarus “Gymnastic Stairs”.

Patent BY 6426 U (2010) – National Center and Intellectual Property of the Republic of Belarus “Device for Training Basketball Players”.

Patent BY 6881 U (2010) – National Center and Intellectual Property of the Republic of Belarus “Device for the Development of Human Power Abilities”.

Patent BY 7594 U (2011) – National Center and Intellectual Property of the Republic of Belarus “Device for training the muscles of the lower extremities of a person”.

Patent BY 8486 C1 (2006) – National Center and Intellectual Property of the Republic of Belarus “Hand expander”.

Patent BY 8765 U (2012) – National Center and Intellectual Property of the Republic of Belarus “Device for measuring the strength index of various muscle groups of a person”.

Patent BY 9569 C1 (2007) – National Center and Intellectual Property of the Republic of Belarus “Gymnastic Bench”.

Sharafeeva, Popova, 2014 – *Sharafeeva, A.B., Popova, A.V.* (2014). Metodika primeneniya trenazherov na zanyatiyakh so studentami, imeyushchimi zabolevanie oporno-dvigatel'nogo apparata [Exercise machine application at classes with students with musculoskeletal system disorders]. *Vestnik Tomskogo gosudarstvennogo universiteta*. 385: 168-170. [in Russian]

Shukshunov, 2001 – *Shukshunov, V.* (2001). Trenazhernie sistemy [Exercise systems]. Moscow, 256. [in Russian]

Skripko, 2013 – *Skripko, A.D., Gryazeva, E.D., Romankova, N.V., Guba, D.V.* (2013). Tekhnologiya primeneniya trenazherov i spetsial'nykh uprazhnenii v protsessae razvitiya dvigatel'nykh sposobnostei studentov [Technology of use of exercise machines and special exercises in development of motive abilities of students]. *Mir sporta*. 2: 58-62. [in Russian]

Vodlozerov, 2003 – *Vodlozerov, V.* (2003). Trenazhery lokalno napravlennogo deystviya [Exercise machines of locally directed action]. Kiev, 102.

Zelenin, 2014 – *Zelenin, L.A.* (2014). Trenazhernye ustroistva v lyzhnoi podgotovke [Training simulators variations in wrestlers steadiness and pulling movements development]. *Teoriya i praktika fizicheskoi kul'tury*. 4: 47-58. [in Russian]

Zelenin, 2015 – *Zelenin, L.A., Kanaev, Y.S.* (2015). Raznovidnosti trenazhernykh ustroistv v sovershenstvovanii ustoichivosti i tyagovykh dvizhenii bortsov [Training simulators in ski training]. *Teoriya i praktika fizicheskoi kul'tury*. 4: 77-81. [in Russian]