REHABILITATION COACHING METHOD AND REHABILITATION COACHING SYSTEM

BACKGROUND

TECHNICAL FIELD

[0001] The disclosure relates to a rehabilitation coaching method and a rehabilitation coaching system using the same.

RELATED ART

[0002] Generally, when a user does a rehabilitation exercise, the user selects an intensity of the rehabilitation exercise according to a normal exercise mode. For example, when doing a heart rehabilitation exercise, the user selects the intensity suitable for the rehabilitation exercise based on his or her age or gender by comparing with an index in a norm table of maximal oxygen consumption (VO_2Max). However, the norm table of VO_2Max is made by sampling and categorizing oxygen consumption conditions of people, and thus the table can not reflect the user's personal physical conditions, such as the user's personal resting heart rate, the user's average heart rate during exercising and the user's current danger level of heart. Thus, according to the norm table of VO_2Max, the user can not be provided with a rehabilitation exercise mode suitable for the user's current physical condition.

[0003] Besides, without professional coaching, the user does the rehabilitation exercise by his or her own blindly, which may not lead the user to achieve an effect of the rehabilitation exercise, and what is worse is that the user may get unrecoverable

injuries because the he or she is not provided with an estimation and guide according to the user's personal physical condition during the rehabilitation exercise. Accordingly, it is needed to develop a rehabilitation exercise method and system which can detecting the user's physical condition and providing the suitable rehabilitation exercise mode according to the user's physical condition to coach the user to do the rehabilitation exercise.

SUMMARY

[0004] The disclosure provides a rehabilitation coaching method and a rehabilitation coaching system, by which a user can do a rehabilitation exercise according to a personalized exercise rhythm so as to achieve an optimal rehabilitation effect and protect the user from exercise injuries due to wrong exercise concepts of the user.

[0005] The disclosure provides a rehabilitation coaching method for assisting the user to do the rehabilitation exercise. The rehabilitation coaching method includes detecting a resting heart rate of the user by an electrocardiograph sensor, setting an exercise rhythm according to a personalized exercise rhythm data for the user and outputting the exercise rhythm to coach the user to do the rehabilitation exercise. The rehabilitation coaching method also includes obtaining a total oxygen consumption of the user during the rehabilitation exercise according to a profile of the user, and an exercise time of doing the rehabilitation exercise and the exercise rhythm, wherein the profile of the user includes a danger level of the user. The rehabilitation coaching method also includes detecting an average heart rate of the user by the electrocardiograph sensor during the rehabilitation exercise and obtaining an exercise intensity for the user according to the resting heart rate of the user and the average heart

rate of the user during the rehabilitation exercise. The rehabilitation coaching method further includes obtaining a recommended exercise rhythm according to the exercise intensity for the user, the total oxygen consumption of the user during the rehabilitation exercise and the danger level of the user and then updating the personalized exercise rhythm data for the user according to the recommended exercise rhythm.

[0006] The disclosure provides a rehabilitation coaching system for assisting a user to do a rehabilitation exercise. The rehabilitation coaching system includes a sensing signal receiver, a memory unit, a personalized rehabilitation coaching unit and an output unit. The sensing signal receiver is configured for receiving a resting heart rate of a user and an average heart rate of the user during the rehabilitation exercise. The memory unit is configured for storing the profile of the user and the personalized exercise rhythm data for the user. The personalized rehabilitation coaching unit is coupled to the sensing signal receiver and the memory unit and configured for setting the exercise rhythm according to the personalized exercise rhythm data for the user. The output unit is coupled to the personalized rehabilitation coaching unit and configured for outputting the exercise rhythm to coach the user to do the rehabilitation exercise. Here, the personalized rehabilitation coaching unit is further configured for obtaining the total oxygen consumption of the user during the rehabilitation exercise according to the profile of the user and an exercise time of doing the rehabilitation exercise and the exercise rhythm, wherein the profile of the user includes the danger level of the user. The personalized rehabilitation coaching unit is further configured for obtaining the exercise intensity for the user according to the resting heart rate of the user and the average heart rate during the rehabilitation exercise. Further, the personalized rehabilitation coaching unit is configured for obtaining the recommended

exercise rhythm according to the exercise intensity for the user, the total oxygen consumption of the user during the rehabilitation exercise, and the danger level of the user.

[0007] In view of the foregoing, by setting the personalized exercise rhythm suitable for each user and providing an exercise rhythm suitable for each user, the rehabilitation coaching method and the rehabilitation coaching system of the disclosure can coach the user to do the rehabilitation exercise and achieve an optimal rehabilitation effect. By this way, the user is protected from the exercise injuries due to wrong exercise concepts.

[0008] In order to make the aforementioned and other objects, features and advantages of the disclosure more comprehensible, several embodiments accompanied with figures are described in detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The accompanying drawings constituting a part of this specification are incorporated herein to provide a further understanding of the disclosure. Here, the drawings illustrate embodiments of the disclosure and, together with the description, serve to explain the principles of the disclosure.

[0010] Fig. 1 is a schematic view illustrating a rehabilitation coaching system according to an embodiment of the present disclosure.

[0011] Fig. 2 is a schematic view illustrating how the rehabilitation coaching system operates according to the present exemplary embodiment.

[0012] Fig. 3 is a schematic block diagram illustrating a personalized rehabilitation coaching unit as illustrated in Fig. 2.

[0013] Fig. 4 is a flow chart illustrating a rehabilitation coaching method according to an embodiment of the present disclosure.

DETAILED DESCRIPTION OF DISCLOSED EMBODIMENTS

[0014] Fig. 1 is a schematic view illustrating a rehabilitation coaching system according to an embodiment of the present disclosure.

[0015] Referring to Fig. 1, a rehabilitation coaching system 100 may be implemented in various rehabilitation exercise equipments, such as a stepping machine, a treadmill, machine or a bicycle machine, to assist a user to do a rehabilitation exercise, and the present disclosure is not limited thereto. In addition, according to an embodiment of the present disclosure, the rehabilitation coaching system 100 may also be used for coaching the user to do a rehabilitation movement, such as stepping, walking or jogging, without using any rehabilitation exercise equipments.

[0016] It is noted that for illustrative convenience, in the present embodiment, the rehabilitation coaching system 100 implemented in a stepping machine is taken as an example and described hereinafter in detail. Here, the so-called stepping exercise means the exercise which a user does an up-and-down exercise repeatedly by a ladder pedal. During the stepping exercise, it is assumed that both the user's left and right feet begin with being on the first rung. At first, the user's right foot (or the left foot) steps up for one rung, and then, the left foot (the right foot) steps up onto the same rung. At this time, both the user's left and right feet are on the second rung. Then, the right foot (left foot) steps down for one rung and then the left foot (right foot) steps down back to the same rung. At last, when both the user's left and right feet return back to the original position (i.e., the first rung), the stepping exercise is completed for once.

[0017] The rehabilitation coaching system 100 includes a physiological signal sensing device 102, a sensing signal receiver 104, an input unit 106, a personalized rehabilitation coaching unit 110, a memory unit 108 and an output unit 112.

[0018] The physiological signal sensing device 102 is configured for detecting a physiological signal of the user. The sensing signal receiver 104 is configured for receiving the physiological signal of the user from the physiological signal sensing device 102. In the present embodiment, the physiological signal sensing device 102 transmits a detected physiological signal to the sensing signal receiver 104 via a wireless communication technique. However, it should be known that the present disclosure is limited thereto. The physiological signal sensing device 102 may also communicate with the sensing signal receiver 104 via a wired communication technique. For example, in the present exemplary embodiment, the physiological signal sensing device 102 includes an electrocardiograph sensor 210 and a weight sensor 230.

[0019] The electrocardiograph sensor 210 is configured for detecting a resting heart rate of the user and an exercise average heart rate of the user during the rehabilitation exercise. For example, the electrocardiograph sensor 210 obtains the user's heart rate by detecting an electrocardiogram, heart beats, blood flow or using Infrared Ray (IR) sensing manner, and transmits the detected signal to the sensing signal receiver 104 via a wireless communication technique, such as Bluetooth, wireless network, and the present disclosure is not limited thereto. In an exemplary embodiment of the present disclosure, the electrocardiograph sensor 210 may also transmits the detected signal to the sensing signal receiver 104 via a wired communication technique, such as twisted pair cables, coaxial cables, or optic fibers.

[0020] The weight sensor 230 is configured for detecting the user's weight. In an exemplary embodiment of the present disclosure, the weight sensor 230 is a mechanical weight measurer. It is noted that though the user's weight is detected by the weight sensor 230, the disclosure is not limited thereto. In another embodiment, the weight sensor 230 may be omitted, and the user's weight is inputted by the user using the input unit 106.

[0021] The input unit 106 is configured for receiving a signal inputted by the user, and the output unit 112 is configured for outputting (or displaying) related information. The input unit 106 has a plurality of keys for the user to input the related information, for example, the profile data, such as the user's name, age and danger level of disease. In addition, for example, in an exemplary embodiment where the output unit 112 includes a monitor, the input unit 106 may also display the keys on the monitor for the user to input the related information. Alternatively, the related information is inputted by the input unit 106 by way of identifying the user's movements, such as gestures or postures.

[0022] The memory unit 108 is configured for storing the user's profile. In particular, when the user uses the rehabilitation coaching system 100 for the first time, the user is requested to input the profile. Then, the profile inputted by the user using the input unit 106 is stored in the memory unit 108. For example, the user's profile includes the user's name, age, gender, weight, danger level. Here, the so-called danger level is classified into a high-risk level, a middle-risk level and a low-risk level according to the user's health condition. However, the classification of the risk levels of the present disclosure is not limited to the afore-mentioned three types. For

example, the danger level of the user includes a danger level of heart disease, a danger level of asthma or other danger levels of a variety of diseases.

[0023] Specially, in the present exemplary embodiment, the memory unit 108 stores personalized exercise rhythm data for the user. Particularly, the personalized exercise rhythm data for the user is set according to the user's physical condition and used for coaching the user to do the rehabilitation exercise. For example, when the user does the stepping rehabilitation exercise, a stepping frequency suitable for the user to do the stepping rehabilitation exercise is set according to the user's personalized exercise rhythm data.

[0024] For example, in the present exemplary embodiment, the memory unit 108 is a flash memory module. However, it is to be understood that the present disclosure is not limited to this. For example, the memory unit 108 may be, for example, a non-volatile memory module, an optical storage medium, a magnetic storage medium or other types of storage media.

[0025] The personalized rehabilitation coaching unit 110 is coupled to the sensing signal receiver 104, the input unit 106, the output unit 112 and the memory unit 108 and configured for controlling the overall operation of the personalized rehabilitation coaching unit 110.

[0026] Fig. 2 is a schematic view illustrating how the rehabilitation coaching system operates according to the present exemplary embodiment.

[0027] Referring to Fig. 2, at first, when the user wearing the electrocardiograph sensor 210 steps on the ladder pedal equipped with the weight sensor 230 and starts the rehabilitation coaching system 100, the personalized rehabilitation coaching unit 110 guides the user to input the user's profile by using the input unit 106 and stores the

user's resting heart rate and weight in the memory unit 108 according to signals regarding the user's heart rate and weight received by the sensing signal receiver 104 from the electrocardiograph sensor 210 and the weight sensor 230. In particular, before the user does the stepping rehabilitation exercise, the personalized rehabilitation coaching unit 110 detects the user's heart rate by using the sensing signal receiver 104 and the electrocardiograph sensor 210 and taking the detected heart rate as the user's resting heart rate.

[0028] Then, the personalized rehabilitation coaching unit 110 sets the exercise rhythm according to the user's personalized exercise rhythm data. Here, the exercise rhythm means the number of times within one minute that the user does the stepping exercise, which is used for coaching the user to do the rehabilitation exercise. For example, the user is reminded to complete the specified number of times of the stepping exercise within a specified period, but the present disclosure is not limited thereto. For example, when doing other rehabilitation exercises, the exercise rhythm may also be used to remind the user to run or walk for the specified number of circles (or the specified number of meters simulated by the treadmill) in a specified period or to remind the user to ride a bicycle for the specified number of circles in a specified period.

[0029] Specially, in the present embodiment, the personalized rehabilitation coaching unit 110 outputs via the output unit 112 a perceived signal according to the exercise rhythm as set to coach the user to do the stepping rehabilitation exercise. For example, the monitor of the output unit 112 displays the stepping frequency of the current stepping rehabilitation exercise, e.g. 25.14 times of stepping in one minute, or displays an animation showing a person doing the stepping rehabilitation exercise on the monitor

to coach the user, but the present disclosure is not limited thereto. For example, in another embodiment of the disclosure, the perceived signal used for coaching the user to do the stepping rehabilitation exercise may be a sound (e.g. a speech sound, a music), an image, a vibration or a combination thereof.

[0030] In addition, the personalized rehabilitation coaching unit 110 displays the user's personal physiological information on the monitor of the output unit 112. For example, the personalized rehabilitation coaching unit 110 continuously receives the signal of the user's heart rate by using the sensing signal receiver 104 and the electrocardiograph sensor 210 and displays the user's information, e.g. the user's electrocardiogram, heartbeat and heart rhythm variation, on the monitor of the output unit 112 according to the received heartbeat signal. In addition, for example, the personalized rehabilitation coaching unit 110 also calculates a calorie consumption of the user and displays the same on the monitor of the output unit 112. Further, for example, the personalized rehabilitation coaching unit 110 detects the user's actual movement to identify a following degree of the user doing the stepping rehabilitation exercise and displays the detected following degree on the monitor.

[0031] Specially, in the present embodiment, during the last minute that the user is to complete the stepping rehabilitation exercise, the personalized rehabilitation coaching unit 110 continuously measures the user's heart rate by using the sensing signal receiver 104 and the electrocardiograph sensor 210 and calculates the user's information, such as the average heart rate and the heart rhythm variation during the stepping rehabilitation exercise, and a total time of the heartbeat returning back to the resting heart rate, a speed of the heartbeat returning back to the resting heart rate.

[0032] After that, the personalized rehabilitation coaching unit 110 proceeds with a personalized norm calculation according to the user's physiological condition (for example, the user's age) and the condition of the user during the stepping rehabilitation exercise (for example, the average heart rate during the stepping rehabilitation exercise) so as to obtain the recommended exercise rhythm suitable for the user and update the personalized exercise rhythm data for the user stored in the memory unit 108 according to the recommended exercise rhythm. Afterward, when the user again does the stepping rehabilitation exercise, the personalized rehabilitation coaching unit 110 sets the exercise rhythm according to the updated personalized exercise rhythm data.

[0033] Hereinafter, a schematic block diagram illustrating the personalized rehabilitation coaching unit 110 is used to describe in detail a mechanism returning a feedback of the recommended exercise rhythm according to the profile of the user and the received physiological signals.

[0034] Fig. 3 is a schematic block diagram illustrating the personalized rehabilitation coaching unit according to an exemplary embodiment of the present disclosure.

[0035] Referring to Fig. 3, the personalized rehabilitation coaching unit 110 includes an exercise rhythm setting module 151, an exercise oxygen consumption calculating module 153, an exercise intensity calculating module 155, a calorie consumption calculating module 157, and a personalized norm calculating module 159.

[0036] The exercise rhythm setting module 151 is configured for reading the personalized exercise rhythm data for the user from the memory unit 108 to set the exercise rhythm. Particularly, the exercise rhythm setting module 151 reads from the memory unit 108 the stored personalized exercise rhythm data for the user and sets the exercise rhythm for doing the stepping rehabilitation exercise according to the

personalized exercise rhythm data. For example, the exercise rhythm setting module 151 sets the exercise rhythm for doing the stepping rehabilitation exercise as 25 times per minute.

[0037] It is should be noted that in an exemplary embodiment of the present disclosure, every time when the user is about to do the rehabilitation exercise, the exercise rhythm setting module 151 determines whether the profile corresponding to the user is stored in the memory unit 108. When the profile corresponding to the user is stored in the memory unit 108, the exercise rhythm setting module 151 reads the personalized exercise rhythm data of the user and sets the exercise rhythm according to the personalized exercise rhythm data. When the profile corresponding to the user is not stored in the memory unit 108, the exercise rhythm setting module 151 displays an interface via the output unit 112 to request the user to input the profile. After the user completes inputting the profile data, such as the user's name, age, gender, danger level of heart disease, the exercise rhythm setting module 151 initially uses a standard exercise rhythm data for the stepping rehabilitation exercise as the personalized exercise rhythm data for the user. Here, the standard exercise rhythm data for the stepping rehabilitation exercise is a constant exercise frequency data that is classified according to ages and genders. In an exemplary embodiment of the present disclosure, the exercise rhythm setting module 151 further selects different standard exercise rhythm data according to the user's weight and danger level, e.g. the danger level of heart disease.

[0038] The exercise oxygen consumption calculating module 153 is configured for calculating the total oxygen consumption of the user during the rehabilitation exercise according to the user's weight and the exercise time and the exercise rhythm of the user

during the rehabilitation exercise. In an exemplary embodiment of the present disclosure, the total oxygen consumption is calculated according to the user's weight, the time of doing the rehabilitation exercise by the user, the oxygen consumption of the user during the exercise and the oxygen consumption of the user during the rest (e.g.. the total oxygen consumption = the user's weight × exercise time × (the oxygen consumption during the exercise + the oxygen consumption during the rest). For example, using the stepping rehabilitation exercise as an example, the exercise oxygen consumption calculating module 153 estimates the total oxygen consumption of the user by the following formula (1).

$$TVO2=W\times T\times((0.2\times f)+(1.33\times 1.8\times H\times f)+3.5\times RVO2) \quad (1)$$

[0039] Here, TVO2 is the user's total oxygen consumption, W is the user's weight, T is the time of doing the stepping rehabilitation exercise, f is the stepping frequency, H is a height of the ladder pedal (unit: meter, m) and RVO2 is the oxygen consumption during the rest. For example, it is assumed that the user's weight is 75 kg, the exercise time of doing the stepping rehabilitation exercise is 3 minutes, the height of the ladder pedal is 0.35 m, the stepping frequency is 24 times per minute, and therefore, the oxygen consumption of the user to do the stepping rehabilitation exercise is 6392.16 ml. It is to be understood that the aforementioned method for calculating the total oxygen consumption is only an example, and the present disclosure is not limited to it. Other manner capable of calculating the total oxygen consumption can be applied in the present disclosure.

[0040] The exercise intensity calculating module 155 is configured for estimating the maximum heart rate for the user according to the user's age and calculating a reserved

heart rate for the user according to the maximum heart rate and the detected resting heart rate. In addition, the exercise intensity calculating module 155 is further configured for calculating the exercise intensity for the user according to the average heart rate of the user during the rehabilitation exercise, the resting heart rate and the reserved heart rate of the user.

[0041] For example, in the present exemplary embodiment, the exercise intensity calculating module 155 calculates the user's maximum heart rate, the reserved heart rate and the exercise intensity based on the following formulas (2) to (4):

$$MHR=220-Age \quad (2)$$

$$HRR=MHR-RHR \quad (3)$$

$$ES=(AHR-RHR)/HRR \quad (4)$$

[0042] Here, MHR is the user's estimated maximum heart rate, Age is the user's age, HRR is the user's reserved heart rate, RHR is the user's resting heart rate, ES is the exercise intensity for the user, and AHR is the user's average heart rate during the rehabilitation exercise. However, it is to be understood that the present disclosure is not limited thereto. The estimated maximum heart rate may be inputted by the user using the input unit 106. For example, if the user's resting heart rate is 70, and the average heart rate during the stepping rehabilitation exercise is 160, then the user's exercise intensity is 72%. It is to be understood that the manner calculating the exercise intensity as above is only an example, and the present disclosure is not limited thereto. Other manner capable of calculating the aforementioned exercise intensity can be applied in the present disclosure.

[0043] The calorie consumption calculating module 157 is configured for obtaining a total calorie consumption of the user during the rehabilitation exercise according to the

total oxygen consumption of the user during the rehabilitation exercise. For example, the calorie consumption calculating module 157 calculates the total calorie consumption of the user during the rehabilitation exercise according to the following formula (5):

$$TK=TVO2\times4.9 \quad (5)$$

[0044] Here, TK is the user's total calorie consumption during the rehabilitation exercise. For example, if a user's total oxygen consumption during the rehabilitation exercise is 6.39 L, the total calorie consumption of the user during the rehabilitation exercise as calculated by the calorie consumption calculating module 157 according to formula (5) is 31.32 kcal. It is to be understood that the total calorie consumption calculated as above is only an example, and the disclosure is not limited thereto. Other manner capable of calculating the total calorie consumption can be applied in the present disclosure.

[0045] The personalized norm calculating module 159 is configured for obtaining the recommended exercise rhythm according to the exercise intensity for the user and the total calorie consumption of the user during the rehabilitation exercise. In particular, the personalized norm calculating module 159 sets an initial exercise intensity according to the user's danger level and calculates a total calorie consumption target and a total oxygen consumption target for the user according to the user's danger level, the exercise intensity for the user and the total calorie consumption of the user during the rehabilitation exercise so as to calculate the recommended exercise rhythm.

[0046] For example, when the user's danger level of heart disease is low, the personalized norm calculating module 159 sets the initial exercise intensity for the user as 75%. In particular, when the user's danger level of heart disease is higher, it means that the user needs to do the rehabilitation exercise more gently. In other words, the

exercise intensity for the user to do the rehabilitation exercise needs to be lower to protect the user from feeling unwell during the rehabilitation exercise. Thus, in the present exemplary embodiment, if the user's danger level of heart disease is the high-risk level, the default exercise intensity suitable for the user to do the stepping rehabilitation exercise is 25%. If the user's danger level of heart disease is the middle-risk level, the default exercise intensity suitable for the user to do the rehabilitation exercise is 50%. If the user's danger level of heart disease is low-risk level, the default exercise intensity suitable for the user to do the rehabilitation exercise is 75%. However, the present disclosure is not limited to the foregoing. In other embodiments of the disclosure, the danger level is adjustable according to actual requirements.

[0047] Next, the personalized norm calculating module 159 calculates the total calorie consumption target and the total oxygen consumption target corresponding to the initial exercise intensity according to the exercise intensity calculated by the exercise intensity calculating module 155 and the total calorie consumption calculated by the calorie consumption calculating module 157. For example, when the exercise intensity is set as 72% for the user during the stepping rehabilitation exercise and the total calorie consumption is 31.32 kcal, the total calorie consumption target and the total oxygen consumption target corresponding to the initial exercise intensity, which is 75%, calculated by the personalized norm calculating module 159 are respectively 32.625 kcal and 6658 ml. Then, the recommended stepping frequency, i.e. the recommended exercise rhythm, according to formula (1) calculated by the norm calculating module 159 is 25.14 times per minute.

[0048] Specially, the norm calculating module 159 updates the personalized exercise rhythm data stored in the memory unit 108 according to the calculated recommended exercise rhythm.

[0049] It should be noted that in the present embodiment, the exercise rhythm setting module 151, the exercise oxygen consumption calculating module 153, the exercise intensity calculating module 155, the calorie consumption calculating module 157 and the personalized norm calculating module 159 are hardware circuits, but the present disclosure is not limited thereto. For example, in another embodiment of the disclosure, the personalized rehabilitation coaching unit 110 may also consist of a processor unit and a memory module. The memory module stores program codes for implementing functions of the exercise rhythm setting module 151, the exercise oxygen consumption calculating module 153, the exercise intensity calculating module 155, the calorie consumption calculating module 157 and the personalized norm calculating module 159. And, the processor unit executes the program codes to coach the user to do the rehabilitation exercise by using the personalized exercise rhythm.

[0050] Fig. 4 is a flow chart illustrating a rehabilitation coaching method according to an exemplary embodiment of the present disclosure.

[0051] Referring to Fig. 4, at first, when the rehabilitation coaching system 100 is enabled, the personalized rehabilitation coaching unit 110 obtains the user's profile (step S401). For example, according to the example where the user's profile is stored in the memory unit 108, the personalized rehabilitation coaching unit 110 reads the user's age data from the memory unit 108, which is inputted thereto by using the input unit 106 according to the user's name (/or any identifiable codes). Otherwise, according to the example where the user's profile is not stored in the memory unit 108,

the personalized rehabilitation coaching unit 110 requests the user to input the profile so as to obtain the user's age data.

[0052] Afterward, in step S403, the electrocardiograph sensor 210 detects the user's resting heart rate.

[0053] Then, in step S405, the personalized rehabilitation coaching unit 110 estimates the maximum heart rate for the user according to the user's age and calculates the user's reserved heart rate according to the user's maximum heart rate and resting heart rate. However, the maximum heart rate is not limited to being estimated according to the user's age, and may also be manually inputted and adjusted by the user.

[0054] Next, in step S407, the personalized rehabilitation coaching unit 110 determines whether the user ever uses the rehabilitation coaching system 100 to complete the rehabilitation exercise according to a record stored in the memory unit 108.

[0055] If the user never uses the rehabilitation coaching system 100 to complete the rehabilitation exercise, in step S409, the personalized rehabilitation coaching unit 110 sets the exercise rhythm based on the standard exercise rhythm data. If the user did use the rehabilitation coaching system 100 to complete the rehabilitation exercise, in step S411, the personalized rehabilitation coaching unit 110 reads the user's personalized exercise rhythm data from the memory unit 108 and sets the exercise rhythm based on the personalized exercise rhythm data.

[0056] Afterward, in step S413, the personalized rehabilitation coaching unit 110 outputs the exercise rhythm to coach the user to do the rehabilitation exercise. For example, as described above, the output unit 112 outputs the stepping frequency, walking speed, jogging speed, or wheel speed of a bicycle by displaying the perception

signals in forms like patterns or sound via using the monitor or audio (speech voice or music) output devices to coach the user to do the rehabilitation exercise.

[0057] In step S415, the electrocardiograph sensor 210 detects the average heart rate of the user during the rehabilitation exercise. For example, during 3 minutes of doing the rehabilitation exercise, the electrocardiograph sensor 210 continuously detects the user's heart rate to calculate the average heart rate during the rehabilitation exercise. However, the present disclosure is not limited thereto. In an exemplary embodiment of the present disclosure, the average heart rate during the rehabilitation exercise may also be the average heart rate within a time period from the time the user starts to do the rehabilitation exercise to the time before the user ends the rehabilitation exercise, for example, one minute before the user ends the rehabilitation exercise.

[0058] Then, in step S417, the personalized rehabilitation coaching unit 110 obtains the exercise intensity corresponding to the user according to the average heart rate of the user during the rehabilitation exercise, the resting heart rate and the reserved heart rate.

[0059] Next, in step S419, the personalized rehabilitation coaching unit 110 obtains the user's weight and the exercise time of doing the rehabilitation exercise. Particularly, in the exemplary embodiment where the weight sensor 230 is equipped, the personalized rehabilitation coaching unit 110 obtains the user's weight by the weight sensor 230 and the sensing signal receiver 104. Otherwise, in the embodiment where the weight sensor 230 is not equipped, the personalized rehabilitation coaching unit 110 obtains the user's weight according to the weight data inputted by the user using the input unit 106. Meanwhile, the rehabilitation coaching system 100 is further equipped with a timer (not shown), and the personalized

rehabilitation coaching unit 110 obtains the exercise time of doing the rehabilitation exercise according to a record of the timer.

[0060] Next, in step S421, the personalized rehabilitation coaching unit 110 obtains the user's total oxygen consumption during the rehabilitation exercise according to the user's weight, the user's exercise time and the exercise rhythm. Meanwhile, in step S423, the personalized rehabilitation coaching unit 110 calculates the personalized total oxygen consumption target for the user according to the danger level of the user, the exercise intensity and the total oxygen consumption of the user during the rehabilitation exercise. For example, in steps S421 and S423, the personalized rehabilitation coaching unit 110 calculates the total calorie consumption target for the user according to the user's danger level, the exercise intensity and the total calorie consumption user during the rehabilitation exercise and calculates the personalized total oxygen consumption target for the user according to the calculated total calorie consumption target during the rehabilitation exercise, the user's weight and the exercise time of doing the rehabilitation exercise.

[0061] At last, in step S425, the personalized rehabilitation coaching unit 110 calculates the recommended exercise rhythm for the user according to the personalized total oxygen consumption target, the user's weight and the exercise time of doing the rehabilitation exercise. In step S427, the personalized rehabilitation coaching unit 110 updates in the memory unit 108 the user's personalized exercise rhythm data based on the recommended exercise rhythm as calculated.

[0062] It is noted that the flow chart of Fig. 4 is only an example and is not intended to limit the disclosure. In other embodiments, the rehabilitation coaching method may

add, delete or adjust the operational details and sequences of the steps according to the actual situation.

[0063] In view of the foregoing, the rehabilitation coaching method and the rehabilitation coaching system in the present disclosure coach users to do a rehabilitation exercise by constantly setting and updating a personalized exercise rhythm data of each user, thereby achieving the optimal rehabilitation effect and protecting the users from exercise injury due to wrong exercise concepts.

[0064] Although the disclosure has been described with reference to the above embodiments, it will be apparent to one of the ordinary skill in the art that modifications to the described embodiment may be made without departing from the spirit of the disclosure. Accordingly, the scope of the disclosure will be defined by the attached claims not by the above detailed descriptions.

CLAIMS:

1. A rehabilitation coaching method for coaching a user to do a rehabilitation exercise, the rehabilitation coaching method comprising:

detecting a resting heart rate of the user by an electrocardiograph sensor;

setting an exercise rhythm according to a personalized exercise rhythm data corresponding to the user;

outputting the exercise rhythm to coach the user to do the rehabilitation exercise;

detecting an average heart rate of the user during the rehabilitation exercise by the electrocardiograph sensor;

obtaining a total oxygen consumption of the user during the rehabilitation exercise according to a profile of the user, an exercise time of doing the rehabilitation exercise and the exercise rhythm, wherein the profile of the user includes a danger level of the user;

obtaining an exercise intensity corresponding to the user according to the resting heart rate of the user and the average heart rate of the user during the rehabilitation exercise;

obtaining a recommended exercise rhythm according to the exercise intensity corresponding to the user, the total oxygen consumption of the user during the rehabilitation exercise and the danger level of the user;

updating the personalized exercise rhythm data corresponding to the user based on the recommended exercise rhythm data; and

adjusting an appropriate exercise rhythm for a present exercise or a next exercise of the user according to the updated personalized exercise rhythm data corresponding to the user.

2. The rehabilitation coaching method as claimed in claim 1, wherein the profile of the user includes a weight of the user, and

wherein the step to obtaining the total oxygen consumption of the user during the rehabilitation exercise according to the profile of the user, the exercise time and the exercise rhythm:

calculating the total oxygen consumption of the user during the rehabilitation exercise according to the weight of the user, the exercise time and the exercise rhythm.

3. The rehabilitation coaching method as claimed in claim 1 or 2, wherein the profile of the user includes an age of the user, and

wherein the step to calculating the exercise intensity corresponding to the user according to the resting heart rate of the user and the average heart rate of the user during the rehabilitation exercise comprises:

estimating a maximum heart rate corresponding to the user according to the age of the user;

calculating a reserved heart rate corresponding to the user according to the maximum heart rate and the resting heart rate; and

calculating the exercise intensity corresponding to the user according to the average heart rate of the user during the rehabilitation exercise, the resting heart rate and the reserved heart rate corresponding to the user.

4. The rehabilitation coaching method as claimed in any one of claims 1-3, further comprising obtaining a total calorie consumption of the user during the rehabilitation exercise according to the total oxygen consumption of the user during the rehabilitation exercise,

wherein the step of obtaining the recommended exercise rhythm according to the exercise intensity corresponding to the user and the total oxygen consumption of the user during the rehabilitation exercise comprises obtaining the recommended exercise rhythm

according to the exercise intensity corresponding to the user and the total calorie consumption of the user during the rehabilitation exercise.

5. The rehabilitation coaching method as claimed in claim 4, wherein the step of obtaining the recommended exercise rhythm according to the exercise intensity corresponding to the user and the total oxygen consumption of the user during the rehabilitation exercise comprises:

calculating a total calorie consumption target for the user according to the danger level of the user, the exercise intensity corresponding to the user and the total calorie consumption of the user during the rehabilitation exercise;

calculating a personalized total oxygen consumption target for the user according to the total calorie consumption target, the weight of the user and the exercise time; and

calculating the recommended exercise rhythm according to the personalized total oxygen consumption target.

6. The rehabilitation coaching method as claimed in any one of claims 1-5, wherein the step of outputting the exercise rhythm to coach the user to do the rehabilitation exercise according to the personalized exercise rhythm data of the user comprises:

determining whether the personalized exercise rhythm data corresponding to the user is stored in a memory unit;

when the personalized exercise rhythm data corresponding to the user is stored in the memory unit, reading the personalized exercise rhythm data corresponding to the user from the memory unit and setting the exercise rhythm according to the personalized exercise rhythm data; and

when the personalized exercise rhythm data corresponding to the user is not stored in the memory unit, setting the exercise rhythm according to a standard exercise rhythm data.

7. The rehabilitation coaching method as claimed in any one of claims 1-6, wherein the step of outputting the exercise rhythm to coach the user to do the rehabilitation exercise comprises:

outputting a perceived signal according to the exercise rhythm to coach the user to do the rehabilitation exercise according to the perceived signal.

8. The rehabilitation coaching method as claimed in claim 7, wherein the perceived signal is a sound, an image, a vibration or a combination thereof.

9. A rehabilitation coaching system for coaching a user to do a rehabilitation exercise, the rehabilitation coaching system comprising:

a sensing signal receiver, receiving a resting heart rate of the user and an average heart rate of the user during the rehabilitation exercise;

a memory unit, storing a profile of the user and a personalized exercise rhythm data corresponding to the user;

a personalized rehabilitation coaching unit, coupled to the sensing signal receiver and the memory unit and setting an exercise rhythm according to the personalized exercise rhythm data corresponding to the user; and

an output unit, coupled to the personalized rehabilitation coaching unit and outputting the exercise rhythm to coach the user to do the rehabilitation exercise,

wherein the personalized rehabilitation coaching unit further obtains a total oxygen consumption of the user during the rehabilitation exercise according to the profile of the

user, an exercise time of doing the rehabilitation exercise and the exercise rhythm, wherein the profile of the user includes a danger level of the user,

wherein the personalized rehabilitation coaching unit obtains an exercise intensity corresponding to the user according to the resting heart rate of the user and the average heart rate of the user during rehabilitation exercise,

wherein the personalized rehabilitation coaching unit obtains a recommended exercise rhythm according to the exercise intensity corresponding to the user, the total oxygen consumption of the user during the rehabilitation exercise, and the danger level of the user,

wherein the personalized rehabilitation coaching unit updates the personalized exercise rhythm data corresponding to the user based on the recommended exercise rhythm data,

wherein the personalized rehabilitation coaching unit adjusts an appropriate exercise rhythm for a present exercise or a next exercise of the user according to the updated personalized exercise rhythm data corresponding to the user.

10. The rehabilitation coaching system as claimed in claim 9, wherein the personalized rehabilitation coaching unit includes:

an exercise rhythm setting module, reading the personalized exercise rhythm data corresponding to the user from the memory unit to set the exercise rhythm.

11. The rehabilitation coaching system as claimed in claim 10, wherein the profile of the user includes a weight of the user, and

wherein the personalized rehabilitation coaching unit further includes:

an exercise oxygen consumption calculating module, calculating the total oxygen consumption of the user during the rehabilitation exercise according to the weight of the user, the exercise time and the exercise rhythm.

12. The rehabilitation coaching system as claimed in claim 11, wherein the profile of the user includes an age of the user, and

wherein the personalized rehabilitation coaching unit further comprises:

an exercise intensity calculating module, estimating a maximum heart rate corresponding to the user according to the age of the user and calculating a reserved heart rate corresponding to the user according to the maximum heart rate and the resting heart rate,

wherein the exercise intensity calculating module calculates the exercise intensity corresponding to the user according to the average heart rate of the user during the rehabilitation exercise, the resting heart rate and the reserved heart rate of the user.

13. The rehabilitation coaching system as claimed in claim 12, wherein the personalized rehabilitation coaching unit further includes:

a calorie consumption calculating module, obtaining a total calorie consumption of the user during the rehabilitation exercise according to the total oxygen consumption of the user during the rehabilitation exercise; and

a personalized norm calculating module, obtaining the recommended exercise rhythm according to the exercise intensity corresponding to the user and the total calorie consumption of the user during the rehabilitation exercise.

14. The rehabilitation coaching system as claimed in claim 13, wherein the personalized norm calculating module calculates a total calorie consumption target of the user

according to the danger level of the user, the exercise intensity corresponding to the user and the total calorie consumption of the user during the rehabilitation exercise,

wherein the personalized norm calculating module calculates a personalized total oxygen consumption target of the user according to the total calorie consumption target, the weight of the user and the exercise time, and

wherein the personalized norm calculating module calculates the recommended exercise rhythm according to the personalized total oxygen consumption target corresponding to the user.

15. The rehabilitation coaching system as claimed in any one of claims 10-14, wherein the exercise rhythm setting module determines whether the personalized exercise rhythm data corresponding to the user is stored in the memory unit,

when the personalized exercise rhythm data for the user is stored in the memory unit, the exercise rhythm setting module reads the personalized exercise rhythm data corresponding to the user, sets the exercise rhythm according to the personalized exercise rhythm data, and when the personalized exercise rhythm data corresponding to the user is not stored in the memory unit, the exercise rhythm setting module sets the exercise rhythm according to a standard exercise rhythm data.

16. The rehabilitation coaching system as claimed in any one of claims 9-15, wherein the output module outputs a perceived signal according to the exercise rhythm to coach the user to do the rehabilitation exercise according to the perceived signal.

17. The rehabilitation coaching system as claimed in claim 16, wherein the perceived signal is a sound, an image, a vibration or a combination thereof.

18. The rehabilitation coaching system as claimed in any one of claims 9-17, further comprising:

an electrocardiograph sensor, detecting the resting heart rate of the user and detecting the average heart rate of the user during the rehabilitation exercise.

19. The rehabilitation coaching system as claimed in any one of claims 11-14, further comprising:

a weight sensor, detecting the weight of the user.

20. The rehabilitation coaching system as claimed in claim 14, further comprising:

an input unit, inputting the weight of the user and the danger level of the user.