



(19) **United States**

(12) **Patent Application Publication**  
**Ciervo**

(10) **Pub. No.: US 2007/0082788 A1**

(43) **Pub. Date: Apr. 12, 2007**

(54) **SYSTEM AND METHODOLOGY FOR  
CUSTOMIZED AND OPTIMIZED EXERCISE  
ROUTINES**

**Publication Classification**

(51) **Int. Cl.**  
*A63B 71/00* (2006.01)  
(52) **U.S. Cl.** ..... **482/8**

(76) **Inventor: Richard D. Ciervo, New Britain, CT  
(US)**

(57) **ABSTRACT**

Correspondence Address:  
**Arthur G. Schaier**  
**Carmody & Torrance LLP**  
**P.O. Box 1110**  
**50 Leavenworth Street**  
**Waterbury, CT 06721-1110 (US)**

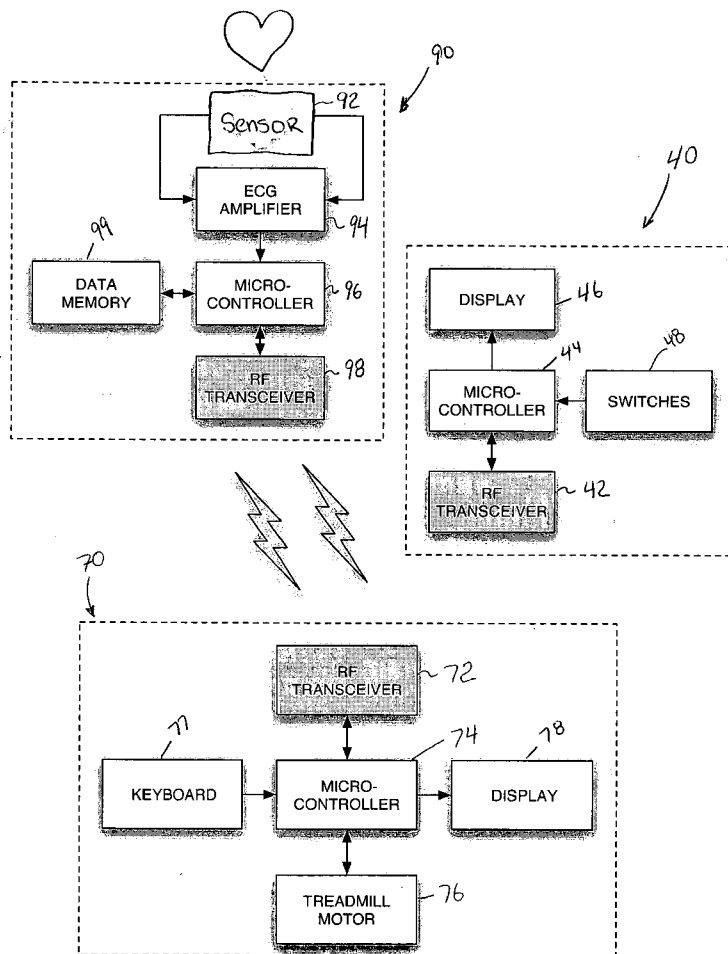
An integrated system including an electronic device and at least one physically separable piece of exercise equipment, wherein the electronic device includes means for receiving physiological sensor data from a physiological sensor; means for storing said physiological sensor data as stored information; and means for transmitting the stored information to the at least one physically separable piece of exercise equipment prior to the commencement of a selected exercise; and the physically separable piece of exercise equipment includes means for receiving the stored information from the electronic device prior to the commencement of the selected exercise; means for structuring the selected exercise based on the received stored information; means for permitting the user to perform the selected exercise. A method of performing a selected exercise on a piece of exercise equipment is also provided.

(21) **Appl. No.: 11/311,016**

(22) **Filed: Dec. 19, 2005**

**Related U.S. Application Data**

(60) **Provisional application No. 60/725,814, filed on Oct. 12, 2005.**



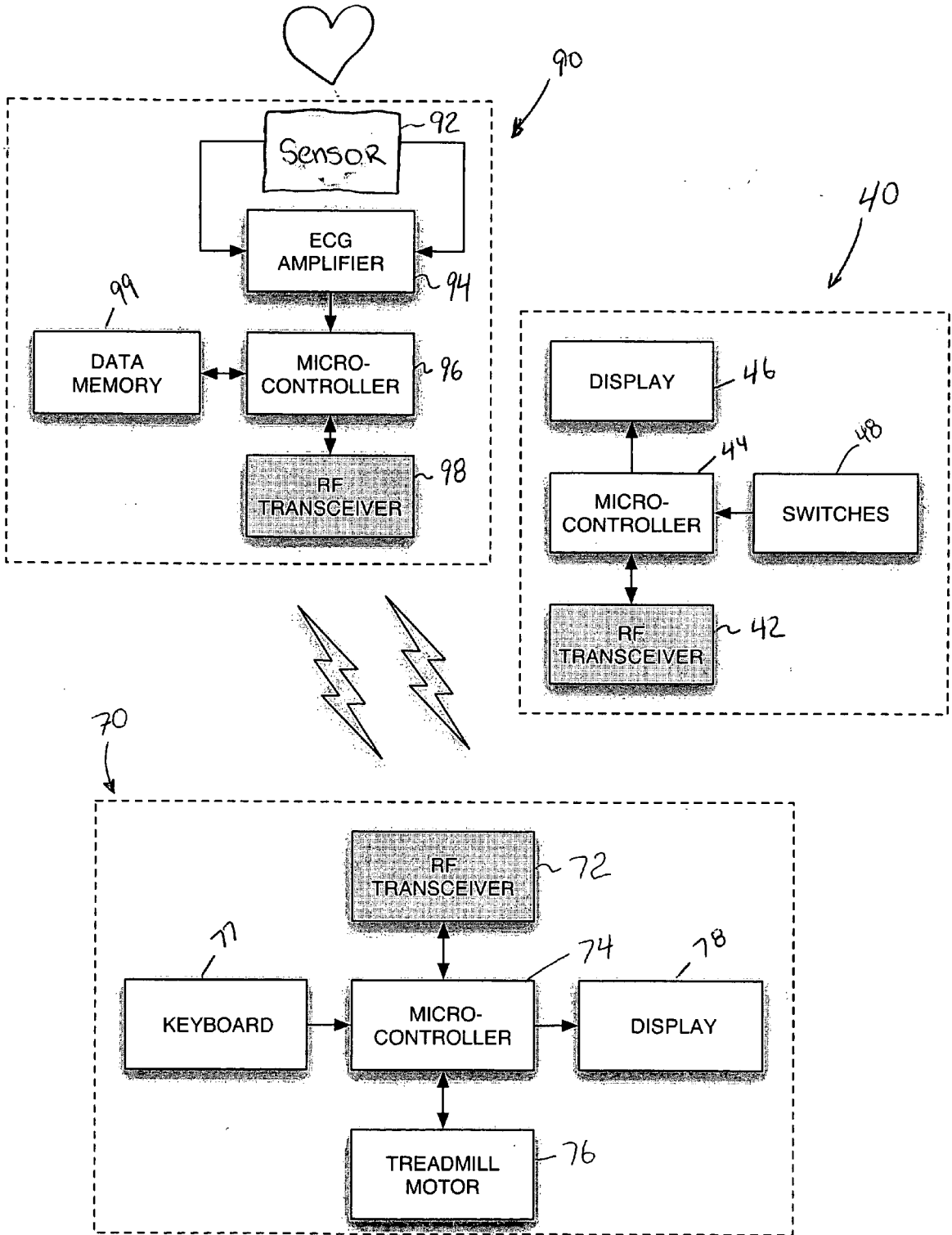


Fig. 1

**SYSTEM AND METHODOLOGY FOR  
CUSTOMIZED AND OPTIMIZED EXERCISE  
ROUTINES**

**RELATED APPLICATIONS**

[0001] This application claims the benefit of U.S. Provisional Application No. 60/725,814, filed Oct. 12, 2005.

**BACKGROUND OF THE INVENTION**

[0002] The present invention relates to a system and method for improving training and/or exercise on at least one piece of exercise equipment, and in particular, to a novel system and method for customizing and optimizing the exercise routine.

[0003] Proper and doctor monitored exercise, such as at an appropriate heart rate, can improve and/or maintain one's overall health. The prior art recognizes this proposition and describes systems and equipment to both motivate and improve the enjoyment of those willing to exercise. Beginning with equipment whereby the user merely inputs her desired exercise parameters (e.g. speed, time, and incline levels on a treadmill for example), the state of the art has evolved to the point whereby the equipment adjusts its level of difficulty (e.g. slowing down (treadmill) or decreasing resistance (pedaling)) based on the measured heart rate of the user.

[0004] For example, U.S. Pat. No. 5,362,069 describes a system whereby a heart rate sensor repeatedly compares the heart rate of the exerciser against threshold levels. If the exerciser's heart rate does not conform to the threshold levels, the resistance of the exercise device is altered to encourage the exerciser to achieve conformity with the threshold levels. In another prior art system described in U.S. Pat. No. 5,931,763, a "key" travels with the user and provides for uploading and downloading of workout information.

[0005] However, it is believed that the prior art suffers from certain perceived deficiencies. For example, the user's measured improvements (or declining abilities) can only be measured and adjusted for (i) when actually engaged in the activity and/or (ii) only when using the actual piece of equipment. That is, there is no known way to effectively utilize the user's physiological parameters when measured outside of the gym and use such information (e.g. min/max heart rate information) the next time the user is performing the exercise on the exercise equipment.

[0006] For example, the existing state of the art provides no means or methodology for storing information such as a user's typical heart rate information (e.g. min/max), weight, age, total hours trained that week, etc., all of which may have been accumulated while away from the gym and then provide, based on the foregoing data, specific workout information (e.g. ranges and parameters) to one or more pieces of exercise machines in a gym to allow the machine to automatically (and preferably, optimally) configure itself for the user's workout.

[0007] Accordingly, it is desirable to provide a system and methodology that overcomes the perceived deficiencies in the prior art and further achieves the aforementioned and below mentioned objectives.

**SUMMARY AND OBJECTIVES OF THE  
INVENTION**

[0008] Accordingly, it is an objective of the present invention to provide a system and methodology to customize and optimize exercise routines.

[0009] It is another objective of the present invention to provide a system and methodology for allowing information accumulated during exercise training performed away from the gym to be used in connection with gym equipment.

[0010] Yet another objective of the present invention is to maintain user motivation for exercise on a regular basis and to increase the likelihood that such users are performing at the proper and specified levels of activity.

[0011] Still other objects and advantages of the invention will in part be obvious from the specification.

[0012] The invention accordingly comprises the features of construction, combination of elements, arrangement of parts and sequence of steps which will be exemplified in the construction, illustration and description hereinafter set forth, and the scope of the invention will be indicated in the claims.

[0013] Generally speaking, in accordance with the present invention, an improved integrated system comprising an electronic device and at least one physically separable piece of exercise equipment is provided, wherein the electronic device comprises means for receiving physiological sensor data from a physiological sensor; means for storing said physiological sensor data as stored information; and means for transmitting the stored information to the at least one physically separable piece of exercise equipment prior to the commencement of a selected exercise; and the physically separable piece of exercise equipment comprises means for receiving the stored information from the electronic device prior to the commencement of the selected exercise; means for structuring the selected exercise based on the received stored information; means for permitting the user to perform the selected exercise. A method of performing a selected exercise on a piece of exercise equipment is also provided. In a preferred embodiment, the electronic device is comprised of a heart rate sensor and a timepiece, configured in a modular configuration, although a one piece sensing unit is contemplated herein. As such, an electronic device to be used within the integrated system is also provided.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0014] For a fuller understanding of the invention, reference is had to the following description taken in connection with the accompanying figures, in which:

[0015] FIG. 1 is a block diagram of a system constructed in accordance with the present invention, applicable for electronic devices of the type disclosed herein.

**DETAILED DESCRIPTION OF THE  
PREFERRED EMBODIMENTS**

[0016] As set forth in greater detail below, the present invention is generally directed to an integrated system comprising an electronic device and at least one physically separable piece of exercise equipment. In one preferred embodiment, the electronic device is a timepiece and a wristwatch in particular. In another embodiment, the elec-

tronic device could itself incorporate the sensor, as more fully disclosed below. The piece of exercise equipment can be of any type or by any manufacturer, and can likewise be for the exercise of any body part(s). The present invention is most applicable and may be best appreciated with exercise equipment having a microprocessor that allows for the receipt and/or otherwise inputting of data from an outside source (e.g. from the electronic device or manually programmable).

[0017] The sensor that is disclosed herein is preferably a heart rate sensor that may (but not necessarily) be worn about one's chest. That is, while a preferred embodiment provides that the electronic device be a timepiece and the sensor be a heart rate sensor worn about one's chest, the present invention contemplates and discloses herein the embodiment whereby the electronic device is in the form of a (e.g.) chest strap, in which the sensor(s) are incorporated therein, making the electronic device a one-piece device (e.g. not modular such as in a physically separated wrist-worn device and chestworn heart rate sensor). As set forth below, other types of electronic devices are likewise contemplated herein.

[0018] As set forth generally, the present invention thus provides many advantages, some of which are the following:

[0019] 1. by providing an arrangement whereby the sensor stores personal information about the user, the sensor can provide this information to a watch or piece of gym equipment automatically to improve the user experience. Such an arrangement overcomes the perceived deficiency of requiring a user to go through a tedious set-up procedure on the gym equipment, or to rely on inaccurate estimations of key parameters;

[0020] 2. eliminating the need for individual pieces of exercise equipment to maintain or otherwise keep track of the statistics for all of the individuals who are using them, as all of the personal setup and workout information "travels" with the person;

[0021] 3. minimizing the size of (and/or components comprising) the electronic device. Typically, parameters such as HRmax, HRmin, etc. are stored within the electronic device (e.g. the watch) and the user is forced to use the watch during the workout even in situations where the gym equipment may offer more features or a more user friendly display. With the electronic device incorporating the sensor itself, the measured personal data can be stored more easily and the user is more free to discard the use of additional devices (e.g. the watch) during the workout, adding to the convenience thereof; and

[0022] 4. providing a means and methodology for more conveniently storing of information such as the user's maximum heart rate, weight, birthday, total hours trained that week, etc. The electronic device would then provide specific information to each machine in a gym to allow the machine to automatically configure itself for the user's workout. When the user has completed her workout (on a treadmill, for example) the machine can then transfer statistics about the workout to the sensor/electronic device and the user can take this information home and transfer it to a PC-based device for later review and analysis.

[0023] Generally speaking, the present invention provides two preferred implementations. In a first contemplated

implementation, the user purchases or otherwise acquires the electronic device comprising a watch/sensor combination (e.g. HRM) for use in connection with a machine in the gym that is compatible with the sensor/watch combination. In a second implementation, the user purchases or otherwise acquires an electronic device with a built-in sensor for use with the particular machine (or set of machines) in the gym.

[0024] In the first implementation, the user preferably enters her physiological data into the watch in a manner within the purview and design of one ordinarily skilled in the art. In addition to this data being present in the memory of the watch, it is also transferred to the memory of the sensor containing device, with any further changes to the data being transferred to the sensor so that the two devices are synchronized ("mirrored"). The watch can also mirror things like workout times for the week, calorie expenditure, etc. within the sensor. During the periods when the user wishes to work out on a compatible exercise machine, the machine will interrogate the sensor for the physiological data. This data is used to automatically configure the equipment for the user. Once the workout is completed, the machine can also transfer workout time, distance, calories consumed, etc. to the sensor. This data can be transferred to the user's PC where it is collected and analyzed. Workout information can also be transferred back to the watch so that the user has an on-wrist summary of his training both in and outdoors.

[0025] In the second implementation and thus without a watch, the user enters her relevant data on each machine only once; it would be transferred to the sensor and then for subsequent workouts, each machine would interrogate the sensor for its settings. Each machine can use the data in the sensor to display performance data over any selected period of time for the user, as long as the historical data is maintained in the sensor.

[0026] The settings stored in the sensor can be wide-ranging. For example, the sensor can store information regarding resistance settings and repetition counts for compatible weight equipment. The workout time and intensity data could be used by a machine to communicate to the user that he is over- or under-training and offer to adjust the current workout to suit (or advise the user to take the day off).

[0027] Reference is thus first made to FIG. 1 for a disclosure of an integrated system, generally comprising a module 40 and a sensing device, generally indicated at 90, which is preferably a detached sensor device of the type worn about one's chest. In accordance with the first embodiment, the electronic device comprises module 40 and the physically separable sensing device 90. In a second embodiment, the electronic device integrates the sensing device functionality with the module into a one unit module. Also included within the system is at least one physically separable piece of exercise equipment, generally indicated at 70. Particulars of each component will now be disclosed.

[0028] By way of background, it is important to note that the currently preferred transmission protocol of information (e.g. heart rate data) from sensing device 90 to electronic device 40 comprises the transmission of data packets at regular intervals (e.g. every two (2) seconds). With this transmission methodology, the transmission rate is independent of the actual heart rate that the respective sensing device is measuring. Once the receiving device synchronizes

with the desired transmitting device, the receiving device is configured to know that every regular interval thereafter (e.g. the aforementioned two (2) seconds), another information packet will be transmitted (and presumably from the sensing device to which the receiving device just synchronized). Standard synchronization protocols are well known the art and need not be set forth in any great detail herein, and one yet to be publicly disclosed synchronization methodology is disclosed in currently owned and just recently filed patent application, entitled "SYSTEM AND METHOD FOR SYNCHRONIZING COMPANION ELECTRONIC DEVICES (application Ser. No. 11/220,748), the subject matter of which is incorporated by reference as if fully set forth herein. Other known methodologies include the utilizing of a receiver that synchronizes with the transmitter from which it receives the strongest signal and utilizing an identification byte that is transmitted by the transmitter, with the companion receiver only being able to synchronize with the transmitter that is transmitting the anticipated identification byte.

[0029] Referring again to FIG. 1, sensing device 90 comprises a physiological parameter sensor 92 coupled to an amplifier 94, which when detecting heartbeats, is preferably an ECG amplifier, which itself is operatively coupled to a microcontroller 96 for processing the amplified ECG signal. The signal, once processed and properly formatted in accordance with the aforementioned protocol, is then transmitted by a transceiver 98.

[0030] A memory device 99 is also provided in the sensing device for storing the personal information about the user. Also, by providing such memory in the sensing device, the wristworn module can be eliminated in view of the ability to provide the interface between the sensing device and the equipment as disclosed herein. Moreover, if desired, all the storing of information (e.g. user's maximum heart rate, weight, birthday, total hours trained that week, etc.) can be provided in memory 99. And finally, a separate memory 99 in the sensing device permits the aforementioned "mirroring" of the information in the sensing device from the module. To be sure, module 40 can likewise have a separate memory device (although not shown in FIG. 1).

[0031] In the preferred embodiment, sensing device 90 is a biomedical sensing device and a heart rate monitor in particular. However, other sensing (i.e. biomedical sensing) devices, such as those transmitting information relating to one's blood pressure and/or oxygen level are contemplated herein and are intended to be covered by the generic use herein of the phrases "sensing device," "biomedical sensing device," "physiological sensor," or the like.

[0032] As illustrated, module 40 comprises a transceiver 42 for receiving the transmitted signal(s) from transceiver 98 of sensing device 90, a microcontroller 44 that is operatively coupled to transceiver 42 for processing the received (e.g. heart rate data) signal(s) and a display 46 for displaying data, which can include the user's heart rate or other information. Display 46 can "mirror" or be independent of the display of the exercise equipment. Switches 48 are preferably in the form of top or side pushers and interface with microcontroller 44 in a known manner for displaying, storing, processing and outputting information, data and signals.

[0033] Thus together, in this first embodiment sensing device 90 and module 40 comprise the preferred means for

receiving physiological sensor data from the physiological sensor, means for storing the physiological sensor data as stored information, and means for transmitting the stored information to the physically separable piece of exercise equipment prior to the commencement of a selected exercise.

[0034] That is, in this first embodiment and in accordance with the present invention, the electronic device has the functionality to store heart rate information based on activities conducted independently of actually using the exercise equipment. For example, the user may use the electronic device for road training (i.e. running) away from the gym or in other more basic exercises (e.g. push-ups). Interval or other training regimens may be employed to obtain and store needed information for customized and optimal training inside the gym on the exercise equipment itself.

[0035] Accordingly, reference is again made to FIG. 1, which illustrates a physically separable piece of exercise equipment, generally indicated at 70. In a preferred embodiment, equipment 70 may be a treadmill, rowing device or virtually any other piece of equipment having the functionality set forth herein. In the preferred embodiment, equipment 70 comprises means for receiving the stored information from the electronic device prior to the commencement of the selected exercise, means for structuring the selected exercise based on the received stored information and means for permitting the user to perform the selected exercise. Thus, equipment 70 preferably comprises a transceiver 72 for receiving the stored information from the electronic device prior to the commencement of the selected exercise. A microcontroller 74 is operatively coupled to transceiver 72 and among other things, processes the information received by transceiver 72 and structures the selected exercise based on the received stored information. Those skilled in the art certainly know how to vary resistance and/or speed/weight levels based on inputting information, such as heart rate information. This latter function can comprise many variations, but in a general and preferred sense, the structuring of the exercise may comprise the particular settings of speed and incline ranges/settings (e.g. on a treadmill) and/or repetitions/resistance (e.g. on a pressing machine (e.g. shoulders/chest, etc.), just to name a few. A tread (e.g. treadmill), a resistance component (e.g. on a rowing device) or weights (e.g. in a circuit training device) 76 makes up at least part of the means for permitting the user to perform the selected exercise and can be programmed and/or adjusted by controller 74.

[0036] A keyboard 77 may also be provided for user or trainer inputting of information, such as age, name, sex, desired time/calories, etc. A display 78, operatively coupled to microcontroller 74, is provided for displaying output (i.e. time, calories, heart rate, distance, etc.) information in accordance with the state of the art.

[0037] The foregoing generally sets forth the overall construction of the present invention. In some specific embodiments, the present invention provides for the electronic device to receive and store physiological sensor data transmitted from the physiological sensor during the performance of the selected exercise on the at least one physically separable piece of exercise equipment. That is, the present invention provides for the electronic device to gather physiological data information when the user is using the equip-

ment. This ensures that the most accurate, up to date exercise and health (e.g. HR) information is being accumulated for optimal use. Thus, memory 99 permits updating of the stored physiological sensor data received during the performance of the selected exercise.

[0038] Again, because the electronic device is operative when used independently of the exercise equipment 70, the electronic device receives and stores physiological sensor data from the physiological sensor while engaged in an exercise that is not the selected exercise on the at least one piece of exercise equipment (e.g. running on the road or training on a piece of equipment that is not the piece of equipment that is otherwise configured to interface with the electronic device). Here too, because of the disclosed micro-processor and memory functionality, the electronic device provides for the updating and storing of the stored physiological sensor data received during the performance of the exercise that is not the selected exercise on the at least one piece of exercise equipment.

[0039] It will thus be seen that the present invention is both patentably different from and a significant improvement over known exercise systems. Specifically, the present invention provides a system and methodology to permit usage of an electronic device away from the gym equipment, and to use the results thereof (e.g. heart rate information, etc.) in a later exercise activity. More specifically, by allowing the electronic device to communicate with the gym equipment and to permit the downloading of information prior to the exercise, the exercise equipment and hence the exercise can be more customized and optimized to the user. That is, in contrast to the current state of the art that at best, permits the exercise to be varied during the actual exercise based on information that the piece of equipment is receiving during the workout, the present invention provides a means and methodology to essentially download the users "workout history" to the equipment for customized and optimized performance.

[0040] While the invention has been particularly shown and described with respect to preferred embodiments thereof, it will be understood that changes in form and details may be made therein without departing from the scope and spirit of the invention.

What is claimed is:

1. An integrated system comprising an electronic device and at least one physically separable piece of exercise equipment, wherein:

the electronic device comprises:

means for receiving physiological sensor data from a physiological sensor;

means for storing said physiological sensor data as stored information; and

means for transmitting the stored information to the at least one physically separable piece of exercise equipment prior to the commencement of a selected exercise; and

the physically separable piece of exercise equipment comprises:

means for receiving the stored information from the electronic device prior to the commencement of the selected exercise;

means for structuring the selected exercise based on the received stored information;

means for permitting the user to perform the selected exercise.

2. The system as claimed in claim 1, wherein the electronic device receives and stores physiological sensor data transmitted from the physiological sensor during the performance of the selected exercise on the at least one physically separable piece of exercise equipment.

3. The system as claimed in claim 2, wherein the electronic device updates the stored physiological sensor data received during the performance of the selected exercise on the physically separable piece of exercise equipment.

4. The system as claimed in claim 1, wherein the electronic device receives and stores physiological sensor data from the physiological sensor while engaged in an exercise that is not the selected exercise on the at least one piece of exercise equipment.

5. The system as claimed in claim 4, wherein the electronic device updates the stored physiological sensor data received during the performance of the exercise that is not the selected exercise on the at least one piece of exercise equipment.

6. The system as claimed in claim 1, wherein the electronic device is comprised of a sensing device and a physically separable module, wherein the sensing device comprises the physiological sensor and the means for receiving the physiological sensor data; and

the sensing device comprises means for wirelessly transmitting the stored information to the module.

7. The system as claimed in claim 1, wherein the electronic device is comprised of a sensing device and a physically separable module, wherein the sensing device comprises the physiological sensor and the means for receiving the physiological sensor data; and

the sensing device comprises means for wirelessly transmitting the stored information to the at least one physically separable piece of exercise equipment.

8. The system as claimed in claim 7, wherein the module comprises a display for displaying heart rate information processed in the sensing device during an exercise.

9. The system as claimed in claim 6, wherein the module is wearable about a wrist and comprises means for entering and storing physiological data.

10. The system as claimed in claim 9, wherein the module comprises means for transmitting the stored physiological data to the sensing device for storage therein.

11. The system as claimed in claim 10, wherein the electronic device is comprised of a sensing device and a physically separable module, wherein the sensing device comprises the physiological sensor and the means for receiving the physiological sensor data; and

the sensing device comprises means for wirelessly transmitting the stored information to the at least one physically separable piece of exercise equipment.

12. A method of performing a selected exercise on a piece of exercise equipment, wherein the method comprises the steps of:

receiving, in an electronic device, physiological sensor data from a physiological sensor;

storing, in the electronic device, the physiological sensor data as stored information;

transmitting the stored information from the electronic device to the at least one physically separable piece of exercise equipment prior to the commencement of the selected exercise and having the at least one physically separable piece of exercise equipment receive the stored information from the electronic device prior to the commencement of the selected exercise;

structuring the selected exercise based on the received stored information; and

performing the selected exercise.

13. An electronic device to be used within an integrated system comprising at least one physically separable piece of exercise equipment, wherein the physically separable piece of exercise equipment comprises means for receiving stored information from the electronic device prior to the commencement of a selected exercise, means for structuring the selected exercise based on the received stored information and means for permitting the user to perform the selected exercise, wherein the electronic device comprises:

means for receiving physiological sensor data from a physiological sensor;

means for storing said physiological sensor data as stored information; and

means for transmitting the stored information to the at least one physically separable piece of exercise equipment prior to the commencement of the selected exercise.

14. The electronic device as claimed in claim 13, wherein the electronic device receives and stores physiological sensor data transmitted from the physiological sensor during the performance of the selected exercise on the at least one physically separable piece of exercise equipment.

15. The electronic device as claimed in claim 14, wherein the electronic device updates the stored physiological sensor data received during the performance of the selected exercise on the physically separable piece of exercise equipment.

16. The electronic device as claimed in claim 13, wherein the electronic device receives and stores physiological sensor data from the physiological sensor while engaged in an exercise that is not the selected exercise on the at least one piece of exercise equipment.

17. The electronic device as claimed in claim 16, wherein the electronic device updates the stored physiological sensor data received during the performance of the exercise that is not the selected exercise on the at least one piece of exercise equipment.

18. The electronic device as claimed in claim 13, wherein the electronic device is comprised of a sensing device and a physically separable module, wherein the sensing device comprises the physiological sensor and the means for receiving the physiological sensor data; and

the sensing device comprises means for wirelessly transmitting the stored information to the module.

19. The electronic device as claimed in claim 13, wherein the electronic device is comprised of a sensing device and a physically separable module, wherein the sensing device comprises the physiological sensor and the means for receiving the physiological sensor data; and

the sensing device comprises means for wirelessly transmitting the stored information to the at least one physically separable piece of exercise equipment.

20. The electronic device as claimed in claim 19, wherein the module comprises a display for displaying heart rate information processed in the sensing device during an exercise, the module is wearable about a wrist and comprises means for entering and storing physiological data and the module comprises means for transmitting the stored physiological data to the sensing device for storage therein.

\* \* \* \* \*