Related U.S. Application Data

Provisional application No. 61/132,348, filed on Jun. 18, 2008.

Publication Classification

Int. Cl.
A63B 26/00

(2006.01)

U.S. Cl.
482/142

ABSTRACT

The present invention relates to a diagnostic or training apparatus including a controller, a balance pad connected to the controller and receiving information from the controller, and a patient support, the balance pad being located within the patient support. A patient support and method are also provided.
BALANCE DISORDER DIAGNOSTIC OR TRAINING APPARATUS


[0002] The present invention relates to the diagnosis and treatment of balance disorders.

BACKGROUND

[0003] Dizziness and other balance disorders affect millions of patients worldwide, arising from injury, infection, stroke, metabolic and inflammatory disorders. Diagnosis of these disorders is initiated by the primary care physician and is refined by otorhinolaryngologists, neurologists, audiologists, physical therapists, and sports medicine specialists. To arrive at an exact diagnosis, an accurate history and physical examination is required and the initial assessment must often be supplemented with audiologic tests, vestibular function testing, blood tests, and imaging studies. Evaluations of vision, cardiovascular function, hormonal levels, and function of the nerves in the feet and spinal column add to the information sometimes required to arrive at a conclusion as to what may be causing the problem, and how best to treat the complaint. Clearly, the technology which is sometimes required for the purpose is complex and, of course, very expensive. For this reason, many patients worldwide receive incomplete evaluations and less than fully effective therapy.

[0004] Some of the most sophisticated instruments available for evaluation of dizzy patients permit measurement of the patient’s ability to balance on a platform, a test commonly referred to as posturography. All sorts of arrangements to test the maintenance of posture have been employed; the simplest known to me is to have a patient stand barefoot on a thick foam rubber pad with a Japanese lantern-type of lampshade on the head to prevent visual fixation. The patient then tries to maintain posture over a period of time. While an experienced clinician can gain much information from observing this sort of test, a precise and quantifiable record is difficult to obtain; such a failing makes it difficult to compare performance over time, but it is precisely the comparison of the individual patient’s performance over time which permits quantifiable analysis of the patient’s condition and allows measurement of efficacy of any treatment being offered.


[0006] Currently available gaming technology (Dancepad) and Wii Fit game with a balance pad permitting simulation of surfing, snowboarding, skateboarding, and the like has the ability to transform bodily balance performance into a signal which can move an avatar of the boarder (patient) within a virtual environment on a video screen. U.S. Pat. No. 6,543,769 discloses a snowboard gaming apparatus.

SUMMARY OF THE INVENTION

[0007] The Wii Fit and other gaming apparatus have the disadvantage that they are not sufficient for use with patients having serious balance disorders. Patients can fall off, or are not stable enough to actually use the gaming apparatus.

[0008] The present invention provides a diagnostic or training apparatus comprising:

[0009] a controller;

[0010] a balance pad connected to the controller and receiving information from the controller; and

[0011] a patient support, the balance pad being located within the patient support.

[0012] The support advantageously can permit a patient to stabilize himself or herself when on the balance pad. Diagnosis and treatment of balance disorders using simple gaming technology and other balance pads becomes possible.

[0013] The present invention also provides a patient support including a base and a hand rail above the base, the base having a balance pad space.

[0014] The present invention also provides a method for diagnosing or treating balance disorders comprising:

[0015] directing a patient to step on a balance pad, and

[0016] providing a patient support for the balance pad to prevent a patient from falling off the balance pad during a balance diagnosis.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. 1 shows schematically a diagnosis apparatus according to one embodiment of the present invention;

[0018] FIG. 2 shows an alternate embodiment of the present invention in which a walker is fixed to a base; and

[0019] FIG. 3 shows a possible attachment device for attaching the base to the walker.

DETAILED DESCRIPTION

[0020] FIG. 1 shows a controller 100, a balance pad 120 (shown schematically by dotted lines and smaller for clarity) and a patient support 10. Controller 100 and balance pad 120 may, for example, be a Wii and Wii Fit available commercially from Nintendo, and be provided with balance diagnosis software or gaming software such as yoga or other commercially available software which a physician may find useful for diagnosis balance disorders. Balance pad 120 may communicate with controller 100 wirelessly or via a wire link.

[0021] Patient support 10 in the preferred embodiment includes a base 20, a hand rail 30 and handle rail supports 40, 42, 44, 46. Base 20 may be, for example, of plastic construction with sand or metal or other weighty material surrounded by the plastic material, and may for example be constructed using similar technology used in the construction of weights used in weight-lifting. Base 20 may have a space 22 for the balance pad 120, and preferably has a space dimensioned to the Wii Fit balance pad. The space 22 may be bare, so that no bottom is present, or have a bottom, preferably with indentations 24 (shown away from pad 120 for clarity) for feet of the Wii Fit balance pads to fit into. If no bottom is present, the balance pad 120 rests on the floor within the support 20. The base 20 may have a opening 26 to access on-off button of the Wii Fit balance pad, and an opening 28 to permit the wireless communication device of the Wii Fit balance pad to function more efficiently.

[0022] Supports 40, 42, 44, 46 may be telescoping metal, for example, aluminum rods, for example, with frictional height adjusters 50, 52, 54, 56 capable of being tightened by turning a ring. The adjusters may also be spring-loaded to permit movement of the top telescoping part relative to the fixed hollow bottom support part. Construction may be similar to that used for adjustable-height hiking poles for example. Sensors 60, 62, 64, 66 may be provided in each of the supports 40, 42, 44, 46 to measure for example the distance that the top telescoping part moves with respect to the
bottom support part. Sensors 60, 62, 64, 66 for example may be targets adapted to be sensed by a Wii sensor sensing body movements, or may be induction or optical sensors sensing other targets or marks on the telescoping parts.

[0023] Given known spring constants of the springs for the telescoping parts, the force on each support 40, 42, 44, 46 can then be determined when a patient grip or falls on the hand rail 30 by determining the distance each top telescoping part moves. Given four spaced sensors, not only the existence of, but also an estimate of the direction of, the misbalance can be determined.

[0024] The sensors can send information wirelessly to the controller, or be connected via wires.

[0025] The hand rail 30 may be height-adjustable via supports 40, 42, 44, 46, and sensors 60, 62, 64, 68 can be initialized once the height is set. Hand rail 30 may include one side 20 that has a latch 32 and hinge 34 so that a patient can be completely surrounded by hand rail 30. Hand rail 30 may include ergonomically-designed padding around an aluminum or metal support connected to the supports 40, 42, 44, 46.

[0026] While a support 10 fully surrounding the patient has been shown a three-sided support or semi-circular support is also possible. Preferably, the support covers at least 270 degrees of the patients' circumferential extent, and most preferably all of it.

[0027] During operation, a physician or technician can open the hand rail at latch 32 about hinge 34, and direct the patient to enter onto the balance pad 120. The latch can be closed, and the patient directed, for example via graphics on a screen 200, to perform certain balance tests or treatment routines. The balance pad 120 can transmit information to controller 100, for example as occurs in the Wii Fit device, and, optionally, information can be collected via sensors 60, 62, 64, 66. Whether or not sensors 60, 62, 64, 66 are present, the support of the present invention provides increased safety, and permits the use of the balance pad to diagnose and treat patients with significant balance disorders in a cost-effective and safe manner. Advantageously, commercially-available balance pads can be converted into diagnostic and treatment devices.

[0028] A simple example, one diagnostic test or training method that can be run is to ask the patient to stand on his or her left foot alone, and determine what the reaction is via, for example, sensors 60, 62, 64, 66 and the balance pad information itself. A series of such predetermined routines can be run and diagnostic information gathered.

[0029] FIG. 2 shows an alternate embodiment in which a base 220 for a balance pad has at least two arms 222, 224 for attaching to a standard four-legged walker 300, such as those used for the elderly. Such medical walkers are available commercially for example from the Invacare Corporation, and may or may not include two front wheels. The base 220 could also have four attachment arms. FIG. 3 shows a possible attachment device for the arm 222 (and any other arms), including a clamp 225 for a leg 310 of walker 300. A wing nut 228 with a screw portion 226 can be removed from two flexible portions 231, 233 of arm 222, for example made of spring steel, so that flexible portions 231, 233 can clasp around leg 310. Wing nut 228 can then be used to fasten walker leg 310 to base 220. The walker 300 with base 220 thus can accept a balance pad, such as balance pad 120.

What is claimed is:
1. A diagnostic or training apparatus comprising:
a controller;
a balance pad connected to the controller and receiving information from the controller; and
a patient support, the balance pad being located within the patient support.
2. The apparatus as recited in claim 1 wherein the balance pad is a Wii Fit balance pad.
3. The apparatus as recited in claim 1 further comprising a screen connected to the controller.
4. The apparatus as recited in claim 1 wherein the patient support includes a hand rail.
5. The apparatus as recited in claim 1 wherein the patient support includes at least one sensor sensing patient contact, the sensor being connected to the controller.
6. The apparatus as recited in claim 1 wherein the patient support includes a base for the balance pad.
7. The apparatus as recited in claim 1 wherein the patient support includes a walker and a base removably fastenable to the walker.
8. A patient support comprising:
a base; and
a hand rail above the base, the base having a balance pad space.
9. The patient support as recited in claim 8 wherein the hand rail is height-adjustable.
10. The patient support as recited in claim 8 wherein the base includes a bottom with depressions for feet of a balance pad.
11. The patient support as recited in claim 8 wherein the hand rail is a section of a walker.
12. A method for diagnosing or treating balance disorders comprising:
directing a patient to step on a balance pad; and
providing a patient support for the balance pad to prevent a patient from falling off the balance pad during a balance diagnosis.

* * * * *