

# PLATAFORMA COMERCIAL. WII BALANCE BOARD.



TECNOLOGIA LOW

[Res Dev Disabil](#). 2010 Jul-Aug;31(4):936-42. doi: 10.1016/j.ridd.2010.03.004. Epub 2010 Apr 9.

## Assisting people with multiple disabilities actively correct abnormal standing posture with a Nintendo Wii balance board through controlling environmental stimulation.

[Shih CH<sup>1</sup>](#), [Shih CT](#), [Chu CL](#).

### ⊕ Author information

#### Abstract

The latest researches adopted software technology turning the Nintendo Wii Balance Board into a high performance change of standing posture (CSP) detector, and assessed whether two persons with multiple disabilities would be able to control environmental stimulation using body swing (changing standing posture). This study extends Wii Balance Board functionality for standing posture correction (i.e., actively adjust abnormal standing posture) to assessed whether two persons with multiple disabilities would be able to actively correct their standing posture by controlling their favorite stimulation on/off using a Wii Balance Board with a newly developed standing posture correcting program (SPCP). The study was performed according to an ABAB design, in which A represented baseline and B represented intervention phases. Data showed that both participants significantly increased time duration of maintaining correct standing posture (TDMCSP) to activate the control system to produce environmental stimulation during the intervention phases. Practical and developmental implications of the findings were discussed.



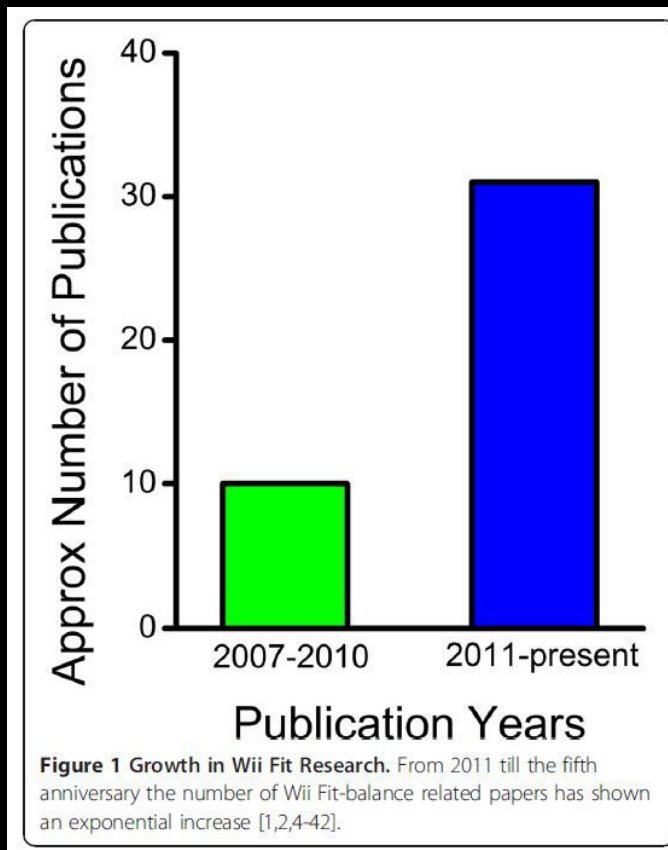


**REVIEW**

**Open Access**

## Using the Wii Fit as a tool for balance assessment and neurorehabilitation: the first half decade of "Wii-search"

Daniel J Goble<sup>1\*</sup>, Brian L Cone<sup>1</sup> and Brett W Fling<sup>2</sup>



**2014- PRESENTE (Pubmed) :**

**155!!**



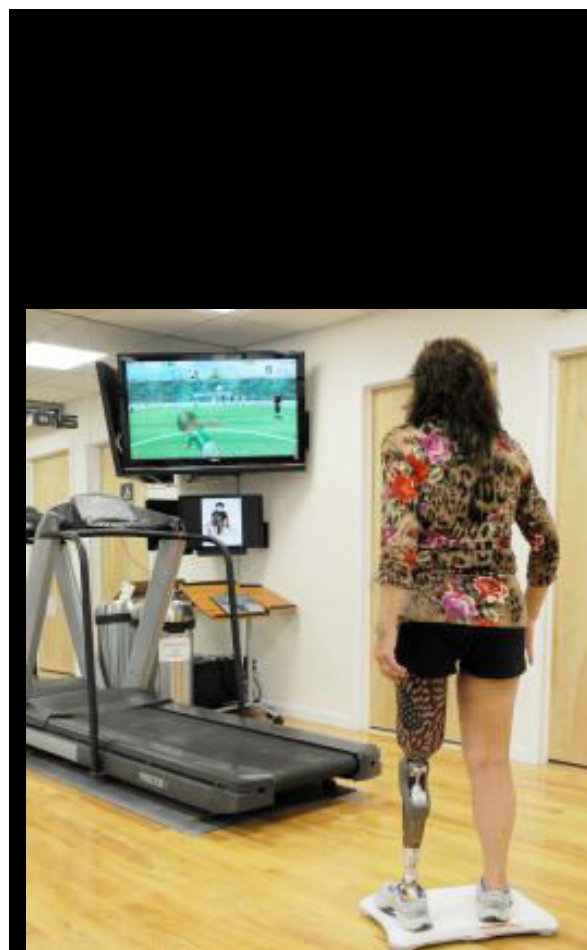
**Table 1 Wii Fit intervention studies that trained balance in healthy adults**

Author(s)	Intervention details	Population (Group size)	Balance-specific Outcome measure	Statistical Significance?
Bareni (2012) [36]	Ski Slalom, Ski Jump and Table Tilt Wii Fit games Dose: 12, 20 min sessions	Older Adults (n= 5)	Berg balance scale Bubble balance score	Not tested Not tested
Padala et al. (2012) [34]	Various Wii Fit games selected from all categories Dose: 40, 30 min sessions	Older Adults (n= 11)	Berg balance scale Tinetti test TUG (normal) p > 0.05	p < 0.01 p < 0.05 p > 0.05
Toulotte et al. (2012) [14]	Various Wii Fit games selected mostly from yoga a balance types Dose: 20, 60 min sessions	Older Adults (n= 9)	Unilateral stance test Tinetti test Wii fit center of balance	p > 0.05 p < 0.05 p < 0.05
Rendon et al. (2012) [30]	3 Wii Fit games – not specified Dose: 18, 40 min sessions	Older Adults (n= 16)	TUG (normal) ABC	p < 0.05 p < 0.05
Franco et al. (2012) [28]	Soccer heading, Ski jump, Ski slalom, Tightrope and Table tilt Wii Fit games Dose: 6, 15 min sessions	Older Adults (n= 11)	Berg balance scale Tinetti test	p < 0.001 p < 0.01
Young et al. (2011) [19]	Two custom-designed games controlled by WiiB Dose: 10, 20 min sessions	Older Adults (n= 6)	ML/AP COP variability eyes open ML COP variability eyes closed AP COP variability eyes closed Tinetti falls efficacy scale	p > 0.05 p > 0.05 <b>p &lt; 0.05</b> Not given
Williams et al. (2011) [15]	Self-selected Wii Fit games from balance and aerobics categories Dose: 12, 20 min sessions	Older Adults (n= 22)	Berg balance scale	<b>p &lt; 0.01</b>
Agmon et al. (2011) [18]	Basic step, Soccer heading, ski slalom and Table tilt Wii Fit games Dose: 50, 30 min sessions	Older Adults (n= 7)	Berg balance scale	<b>p &lt; 0.05</b>
Nitz et al. (2010) [7]	Self-selected Wii Fit games from all categories Dose: 20, 30 min sessions	Adults (n= 8)	TUG (normal and cognitive) mCTSIB (foam, eyes closed) mCTSIB (unilateral, eyes closed) Limits of stability test	p > 0.05 p > 0.05 <b>p &lt; 0.05</b> p > 0.05
Pigford et al. (2010) [1]	Ski slalom, Table tilt and Deep breathing Wii Fit games Dose: 10, 20 min sessions	Older Adults (n= 1)	Berg balance scale TUG (normal) ABC	Not tested Not tested Not tested
Hanneton and Hanneton (2009) [2]	Deep breathing, Warrior posture Torso Twist, Soccer heading, Ski slalom, Ski jump, Table tilt and Basic step games Wii Fit games	Adults (n= 4)	Improvement in game scores	Not tested Not tested

**Table 2 Wii Fit Intervention studies that rehabilitated balance in clinical populations**

Author(s)	Intervention details	Population	Balance-specific Outcome measure	Statistical Significance?
Nilsagard et al. (2012) [29]	Perfect 10, Ski/snowboard slalom, Table tilt(+), Penguin slide, Soccer heading, Tightrope, Skateboard and balance bubble(+),Wii Fit games Dose: 12, 30 min sessions	Multiple Sclerosis (n = 41)	TUG (normal and cognitive) Four square step test ABC	p < 0.05 p < 0.01 p < 0.05
Esculier et al. (2012) [31]	Table tilt, Ski slalom, Balance bubble, ski jump and penguin slide Wii Fit games Dose: 18, 40 min sessions	Parkinson's Disease (n = 10)	One-leg stance duration COP velocity variability ABC TUG (normal) Tinetti's test CBM	p < 0.001 p < 0.05 p > 0.05 p < 0.05 p < 0.05 p < 0.001
Miller et al. (2012) [27]	Wii Fit games selected based on participant preference Dose: 12, 20 min sessions	Transfemoral Amputation (n = 2)	Biodex balance test ABC	Not tested Not tested
Kennedy et al. (2011) [22]	Custom designed "WiiHab" tasks using WBB including Sit to Stand, Weight Shifting and Stepping Dose: 6, 12 min sessions	Acquired Brain Injury (n = 1)	Improvement on custom designed tasks	Not tested Not tested
Zettergren et al. (2011) [17]	Sun salutation, Half moon, Rowing squat, Torso twists, Chair, Penguin slide, Table tilt and Bubble balance Wii Fit games Dose: 12, 50 min sessions	Parkinson's Disease (n = 1)	TUG (normal) Berg balance scale	Not tested Not tested
Gil Gomez et al. (2011) [21]	Custom designed balance games using WBB including Simon, Balloon breaker and Air hockey Dose: 20, 60 min sessions	Acquired Brain Injury (n = 9)	Berg balance scale Brunel balance assessment Anterior reach test TUG (normal)	p < 0.001 p < 0.05 p < 0.01 p < 0.01
Shih et al. (2010) [10]	Change of standing posture detector using the WBB Dose: 45, 3 min sessions	Cerebral Palsy (n = 2)	Duration of time in desired standing posture	p < 0.01
Deutsch et al. (2009) [4]	Ski jump, Ski slalom, Tightrope, Lunges and Park stroll Wii Fit games Dose: 12, 60 min sessions	Chronic Stroke (n = 2)	ABC TUG (normal and cognitive)	Not tested Not tested

Abbreviations: ABC activities-based balance confidence scale, TUG timed up and go, CBM community balance and mobility scale.





[J Athl Train](#). 2014 Jul-Aug;49(4):540-9. doi: 10.4085/1062-6050-49.3.32. Epub 2014 Jun 16.

## Reliability and validity evidence of multiple balance assessments in athletes with a concussion.

[Murray N<sup>1</sup>](#), [Salvatore A](#), [Powell D](#), [Reed-Jones R](#).

### Author information

### Abstract

**CONTEXT:** An estimated 300000 sport-related concussion injuries occur in the United States annually. Approximately 30% of individuals with concussions experience balance disturbances. Common methods of balance assessment include the Clinical Test of Sensory Organization and Balance (CTSIB), the Sensory Organization Test (SOT), the Balance Error Scoring System (BESS), and the Romberg test; however, the National Collegiate Athletic Association recommended the Wii Fit as an alternative measure of balance in athletes with a concussion. A central concern regarding the implementation of the Wii Fit is whether it is reliable and valid for measuring balance disturbance in athletes with concussion.

**OBJECTIVE:** To examine the reliability and validity evidence for the CTSIB, SOT, BESS, Romberg test, and Wii Fit for detecting balance disturbance in athletes with a concussion.

**DATA SOURCES:** Literature considered for review included publications with reliability and validity data for the assessments of balance (CTSIB, SOT, BESS, Romberg test, and Wii Fit) from PubMed, PsycINFO, and CINAHL.

**DATA EXTRACTION:** We identified 63 relevant articles for consideration in the review. Of the 63 articles, 28 were considered appropriate for inclusion and 35 were excluded.

**DATA SYNTHESIS:** No current reliability or validity information supports the use of the CTSIB, SOT, Romberg test, or Wii Fit for balance assessment in athletes with a concussion. The BESS demonstrated moderate to high reliability (interclass correlation coefficient = 0.87) and low to moderate validity (sensitivity = 34%, specificity = 87%). However, the Romberg test and Wii Fit have been shown to be reliable tools in the assessment of balance in Parkinson patients.

**CONCLUSIONS:** The BESS can evaluate balance problems after a concussion. However, it lacks the ability to detect balance problems after the third day of recovery. Further investigation is needed to establish the use of the CTSIB, SOT, Romberg test, and Wii Fit for assessing balance in athletes with concussions.





## Wii Fit™ exercise therapy for the rehabilitation of ankle sprains: Its effect compared with physical therapy or no functional exercises at all.

Punt IM<sup>1,2</sup>, Ziltener JL<sup>3</sup>, Monnin D<sup>2</sup>, Allet L<sup>1,2</sup>.

### ⊕ Author information

#### Abstract

Lateral ankle sprains represent the most common sports-related injuries. The Nintendo Wii Fit™ could be useful in the treatment of ankle sprains. The aim of this study was to compare the effectiveness of exercise training using the Wii Fit™ in ankle sprain patients: (a) with physical therapy; and (b) a control group not receiving any treatment. Ninety lateral ankle sprain patients were randomized to a Wii Fit™, physical therapy, or control group. We assessed the following outcome measures before, and 6 weeks after starting the allocated treatment: Foot and Ankle Ability Measure, pain during rest and walking, delay before return to sport, patient satisfaction, and effectiveness of the allocated treatment. Six weeks after the baseline measures, foot and ankle ability scores had improved in all groups, and pain had decreased during walking ( $P < 0.050$ ). No between-group differences were detected between Wii Fit™ treatment, and both other groups ( $P > 0.050$ ). In conclusion, the Wii Fit™ could be used as an exercise therapy to treat ankle sprain patients. However, Wii Fit™ was not more effective than only physical therapy, or no exercise therapy at all. Patients who did not receive treatment showed similar results as people who got any kind of exercise therapy.

## Reliability of the Wii Balance Board in kayak.

Vando S<sup>1</sup>, Laffaye G<sup>2</sup>, Masala D<sup>1</sup>, Falese L<sup>1</sup>, Padulo J<sup>3</sup>.

### ⊕ Author information

#### Abstract

**BACKGROUND:** the seat of the kayaker represent the principal contact point to express mechanical Energy.

**METHODS:** therefore we investigated the reliability of the Wii Balance Board measures in the kayak vs. on the ground.

**RESULTS:** Bland-Altman test showed a low systematic bias on the ground (2.85%) and in kayak (-2.13%) respectively; while 0.996 for Intra-class correlation coefficient.

**CONCLUSION:** the Wii Balance Board is useful to assess postural sway in kayak.

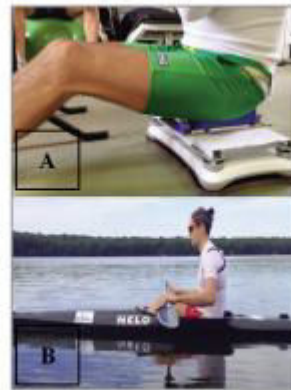


Figure 1 A, B. Wii Balance Board on the ground and in kayak.

## Validity and reliability of balance assessment software using the Nintendo Wii balance board: usability and validation.

Park DS, Lee G<sup>1</sup>.

### Author information

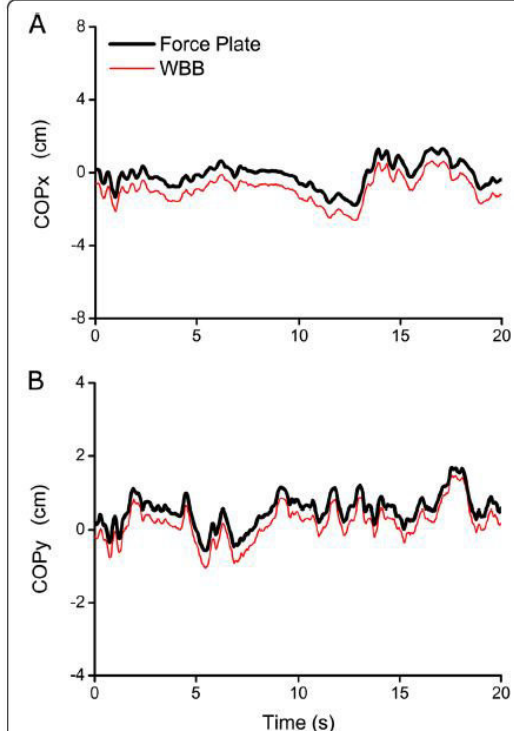
#### Abstract

**BACKGROUND:** A balance test provides important information such as the standard to judge an individual's functional recovery or make the prediction of falls. The development of a tool for a balance test that is inexpensive and widely available is needed, especially in clinical settings. The Wii Balance Board (WBB) is designed to test balance, but there is little software used in balance tests, and there are few studies on reliability and validity. Thus, we developed a balance assessment software using the Nintendo Wii Balance Board, investigated its reliability and validity, and compared it with a laboratory-grade force platform.

**METHODS:** Twenty healthy adults participated in our study. The participants participated in the test for inter-rater reliability, intra-rater reliability, and concurrent validity. The tests were performed with balance assessment software using the Nintendo Wii balance board and a laboratory-grade force platform. Data such as Center of Pressure (COP) path length and COP velocity were acquired from the assessment systems. The inter-rater reliability, the intra-rater reliability, and concurrent validity were analyzed by an intraclass correlation coefficient (ICC) value and a standard error of measurement (SEM).

**RESULTS:** The inter-rater reliability (ICC: 0.89-0.79, SEM in path length: 7.14-1.90, SEM in velocity: 0.74-0.07), intra-rater reliability (ICC: 0.92-0.70, SEM in path length: 7.59-2.04, SEM in velocity: 0.80-0.07), and concurrent validity (ICC: 0.87-0.73, SEM in path length: 5.94-0.32, SEM in velocity: 0.62-0.08) were high in terms of COP path length and COP velocity.

**CONCLUSION:** The balance assessment software incorporating the Nintendo Wii balance board was used in our study and was found to be a reliable assessment device. In clinical settings, the device can be remarkably inexpensive, portable, and convenient for the balance assessment.



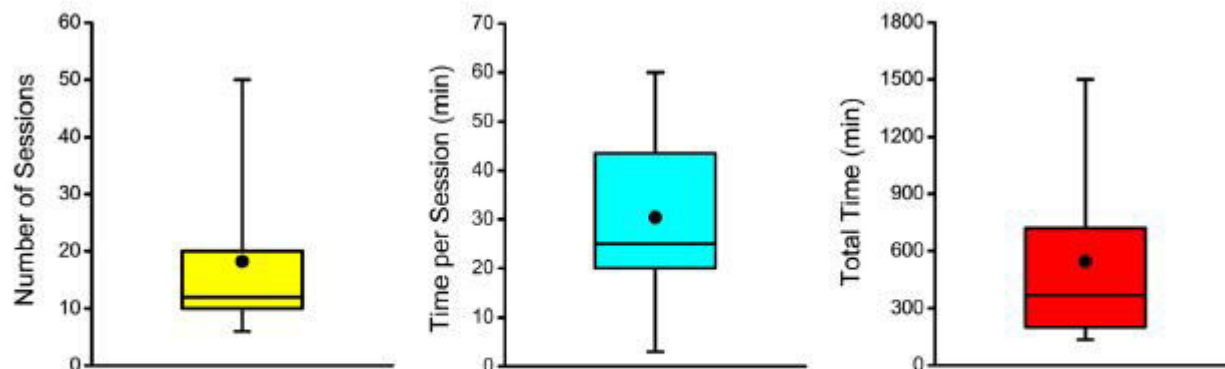
**Figure 2** Representative COPx (A) and COPy (B) data for the force plate and WBB over the course of an example 20 s static balance trial. Pearson Correlation between the two signals is  $r = 0.99$ .

REVIEW

Open Access

## Using the Wii Fit as a tool for balance assessment and neurorehabilitation: the first half decade of “Wii-search”

Daniel J Goble<sup>1\*</sup>, Brian L Cone<sup>1</sup> and Brett W Fling<sup>2</sup>



**Figure 4 Wii Fit Intervention Dosing Parameters.** Box and whisker plots representing the 95<sup>th</sup> percentile (whiskers), interquartile range (box), mean (black circle) and median (black line) data for the various dosing parameters of Wii Fit interventions [1,2,4,7,10,15,17-19,21,22,27-31,34,36].

ative of typical intervention characteristics. Using median data, interventions with 12 sessions of 30 min per session would appear to be more normal with an intervention time of 485 min. These values serve as a guideline for optimally designing future Wii Fit interventions. However,



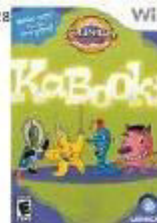
# Video games currently used in rehabilitation clinics



- **Wii Sports™** [1, 8, 9, 10, 12, 13, 14, 15, 16, 19, 21, 24, 25, 27, 28, 29, 31, 62]
  - Tennis
  - Bowling
  - Boxing
  - Golf (rare)



- **Wii Fit™** [1, 3, 8, 10, 12, 13, 14, 23, 27, 28, 30, 61, 62]
  - Table tilt
  - Bubble balance
  - Tightrope tension
  - Torso & waist twist
  - Hula hoop game
  - Ski slalom
  - Ski jump
  - Jogging



- **We Ski & Snowboard™** [28]
- **Wii Music™** [28, 62]
- **Link's Crossbow Training™** [28]
- **Blazing Angels™** [28]
- **Shaun White: Snowboarding Road Trip™** [28]
- **Smarty Pants™** [12]
- **Big Beach Sports™** [12]
- **Wii Fit Plus™** [28]
- **Korinpa: Marble Mania™** [28]



- **BOOM BLOX™** [27]
- **Mario & Sonic at the Olympic Games™** [8, 13, 28]
- **Wii Play™** [8, 15, 19, 52, 62]
- **Wii Sports Resort™** [28]
- **DECA Sports™** (a.k.a. Sports Island) [12, 28]
- **EA SPORTS Active™** [28]
- **Samba De Amigo™** [28]
- **Carnival Games™** [12, 28]
- **Cooking Mama: Cook Off™** [19, 28]
- **WarioWare: Smooth Moves™** [28]
- **Big Brain Academy: Wii Degree™** [19, 24, 28]
- **SSX Blur™** [28]
- **We Ski™** (a.k.a. Family Ski) [28]
- **Rayman Raving Rabbids 2™** [28]
- **Trauma Center: Second Opinion™** [28]
- **Trauma Center: New Blood™** [19]
- **Super Monkey Ball Banana Blitz™** [12]
- **Are You Smarter Than A 5<sup>th</sup> Grader? Make the Grade™** [12]
- **Cranium Kabookii™** [12]
- **Game Party 2™** [8]
- **Mario Kart Wii™** [62]



All images from Nintendo.com

Centro de gravedad (CG)

¡Qué maravilla!  
 ¡Tu centro de gravedad está perfectamente centrado! (A)

Tu CG

Izda. 50.0%

Dcha. 50.0%

Hit the blue tiles with the dot

17.28

Da 20 pasos en el sitio

8

I D

Wii Fit

www.gulbasnintendo.com

Stay in the blue area for three seconds.

Round 3

18.58

L 40%

R 60%

15 mph

Misses 0

0:26.01

Level 69

45 pts

+9

レベル3

44

## Typical balance exercises or exergames for balance improvement?

[Gioftsidou A<sup>1</sup>](#), [Vernadakis N](#), [Malliou P](#), [Batziou S](#), [Sofokleous P](#), [Antoniou P](#), [Kouli O](#), [Tsapralis K](#), [Godolias G](#).

### Author information

#### Abstract

**BACKGROUND AND OBJECTIVES:** Balance training is an effective intervention to improve static postural sway and balance. The purpose of the present study was to investigate the effectiveness of the Nintendo Wii Fit Plus exercises for improving balance ability in healthy collegiate students in comparison with a typical balance training program.

**METHODS:** Forty students were randomly divided into two groups, a traditional (T group) and a Nintendo Wii group (W group) performed an 8 week balance program. The "W group" used the interactive games as a training method, while the "T group" used an exercise program with mini trampoline and inflatable discs (BOSU). Pre and Post-training participants completed balance assessments.

**RESULTS:** Two-way repeated measures analyses of variance (ANOVAs) were conducted to determine the effect of training program. Analysis of the data illustrated that both training program groups demonstrated an improvement in Total, Anterior-posterior and Medial Lateral Stability Index scores for both limbs. Only at the test performed in the balance board with anterior-posterior motion, the improvement in balance ability was greater in the "T group" than the "W group", when the assessment was performed post-training ( $p=0.023$ ).

**CONCLUSIONS:** Findings support the effectiveness of using the Nintendo Wii gaming console as a balance training intervention tool.

## Wii Fit exer-game training improves sensory weighting and dynamic balance in healthy young adults.

[Cone BL<sup>1</sup>](#), [Lewy SS<sup>2</sup>](#), [Goble DJ<sup>3</sup>](#).

### Author information

#### Abstract

The Nintendo Wii Fit is a balance training tool that is growing in popularity due to its ease of access and cost-effectiveness. While considerable evidence now exists demonstrating the efficacy of the Wii Fit, no study to date has determined the specific mechanism underlying Wii Fit balance improvement. This paucity of knowledge was addressed in the present study using the NeuroCom Balance Manager's Sensory Organization Test (SOT) and Limits of Stability (LOS) test. These well-recognized posturography assessments, respectively, measure sensory weighting and dynamic stability mechanisms of balance. Forty healthy, young participants were recruited into two groups: Wii Fit Balance Intervention (WFBI) ( $n=20$ ) and Control (CON) ( $n=20$ ). Balance training consisted of seven Wii Fit exer-games played over the course of six consecutive weeks (2-4×/week, 30-45min/day). The WFBI group performed Neurocom testing before and after the intervention, while the CON group was tested along a similar timeline with no intervention. Mixed-design ANOVAs found significant interactions for testing time point and condition 5 of the SOT ( $p<0.02$ ), endpoint excursion ( $p<0.01$ ), movement velocity ( $p<0.02$ ), and response time ( $p<0.01$ ). These effects were such that greater improvements were seen for the WFBI group following Wii Fit training. These findings suggest that individuals with known issues regarding the processing of multiple sources of sensory information and/or who have limited functional bases of support may benefit most from Wii Fit balance training.

# Exergaming and Static Postural Control in Individuals With a History of Lower Limb Injury

Jennifer Sims, MEd, ATC\*; Nicole Cosby, PhD, ATC†; Ethan N. Saliba, PhD, DPT, PT, ATC ‡; Jay Hertel, PhD, ATC, FNATA, FACSM‡; Susan A. Saliba, PhD, PT, ATC, FNATA‡

\*Albion College, Albion, MI; †Point Loma Nazarene University, San Diego, CA; ‡University of Virginia, Charlottesville. Ms Sims is now at Western Michigan University, Kalamazoo.





<p><b>Balance</b>          Soccer Heading          Table Tilt          Penguin Slide          Ski Slalom          Balance Bubble</p>			
<p><b>Strength</b>          Lunge          Single Leg          Extension          Sideways Leg Lift</p>			
<p><b>Aerobics</b>          Hula Hoop          Super Hula Hoop          Basic Step</p>			
<p><b>Yoga</b>          Half Moon          Tree          Chair</p>			

Appendix A. Wii Fit rehabilitation protocol. Rehabilitation should be 3x/wk for no more than 15 minutes. Participants began the first session with a 15-minute assessment of body composition and current balance. Each participant began with soccer heading each time he or she began the Wii Fit program. The Wii Fit program was set up to provide additional activities and levels based on the individual's accumulated time. Participants could move on to the advanced levels when 3 stars were achieved in the basic level.

## Clinical Implications

We chose to examine the effects of the Wii Fit on lower limb joint injuries, because this is the first trial to our knowledge to use the Wii Fit as a rehabilitation tool in patients with a self-reported musculoskeletal injury. After 4 weeks of balance training, participants in the Wii Fit and traditional rehabilitation groups experienced a less constrained sensorimotor system and had more time available to make a postural correction. Improvements in the magnitude of the TTB in the eyes-open positions were not observed until the second week of rehabilitation; therefore, we would not expect to observe immediate clinical changes when using this device in a rehabilitation setting. Based on our results, we would recommend using the Wii Fit as an adjunctive rehabilitation tool to complement therapeutic exercise for patients with a self-reported history of lower limb injury. Because the Wii Fit is an interactive gaming device, it allows rehabilitation to be completed without the aid of a clinician. More importantly, the Wii Fit can be used to heighten patient interest and compliance and can possibly be used as a part of a home exercise program.<sup>22</sup>

Future researchers should focus on using the Wii Fit and other exergames in a homogeneous population of patients during the typical postoperative or postinjury time period. The improvements demonstrated in this study justify the need for continued examination of exergaming in musculoskeletal rehabilitation. Future investigators should also focus on changes in postural control after Wii Fit intervention in healthy individuals. A major finding of the current research study was that patients with a history of lower limb injury had improvements in the magnitude of the mean of the TTB minima; however, we currently do not know what the relationship is between an improvement in this TTB measure and injury risk. Future authors should examine the relationship between increased TTB values after a balance training program and the reinjury rate.



## Comparison between Nintendo Wii Fit and conventional rehabilitation on functional performance outcomes after hamstring anterior cruciate ligament reconstruction: prospective, randomized, controlled, double-blind clinical trial

Gul Baltaci · Gulcan Harput · Bunyamin Haksever · Burak Ulusoy · Hamza Ozer

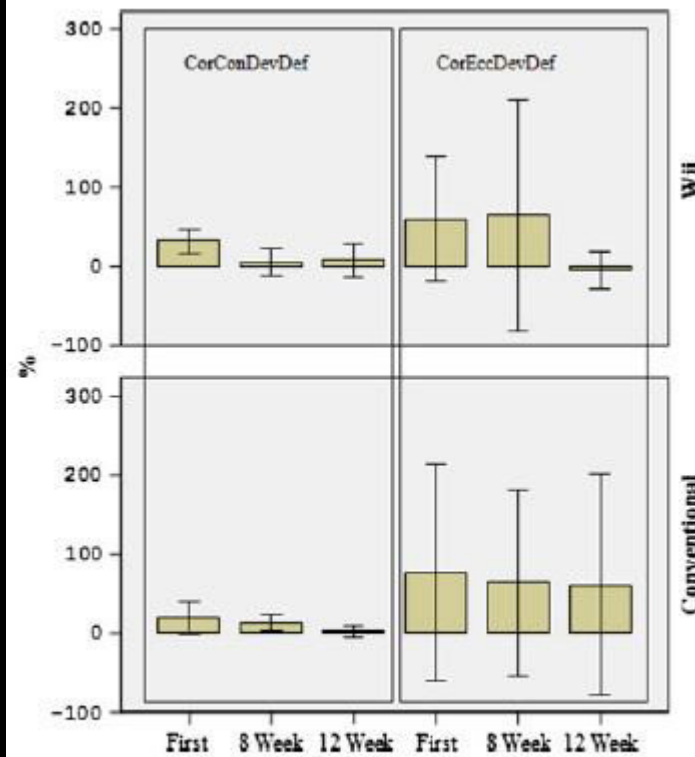


Fig. 3 The coordination test results of at first, 8 and 12th weeks of rehabilitation (CorConDevDef: coordination concentric deviation deficit, CorEccDevDef: Coordination eccentric deviation deficit)

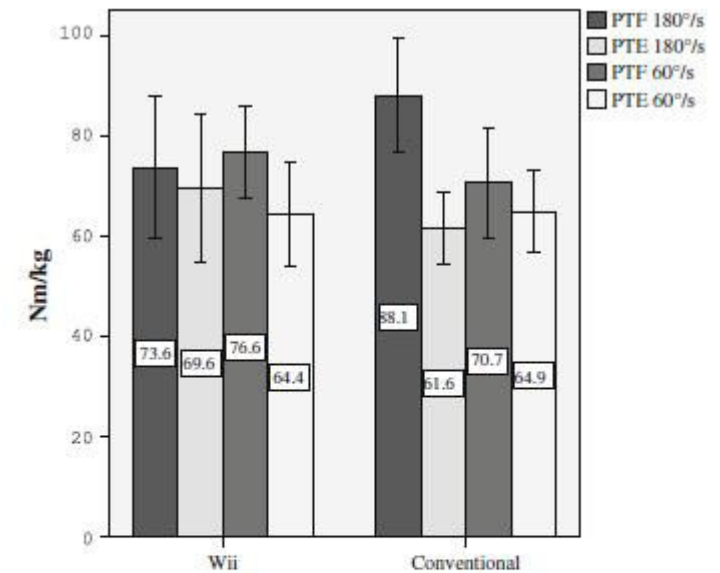


Fig. 4 Involved/non-involved (I/NI) strength ratio in peak torque flexion and extension at 180 and 60°/s angular velocities. (PTF peak torque flexion, PTE peak torque extension)

# ATHLETIC TRAINERS MAKING USE OF WII FIT PLUS



The Albion College athletic training room's start to the campus' theme year of wellness got an unexpected lift when Elaine Starkey, '13, donated to the Kinesiology Department the Wii Fit Plus she won at the Aug. 25 Wellness Fair.

Head Athletic Trainer Sara Ko and faculty members Carol Moss and strength training exercises.

"The Wii Fit Plus makes rehab how to best introduce this technology tailor modalities for each individual.

Elaine Starkey donated the Wii Fit Plus she won at the Wellness Fair to the Athletic Training room.

More than 30 vendors and well offering everything from organizational planning services.

Albion College's Year of Wellness occupational, cultural, environmental,

community. A core focus of the College's strategic plan and interactive opportunities specifically designed for

## COLLEGE FOOTBALL

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## Universities turn to Wii Fit as way of examining concussions

By Steve Yanda  
Washington Post Staff Writer  
Thursday, August 19, 2010

Across the spectrum of athletics from youth soccer to the [National Football League](#), concussions are one of the most worrisome of injuries: hard to diagnose and even harder to know when an athlete has recovered. Now, in an unusual combination of real sports and their digital imitators, a handful of colleges, including the [University of Maryland](#), are turning to a video game for help.

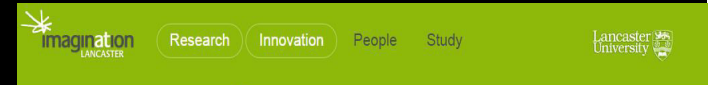


Maryland football player Jacob Wheeler gives the Wii Fit a try as assistant trainer Kate Goeler records his score, which would be used as a frame of reference in the event Wheeler ever suffered a concussion. (Toni L. Sandys/the Washington Post)

<http://www.steelwebdesign.com/REU/wiihabilitation.html>

<http://wiihabilitationresearch.blogspot.com>

<http://wiihabtherapy.blogspot.com>



## ReWiiRe

### Research for Wii Rehabilitation

The ReWiiRe project aims to investigate the use of computer game technology, in physical rehabilitation. It is a collaboration between Brunel University London, Lancaster University and Anglia Ruskin University.

An initial 15 month exploratory research study (funded by the NHS London Regional Innovation Fund and Brunel University London), involving five National Health Service (NHS) sites, investigated patient and therapist experiences of using the Wii as an adjunct to physiotherapy. Data from this study was used to inform the design and development of a personalised stroke therapy device using adapted Wii technology, professional game authoring software combined with a game engine, for rehabilitation of the arm after stroke. The device uses games and activities which can be personalised to an individual's needs with regards to range of movement and speed.





## ALL-WORLD NFL RB ADRIAN PETERSON REHABBING HIS KNEE WITH WII, WII FIT

Written by: Rocco DeMaro | August 13, 2012 at 9:22AM



"He's basically playing a video game with his leg." — Eric Sugarman, Vikings Head Athletic Trainer

In his first four years in the NFL, Adrian Peterson made a compelling case for himself as the best running back on the planet.



## Wii knee.

[Robinson RJ](#)<sup>1</sup>, [Barron DA](#), [Grainger AJ](#), [Venkatesh R](#).

### [+ Author information](#)

### Abstract

We present the case of a 16-year-old boy who injured his knee whilst playing on the video games console Nintendo Wii. The patient presented with an acutely swollen and painful knee to the emergency department of our institution. Initial radiographs revealed an effusion and an osteochondral fracture. Further imaging with magnetic resonance imaging demonstrated evidence of lateral patella dislocation with medial patello-femoral ligamentous damage and a large femoral osteochondral fracture. The patient was successfully treated with surgical fixation of the osteochondral fragment and medial patello-femoral ligament repair. This case highlights the force that can be generated whilst using these new games consoles.



October 2009, Volume 193, Number 4

Letters

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## **Achilles Wiitis: Making the Case for Proprioceptive Training in Tendinopathy**

Karsten Knobloch

[Share](#)

**Affiliation:** *Hannover Medical School, Hannover, Germany*

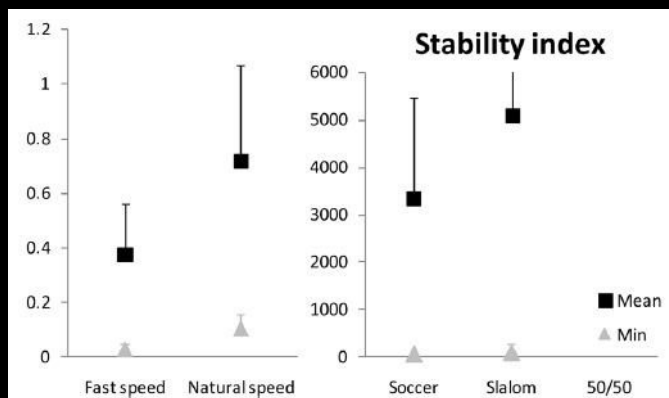
**Citation:** *American Journal of Roentgenology*. 2009;193: W356-W356.

RESEARCH

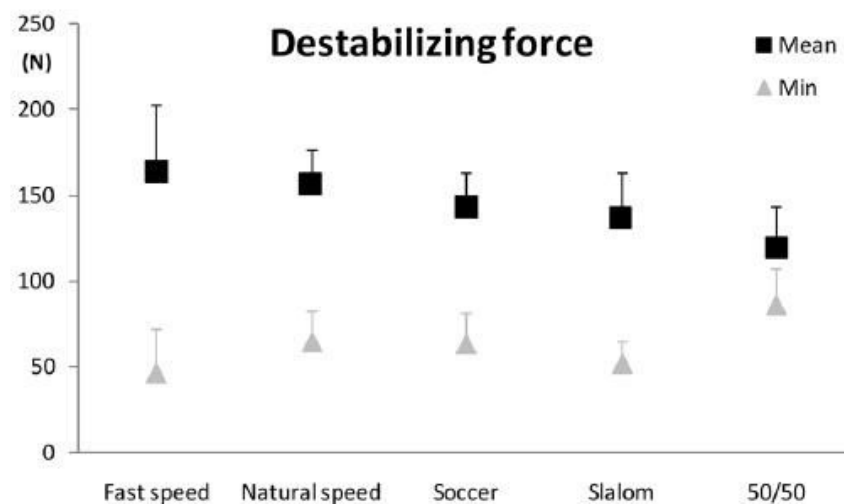
Open Access

# Dynamic stability requirements during gait and standing exergames on the wii fit<sup>®</sup> system in the elderly

Cyril Duclos<sup>1,2\*</sup>, Carole Miéville<sup>1,2</sup>, Dany Gagnon<sup>1,2</sup> and Catherine Leclerc<sup>1,2</sup>



**Figure 1** Mean (black squares) and minimum (grey triangles) stability index values for the group, for the five tasks. Lower stability index represents lower overall stability. Error bars represent one standard deviation (SD) of the value. The maximums of the vertical axes were chosen to show most of the values despite large scale differences, without flattening the results with lower values. However, the values for the 50/50 Challenge are missing (Min (SD): 10513.8 N (12764.6), Mean (SD): 386783.1 (4.1 x 10<sup>5</sup>)), as well as the SD for Slalom (SD = 2131.2).



**Figure 2** Mean (black squares) and minimum (grey triangles) destabilizing force values for the group, for the five tasks (N). Lower destabilizing force represents lower postural stability. Error bars represent one standard deviation (SD) of the value.

## No transfer between conditions in balance training regimes relying on tasks with different postural demands: Specificity effects of two different serious games.

Naumann T<sup>1</sup>, Kindermann S<sup>2</sup>, Joch M<sup>2</sup>, Munzert J<sup>2</sup>, Reiser M<sup>2</sup>.

### Author information

#### Abstract

Despite the increasing use of video games involving whole body movements to enhance postural control in health prevention and rehabilitation, there is no consistent proof that training effects actually transfer to other balance tasks. The present study aimed to determine whether training effects on two different video-game-based training devices were task-specific or could be transferred to either postural control in quiet stance or to performance on the other device. 37 young healthy adults were split into three groups: two intervention groups that trained for 30min on either the Nintendo(®) Wii Fit Balance Board or the MFT Challenge Disc(®) three times per week for 4 weeks and a control group that received no training. All games require participants to control virtual avatars by shifting the center of mass in different directions. Both devices differ in their physical properties. The Balance Board provides a stable surface, whereas the Challenge Disc can be tilted in all directions. Dependent variables were the game scores on both devices and the center of pressure (COP) displacements measured via force plate. At posttest, both intervention groups showed significant increases in performance on the trained games compared to controls. However, there were no relevant transfer effects to performance on the untrained device and no changes in COP path length in quiet stance. These results suggest that training effects on both devices are highly specific and do not transfer to tasks with different postural demands.



¿ALTERNATIVAS?



# Balance Trainability Using the Nintendo Wii Balance Board in Sportive People

Autoren

S. Paukowits, T. Stöggel

Institut

Interfakultärer Fachbereich Sport- und Bewegungswissenschaft, Universität Salzburg



## Abstract



**Background:** A multivariable training has a positive impact on balance skills and risk of injury. To date the effect of this training using the Nintendo Wii balance board in sportive people has not yet been investigated.


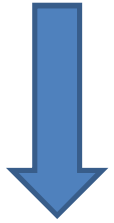


**Objective:** The aim of this study was to investigate whether training with the Nintendo Wii balance board can improve balance skills.

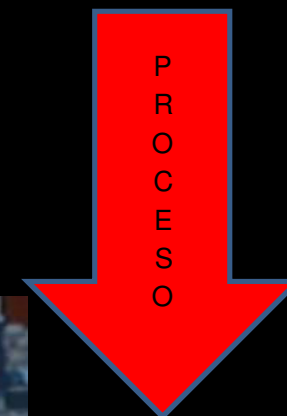
**Method:** 20 people were randomized into a control and an intervention group each with 10 people who performed a unilateral stance test with eyes open and closed as well as the star excursion balance test before and after the intervention. The control group completed their usual sports and the intervention group an adjunct training with the Nintendo Wii balance board for 4 weeks.

**Results:** Adjunct Training using the Nintendo Wii Balance Board did not improve sportive people's balance skills significantly. The intervention group, however, attained better results in the star excursion balance test, whereas the control group did not show any changes. The unilateral stance tests did not provide significant differences before and after training within both groups.

**Conclusion:** The use of the Nintendo Wii balance board should be further investigated by employing individual difficulty levels.

# CONTENIDOS- CARGA- FASES

S	CONTENIDOS DESTACABLES	CARGA	FASE
1	MUSINTRIN EXTR PIE	SIN CARGA 9.1-13.6 kg  25% peso corporal	INICIAL PROLIFERACION
2	FLEXIBILIDAD GENERAL- CORE		
3	PISCINA FAM MUSINTRIN EXTR PIE. AROUND WORLD ISOMETRIA		
4	COCONTRACIONES	CARGA PARCIAL 2 MULETAS 50% peso corporal 	INTERMEDIA TRANSICION
5	GEMELO BANDA ELASTICA		
6	PROPIO FACILITADA 1		
7	EXTENSION ACTIVA 90-40°		
8	ACTIVIDADES MARCHA PC (PP)		
9	BICICLETA		
10	PROPIO FACILITADA 2		
11	LEG PRESS MINI SQUATS	CARGA PARCIAL 1 MULETA 75% peso corporal 	AVANZADA REMODELADO
12	ACTIVIDADES MARCHA PC (PISCINA)		
13	ELIPTICA		
14	<b>PROPIO WII - ACTIVIDADES MARCHA PC (PM) EDUCAT</b>	CARGA TOTAL  ALTO IMPACTO	RETORNO A LA ACTIVIDAD MADURACION
15	<b>PROPIO WII- MARCHA</b>		
16	<b>PROPIO WII- BALÓN</b>		
17	AUTOPCARGA- CARREERA		
18	TECNICA DE CARREERA		
19	BAJO- MEDIO IMPACTO		
20	PROPIO +++		
21	ALTO IMPACTO		
22	INTEGRA EQUIPO		



Schmitt y col., 2010; Reinold y col., 2006

# ESTRUCTURA METODOLOGICA FUERZA

(Froböse, 1992 en Buchbauer, Seitinger, 2005)

Activación, facilitación (coordinación intermuscular)  
Propiocepción (= preentrenamiento)



Entrenamiento resistencia muscular local (preentrenamiento)



Aumento superficie transversal músculo (regeneración muscular)



Elevación calidades neuromusculares fuerza



Desarrollo variado calidades fuerza en función situación





CAM00242.mp4



CAM00243.mp4



CAM00244.mp4



CAM00227b.avi



CAM00226b.avi



CAM00762.mp4



CAM00763.mp4

## Comprados juntos habitualmente



**Precio para los tres: EUR 169,44**

[Añadir los tres a la cesta](#)

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# WiiHabilitation

WIISEARCH  
RESEARCHING RECOVERY APPLICATIONS  
UTILIZING WII HARDWARE

## 3D Point Tracking

Utilizing the integrated camera in the Wiimote, it is possible to track body angles and motion during certain exercises in which the therapist would need to determine how the patient's body flexed and the range of motion possible in the torso and extremities. To facilitate this need, special hardware was created in the form of an Infrared Belt to track waist contortion along the horizontal plane.

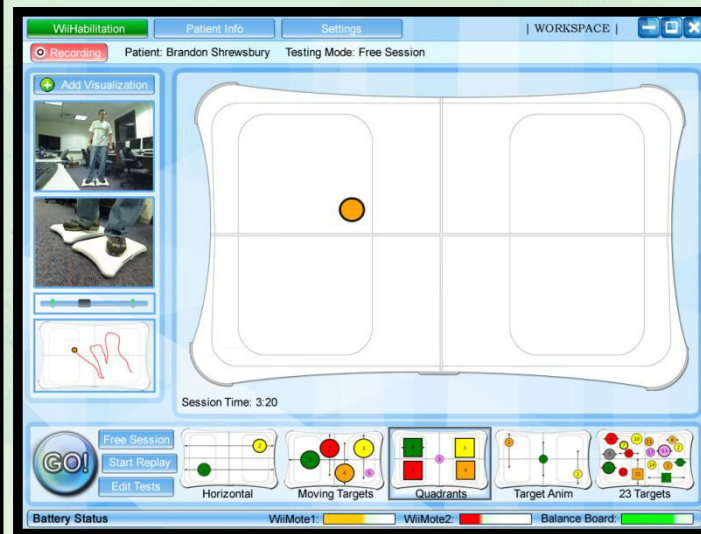


## Wiimote Audio

The Wiimote speaker is capable of playing basic sounds, but did not have a driver capable of using it. Wiimotelib was modified to include audio support. We can now provide auditory feedback to patients during a therapy session, which is especially important for those with limited vision.



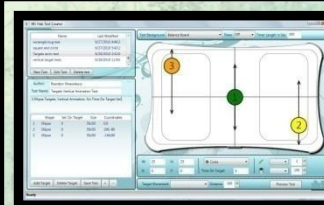
The data shows with ~99% certainty that the mean time for a signal to be sent to the Wiimote from the computer is less than 3/4th of a millisecond. Out of over 7,500 trials, there were fewer than 20 outliers.



WiiHabilitation was designed to provide an interactive recovery system for stroke and amputee patients. It uses the Wii balance board to actively monitor weight distribution and center of balance during patient sessions. To effectively employ this technology in a patient setting, a robust application was required that could combine multiple input devices, record instrument data, replay sessions, interpret patient progress, and allow for scalability should new instruments need to be added. A model-view-controller model was applied, with a publish / subscribe framework driving data between, allowing for any instrument and any data visualization to be added with ease.

## WiiHab Test Creator

It was important for the therapists to create balance tests specifically designed to work affected areas of the patients body. Test Creator gives the therapist complete control over target size, location, opacity, color, shape, and movement.

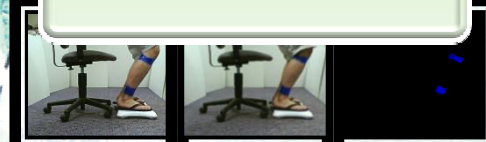


## Audio Processing

A voice action annotation system, based on Microsoft's speech API, was explored as a hands free interface that would allow therapists to focus on the patient during recovery sessions, while still being able to log annotation data at run-time in a simple and efficient manner.

## Computer Vision

Patient progress is measured subjectively, leaving much to therapist interpretation. Image processing was used to track the patient to create an objective scoring system. We captured body positioning based on blue bands wrapped around an extremity. Future versions will apply Microsoft's Kinect system.



Capture Gaussian Blur Color Filter

## Conclusion

Our system is ready to include image processing, auditory feedback, and live annotating of data. Any test can be fully customized and created by the therapist for a specific patient. Data is constantly recorded, including webcam streams, for future analysis. In-home deployment is trivial, requiring only a Wii Balance Board and computer.



BALANCE  
CONCEPTS

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[The Problem](#)

[The Solution](#)

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[Downloads](#)



#### User Guides:

Coming Soon: Patient home care plans

- [Balance Protocols for Practitioners](#)

- [Test Result Graphs](#)

- [2.7 User Guide](#)

- [Aspects of Balance](#)

- [Pondera Applications](#)

- [Patient Balance Information](#)

- [Practitioner Balance Information](#)

#### Software Updates:

Coming Soon:

#### Screen Shots:

(Non Flash - Click Here)



BALANCECONCEPTS.COM.AU



Balance enhancement exercise  
program

## Does a Wii-based exercise program enhance balance control of independently functioning older adults? A systematic review

This article was published in the following Dove Press journal:

Clinical Interventions in Aging

23 October 2014

[Number of times this article has been viewed](#)

Yocheved Laufer

Gali Dar

Einat Kodesh

Physical Therapy Department, Faculty  
of Social Welfare and Health Sciences,  
University of Haifa, Haifa, Israel

**Background:** Exercise programs that challenge an individual's balance have been shown to reduce the risk of falls among older adults. Virtual reality computer-based technology that provides the user with opportunities to interact with virtual objects is used extensively for entertainment. There is a growing interest in the potential of virtual reality-based interventions for balance training in older adults. This work comprises a systematic review of the literature to determine the effects of intervention programs utilizing the Nintendo Wii console on balance control and functional performance in independently functioning older adults.

**Products: Physiofun Balance Training**

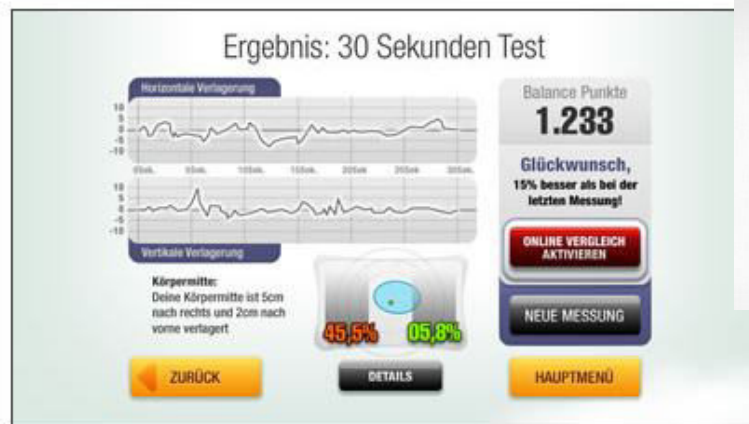
Category: Health & Fitness  
 Number of Players: 1  
 Age rating: No restriction  
 Publisher: Kaasa Health GmbH  
 Release date: September 10, 2010



**Description of the software**

Patients who have completed a rehabilitation program know the problem: Lots of exercises which are necessary and important for the healing process are often monotonous and boring. Especially when we're talking about bodily poise and balance, there's hardly any variation.

This is where PHYSIO FUN Balance Training can help. The program helps make balancing exercises entertaining. PHYSIO FUN Balance Training is also excellently suited for post-rehab care of patients that visited physiotherapists and private rehab centres. Instead of bringing home expensive specialised equipment, important exercises for patients recovering from, for example, foot, knee or hip complaints can now be carried out in a fun and entertaining way.



English ▾



**PHYSIOFUN**

Stay in balance. Physiofun uses the Wii™ and Wii Balance Board to change repetitive physiotherapy exercises into something fun and entertaining – right in your living room. You might even start looking forward to your physical therapy.

[www.physiofun.com](http://www.physiofun.com)



EXPLICACION WII FIT  
TIPOS DE EJERCICIOS  
PRACTICA



THANKS FOR PLAYING!



# TECNOLOGIA LOW COST PREVENCIÓN Y RECUPERACIÓN DE LESIONES



Tecnologia low cost

Julio 2015

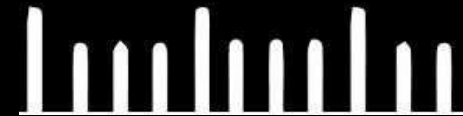
Eugenio Rodriguez Pujol



**FREE  
DOWNLOAD**

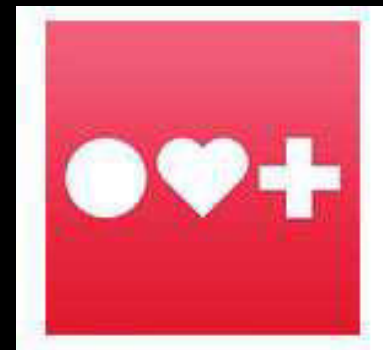


Check  
Your  
**MOTION**



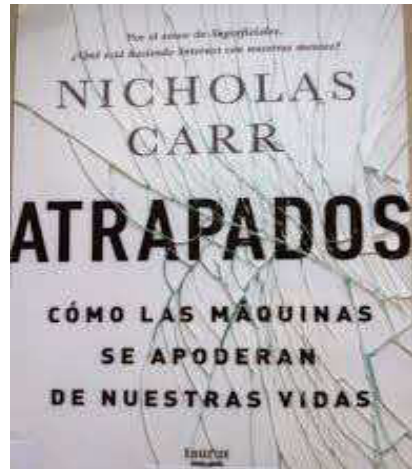
**Strengthen your ankle  
Versterk je enkel v.2.1**

**DE PAGO**

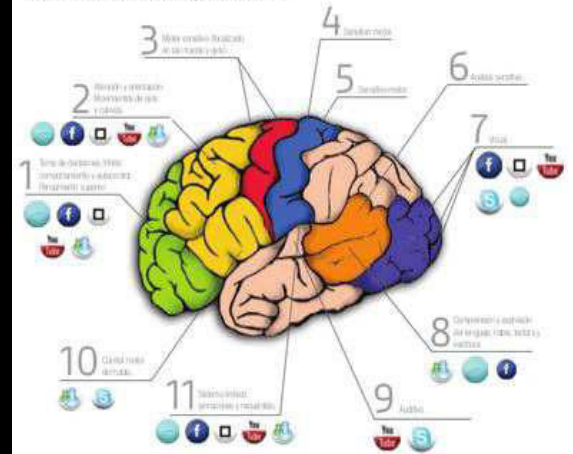


Ankle  
VU Medisch Centrum D

★★★★★ 1,00 €



Mapa funcional del cerebro según red social 2.0



IS  
Google  
MAKING  
US  
Stoopid?

# Los 'smartphones' serán los ordenadores del futuro, según IDC

Mobile 18 junio, 2014



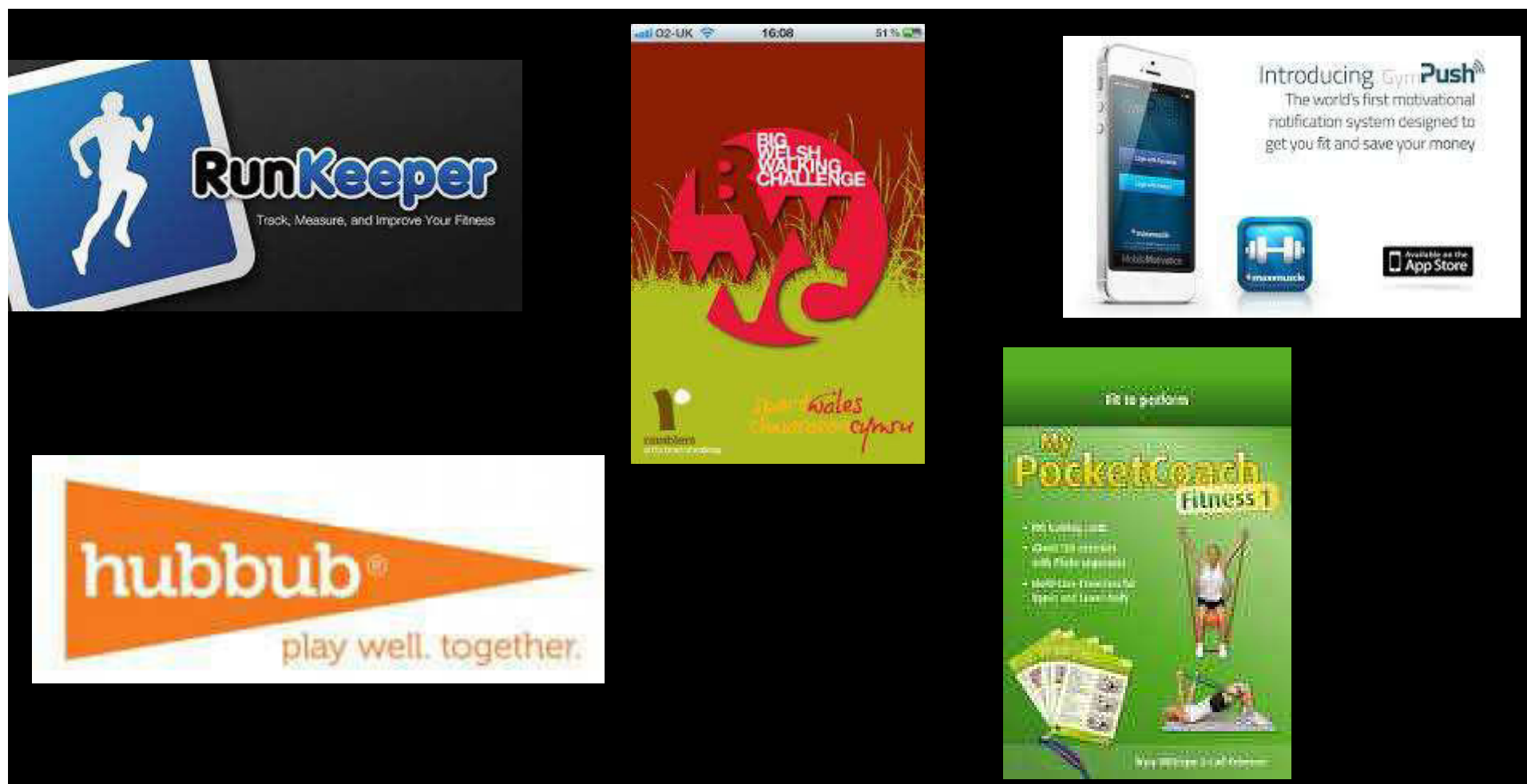


REVIEW

Open Access

# Apps to promote physical activity among adults: a review and content analysis

Anouk Middelweerd<sup>1</sup>, Julia S Mollee<sup>2</sup>, C Natalie van der Wal<sup>2,3</sup>, Johannes Brug<sup>1</sup> and Saskia J te Velde<sup>1\*</sup>



# APLICACIONES

## FORMAS EJERCICIO



# GAMIFICATION. SERIOUS GAMES.

## EXERGAMING





# Obesidad infantil

Original Investigation | May 2014

JOURNAL CLUB

## Effects of a Pediatric Weight Management Program With and Without **Active Video Games** A Randomized Trial

Stewart G. Trost, PhD<sup>1</sup>; Deborah Sundal, MA<sup>2</sup>; Gary D. Foster, PhD<sup>3</sup>; Michelle R. Lent, PhD<sup>3</sup>; Deneen Vojta, MD<sup>2</sup>

[+] Author Affiliations

JAMA Pediatr. 2014;168(5):407-413. doi:10.1001/jamapediatrics.2013.3436.

Text Size: A A A

## Un programa de 16 semanas presenta diferencias significativas control peso en población infantil

Hindawi Publishing Corporation  
Journal of Obesity  
Volume 2013, Article ID 438364, 8 pages  
<http://dx.doi.org/10.1155/2013/438364>



Review Article

## Exergaming as a Strategic Tool in the Fight against **Childhood Obesity**: A Systematic Review

Carminda Maria Goersch Fontenele Lamboglia,<sup>1</sup> Vanina Tereza Barbosa Lopes da Silva,<sup>1</sup> José Eurico de Vasconcelos Filho,<sup>2</sup> Mônica Helena Neves Pereira Pinheiro,<sup>3</sup> Marilene Calderaro da Silva Munguba,<sup>4</sup> Francisco Valmar Isaias Silva Júnior,<sup>2</sup> Fernando Alberto Ramirez de Paula,<sup>3</sup> and Carlos Antônio Bruno da Silva<sup>1,5</sup>

## Alabama public schools turn to Wii childhood obesity



By Marie Leech | [mleech@al.com](mailto:mleech@al.com)  
Email the author | Follow on Twitter  
on September 17, 2011 at 12:15 PM

Print



Actress Kelly Monaco works out with the new Wii Fit Plus at Village at the Yard during last year's Sundance film festival. Alabama public schools are using the system to fight childhood obesity. (AP)

Ask most third-graders whether they'd rather run laps in hundred-degree temperatures or play a video game, and it doesn't take a genius to correctly predict their answer.

What did take some brainpower, however, was figuring out how to use that fondness for electronic games to get some of the same benefits as running.

Wee Can Fight Obesity is a fitness program for third-graders in Alabama public schools, and uses the Wii Fit Plus Bundle and EA Sports Active video games to improve physical fitness three days a week during P.E. class.

The one-year program is in 30 schools this year, and was in 30

La tecnología puede ser una estrategia eficaz para reforzar conductas activas y sanas.

Exergaming como potenciador de conductas positivas

## Evaluación postural



Smartphone Sensitivity in Objective Balance Testing

The Science Behind Sway Balance™  
Clinical Research Report  
July 23<sup>rd</sup>, 2013



## Equilibrio postural 3ª edad

[Dan Med J](#). 2014 Jan;61(1):B4775.

**Assessment of postural balance in community-dwelling older adults - methodological aspects and effects of biofeedback-based Nintendo Wii training.**

[Jørgensen MG](#).

## Parkinson

[J Neuroeng Rehabil](#). 2014 Mar 7;11:33. doi: 10.1186/1743-0003-11-33.

**The role of exergaming in Parkinson's disease rehabilitation: a systematic review of the evidence.**

[Barry G](#), [Galna B](#), [Rochester L](#)<sup>1</sup>.

## Esclerosis múltiple

[Arch Phys Med Rehabil](#). 2014 Oct;95(10):1803-9. doi: 10.1016/j.apmr.2014.04.020. Epub 2014 May 10.

**Exergaming with additional postural demands improves balance and gait in patients with multiple sclerosis as much as conventional balance training and leads to high adherence to home-based balance training.**

[Kramer A](#)<sup>1</sup>, [Dettmers C](#)<sup>2</sup>, [Gruber M](#)<sup>3</sup>.

## Accidentes cerebro vasculares

[Clin Rehabil](#). 2014 Aug 14. pii: 0269215514542638. [Epub ahead of print]

**Participant and caregiver experience of the Nintendo Wii Sports™ after stroke: qualitative study of the trial of Wii™ in stroke (TWIST).**

[Wingham J](#)<sup>1</sup>, [Adie K](#)<sup>2</sup>, [Turner D](#)<sup>3</sup>, [Schofield C](#)<sup>3</sup>, [Pritchard C](#)<sup>3</sup>.

**Review**

**Sports injury prevention in your pocket?!  
Prevention apps assessed against the available  
scientific evidence: a review**

Daan M van Mechelen, Willem van Mechelen, Evert A L M Verhagen



18 apps ios “lesión – prevención –rehabilitación”  
4 información científica  
5 falsas afirmaciones

# ¿RENDIMIENTO?



# Interventions to Prevent Sports Related Injuries: A Systematic Review and Meta-Analysis of Randomised Controlled Trials

Mari Leppänen, Sari Aaltonen, Jari Parkkari, Ari Heinonen, Urho M. Kujala



## 5.5 Conclusion

This study set out to determine what the means to prevent sports injuries are. In conclusion, this systematic review and meta-analysis of 67 RCTs shows evidence that different interventions, such as insoles, external joint supports and training programs seem to be effective to reduce the risk of sporting injuries. In the field of sports, there may be a gap between practice guidelines and evidence-based preventive methods. This is the case especially in amateur and youth sports, where coaches may not have adequate education and knowledge on injury prevention and where accustomed behavior may be difficult to change. The significance of the current findings is that at least to a certain extent sports injuries can be prevented and by taking these preventive actions to practice, major benefits can be accomplished.

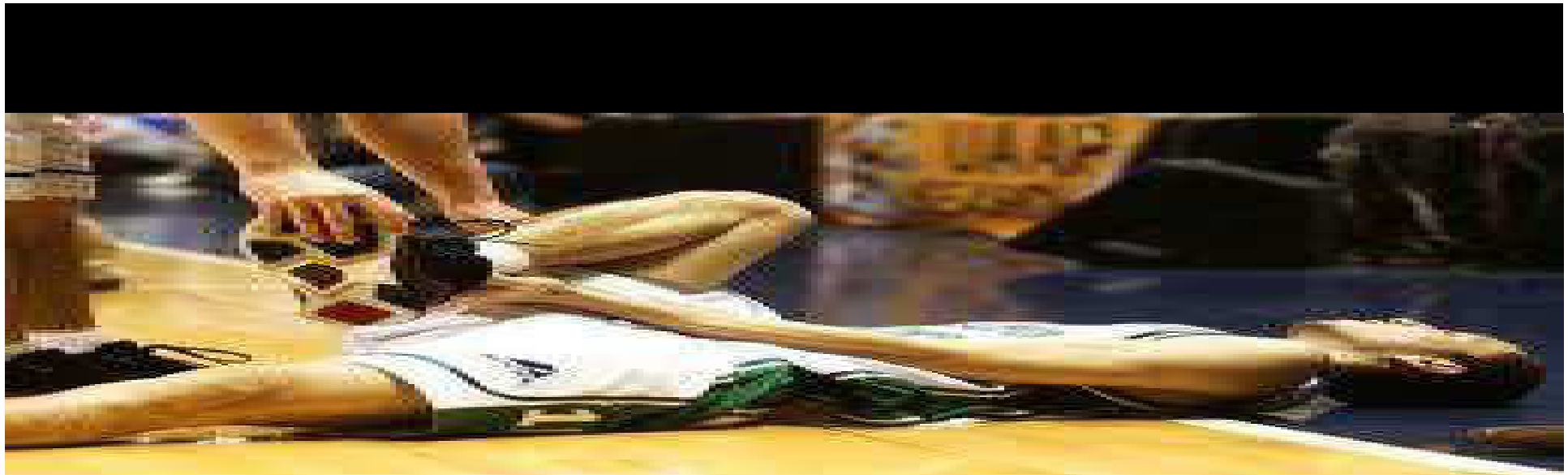
*Br J Sports Med* 2015;49:865-870 doi:10.1136/bjsports-2015-094639

**Review**

**Neuromuscular training injury prevention strategies in youth sport: a systematic review and meta-analysis**

Carolyn A Emery<sup>1,2</sup>, Thierry-Olivier Roy<sup>3</sup>, Jackie L Whittaker<sup>1,2</sup>, Alberto Nettel-Aguirre<sup>1,2</sup>, Willem van Mechelen<sup>4</sup>

There is evidence for the effectiveness of neuromuscular training strategies in the reduction of injury in numerous team sports. Lack of uptake and ongoing maintenance of such programmes is an ongoing concern. A focus on implementation is critical to influence knowledge, behaviour change and sustainability of evidence informed injury prevention practice.



### LESIONES MÁS FRECUENTES EN EL BALONCESTO

<i>TIPO DE LESIÓN</i>	<i>INCIDENCIA (%)</i>
Esguince de Tobillo	13,2 – 25,0
Tendinitis Rotuliana / Condropatía Rotuliana	3,9 – 10,87
Lumbalgia	6,1 – 7,45
Esguince de Rodilla	3,6 – 4,61
Esguince / Luxación de dedos de la mano	2,7 – 17,09
Tendinitis Aquilea	3,2 – 2,84
Fascitis Plantar	1,6 – 2,84
Hernia / Protusión discal lumbar	1 – 2,83
Rotura meniscal	1 – 2,13
Síndrome compartimental en piernas	2,13

Manonelles y Tarrega, 1998

**Longer reaction time of the fibularis longus muscle and reduced postural control in basketball players with functional ankle instability: A pilot study.**

Méndez-Rebolledo G, et al. *Phys Ther Sport*. 2014.



**CONCLUSION:** Basketball players with FAI have reduced postural control and longer reaction time of the fibularis and tibialis anterior muscles.

*Br J Sports Med* 2013;47:e3 doi:10.1136/bjsports-2013-092558.46

**Abstracts from the 3rd European College of Sports and Exercise Physicians (ECOSEP) conference on 25–27 April 2013**

**EFFECTS OF STRIKING STRATEGY ON LOWER EXTREMITY LOADING DURING RUNNING**

Juha-Pekka Kulmala<sup>1,2,3</sup>, Janne Avela<sup>1</sup>, Kati Pasanen<sup>2</sup>, Jari Parkkari<sup>2</sup>

*J Strength Cond Res*. 2013 Jan;27(1):69-75. doi: 10.1519/JSC.0b013e31824f202d.

**Kinematic factors affecting fast and slow straight and change-of-direction acceleration times.**

Hewitt JK<sup>1</sup>, Cronin JB, Hume PA.

*J Strength Cond Res*. 2013 Aug 12. [Epub ahead of print]

**The Relationship between Dynamic Stability and Multidirectional Speed.**

Lockie RG<sup>1</sup>, Schultz AB, Callaghan SJ, Jeffriess MD.





# TECNICAS CAMBIO DE CONDUCTA

## Behavior change techniques



**Figure 2** Frequencies of the 23 behavior change techniques used in apps. Behavior change techniques are scored using the taxonomy created by Abraham and Michie [14], ranked by the most frequently applied techniques.

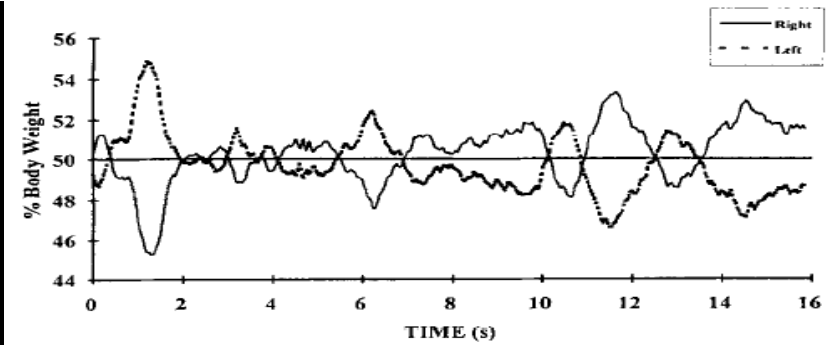
# Human balance and posture control during standing and walking

D A Winter PhD, PEng

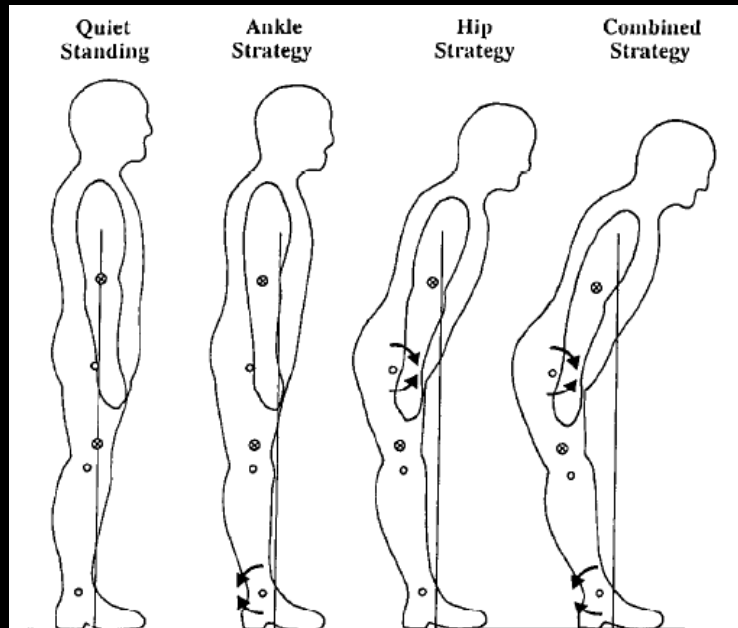
Department of Kinesiology, University of Waterloo, Waterloo, Ontario, Canada

Key words: Balance, inverted pendulum model, standing, walking

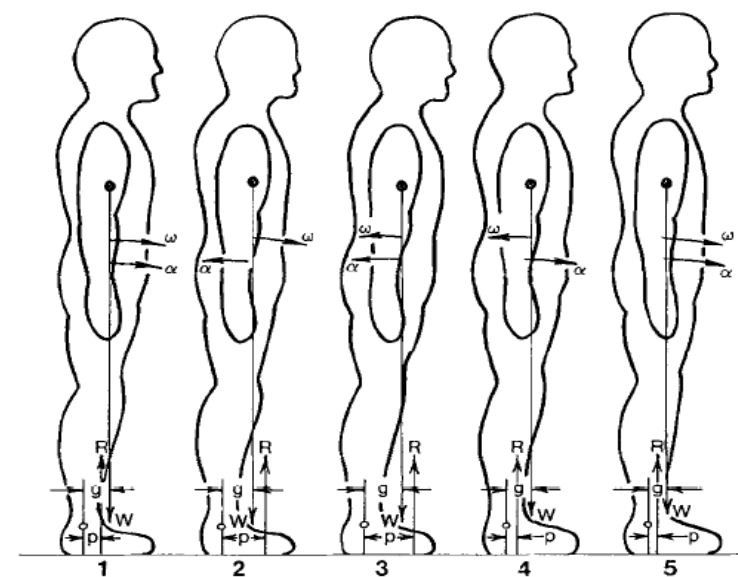
Gait & Posture: 1995; Vol. 3: 193-214, December



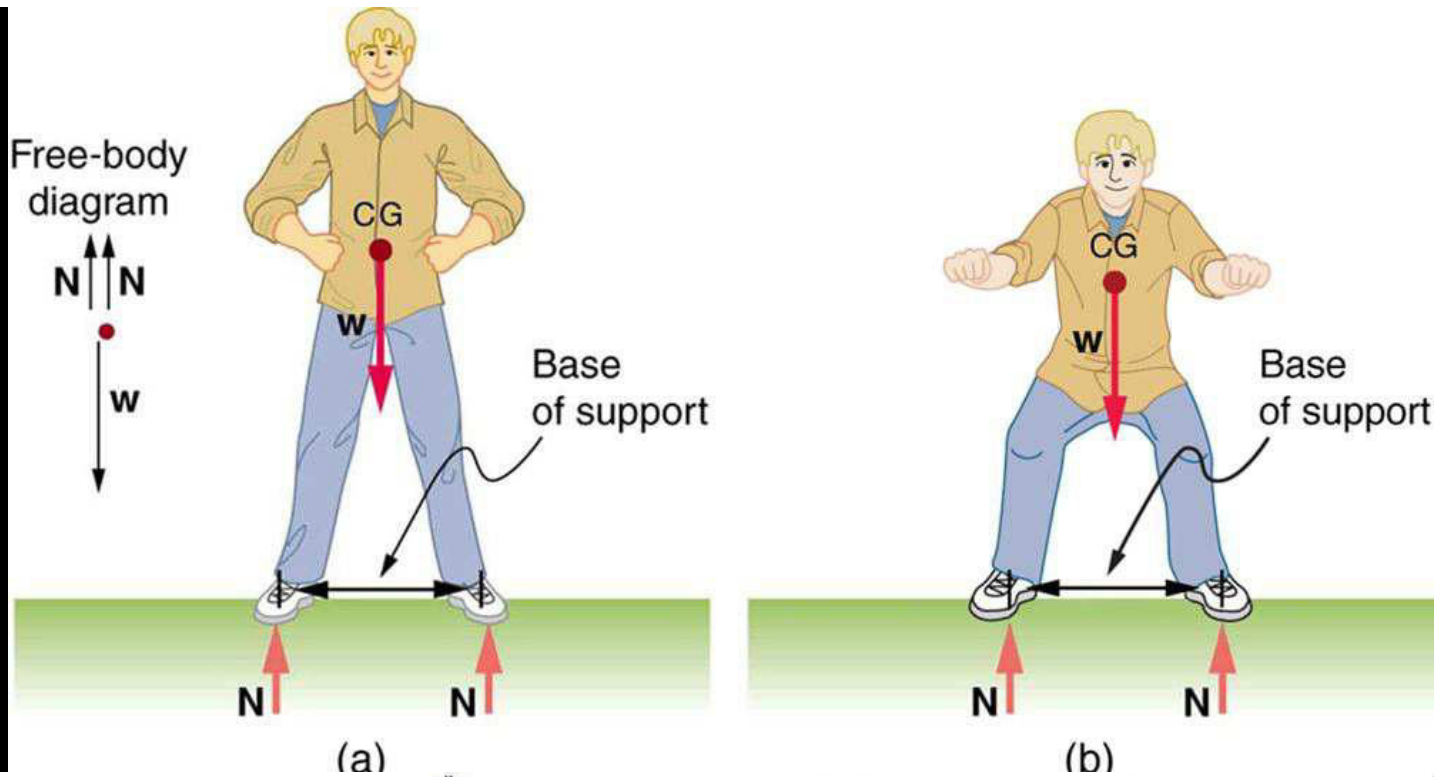
**Figure 6.** Right and left vertical ground reaction forces for the same subject as in Figures 4 and 5. These forces fluctuate several percent about 50% and are completely out of phase, which indicates that one limb unloads instantaneously as the other loads. Mechanically, this means a tight coupling at each of the joints. Note the shape of these waveforms are the same as  $COP_{net}$  in Figure 5, indicating the fact that a load/unload mechanism by the hip abductors/adductors is controlling  $COP_{net}$  in the M/L direction.



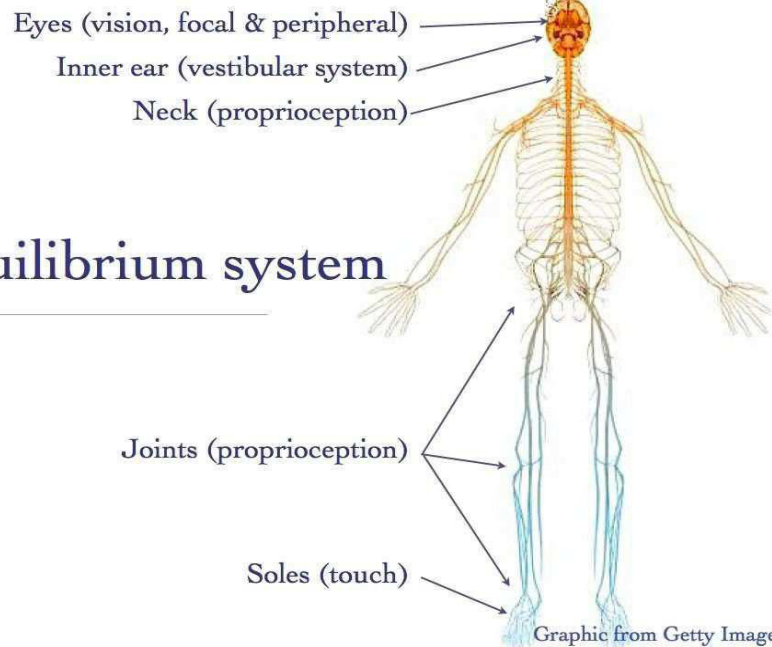
**Figure 10.** Displacement of the COM of the body as a result of a 10 N m applied for 300 ms at the ankle (ankle strategy), at the hip (hip strategy), and at both the ankle and hip (combined strategy).



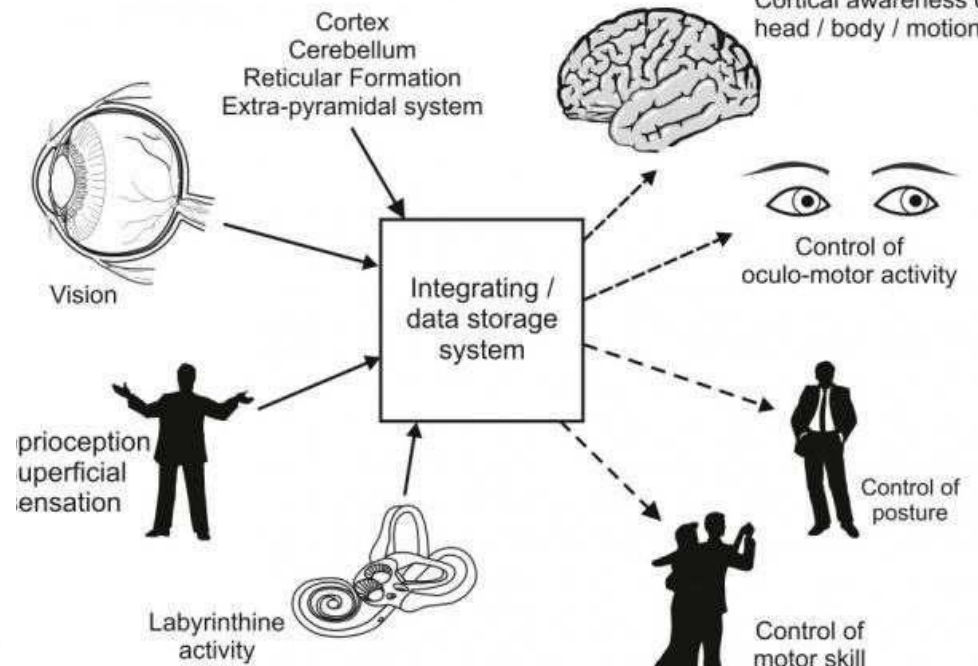
**Figure 1.** A subject swaying back and forth while standing quietly on a force platform. Five different points in time are described, showing the centre of gravity ( $g$ ) and the centre of pressure ( $p$ ) locations along with the associated angular accelerations ( $\alpha$ ) and angular velocities ( $\omega$ ). See text for detailed description.



Cortical awareness of head / body / motion



## Equilibrium system



## **Role of body-worn movement monitor technology for balance and gait rehabilitation.**

[Horak F](#)<sup>1</sup>, [King L](#)<sup>2</sup>, [Mancini M](#)<sup>3</sup>.

### **Author information**

#### **Abstract**

This perspective article will discuss the potential role of body-worn movement monitors for balance and gait assessment and treatment in rehabilitation. Recent advances in inexpensive, wireless sensor technology and smart devices are resulting in an explosion of miniature, portable sensors that can quickly and accurately quantify body motion. Practical and useful movement monitoring systems are now becoming available. It is critical that therapists understand the potential advantages and limitations of such emerging technology. One important advantage of obtaining objective measures of balance and gait from body-worn sensors is impairment-level metrics characterizing how and why functional performance of balance and gait activities are impaired. Therapy can then be focused on the specific physiological reasons for difficulty in walking or balancing during specific tasks. A second advantage of using technology to measure balance and gait behavior is the increased sensitivity of the balance and gait measures to document mild disability and change with rehabilitation. A third advantage of measuring movement, such as postural sway and gait characteristics, with body-worn sensors is the opportunity for immediate biofeedback provided to patients that can focus attention and enhance performance. In the future, body-worn sensors may allow therapists to perform telerehabilitation to monitor compliance with home exercise programs and the quality of their natural mobility in the community. Therapists need technological systems that are quick to use and provide actionable information and useful reports for their patients and referring physicians. Therapists should look for systems that provide measures that have been validated with respect to gold standard accuracy and to clinically relevant outcomes such as fall risk and severity of disability.

## **Sports injuries in footballers related to defects of posture and body mechanics.**

[Watson AW](#)<sup>1</sup>.



OH DIOS MÍO!  
A BIRD'S EYE VIEW

[J Athl Train](#). 2014 Mar-Apr;49(2):181-91. doi: 10.4085/1062-6050-49.2.06. Epub 2014 Feb 25.

**Bilateral improvements in lower extremity function after unilateral balance training in individuals with chronic ankle instability.**

[Hale SA](#)<sup>1</sup>, [Fergus A](#), [Axmacher R](#), [Kiser K](#).

[Med Sci Sports Exerc](#). 2008 Aug;40(8):1522-8. doi: 10.1249/MSS.0b013e31817356d6.

**Biomechanics of ankle instability. Part 2: Postural sway-reaction time relationship.**

[Mitchell A](#)<sup>1</sup>, [Dyson R](#), [Hale T](#), [Abraham C](#).

[Foot Ankle Int](#). 2014 Oct;35(10):1068-74. doi: 10.1177/1071100714539657. Epub 2014 Jun 18.

**Difference in postural control between patients with functional and mechanical ankle instability.**

[Chen H](#)<sup>1</sup>, [Li HY](#)<sup>1</sup>, [Zhang J](#)<sup>1</sup>, [Hua YH](#)<sup>2</sup>, [Chen SY](#)<sup>1</sup>.

[J Sport Rehabil](#). 2015 May;24(2):156-62. doi: 10.1123/jsr.2013-0137. Epub 2014 Oct 30.

**Effects of 1 week of unilateral ankle immobilization on plantar-flexor strength, balance, and walking speed: a pilot study in asymptomatic volunteers.**

[Caplan N](#)<sup>1</sup>, [Forbes A](#), [Radha S](#), [Stewart S](#), [Ewen A](#), [St Clair Gibson A](#), [Kader D](#).

## **Injury risk factors, screening tests and preventative strategies: a systematic review of the evidence that underpins the perceptions and practices of 44 football (soccer) teams from various premier leagues.**

McCall A<sup>1</sup>, Carling C<sup>2</sup>, Davison M<sup>3</sup>, Nedelec M<sup>1</sup>, Le Gall F<sup>4</sup>, Berthoin S<sup>5</sup>, Dupont G<sup>1</sup>.

### **Author information**

#### **Abstract**

**PURPOSE:** To systematically review the scientific level of evidence for the 'Top 3' risk factors, screening tests and preventative exercises identified by a previously published survey of 44 premier league football (soccer) teams. Also, to provide an overall scientific level of evidence and graded recommendation based on the current research literature.

**METHODS:** A systematic literature search (Pubmed [MEDLINE], SportDiscus, PEDRO and Cochrane databases). The quality of the articles was assessed and a level of evidence (1++ to 4) was assigned. Level 1++ corresponded to the highest level of evidence available and 4, the lowest. A graded recommendation (A: strong, B: moderate, C: weak, D: insufficient evidence to assign a specific recommendation) for use in the practical setting was given.

**RESULTS:** Fourteen studies were analysed. The overall level of evidence for the risk factors previous injury, fatigue and muscle imbalance were 2++, 4 and 'inconclusive', respectively. The graded recommendation for functional movement screen, psychological questionnaire and isokinetic muscle testing were all 'D'. Hamstring eccentric had a weak graded 'C' recommendation, and eccentric exercise for other body parts was 'D'. Balance/proprioception exercise to reduce ankle and knee sprain injury was assigned a graded recommendation 'D'.

**CONCLUSIONS:** The majority of perceptions and practices of premier league teams have a low level of evidence and low graded recommendation. This does not imply that these perceptions and practices are not important or not valid, as it may simply be that they are yet to be sufficiently validated or refuted by research.



**Correlation of ankle eversion to inversion strength ratio and static balance in dominant and non-dominant limbs of basketball players.**

Dabadghav R. J Sports Med Phys Fitness. 2015.

# PREVENCION REHABILITACION

## Aplicaciones prevencion readaptacion especificas

[BMC Musculoskelet Disord](#). 2014 Jan 7;15:2. doi: 10.1186/1471-2474-15-2.

**The implementation effectiveness of the 'Strengthen your ankle' smartphone application for the prevention of ankle sprains: design of a randomized controlled trial.**

Van Reijen M, Vriend II, Zuidema V, van Mechelen W, Verhagen EA<sup>1</sup>.



*Br J Sports Med* 2015;49:484-488 doi:10.1136/bjsports-2013-092896

Original article

**Implementation of an App-based neuromuscular training programme to prevent ankle sprains: a process evaluation using the RE-AIM Framework**

Editor's choice

Ingrid Vriend<sup>1</sup>, Iris Coehoorn<sup>1</sup>, Evert Verhagen<sup>2</sup>



## Medicine 2.0

World Congress on Social Media, Mobile Apps, Internet / Web 2.0

*Synnott, Bleakley, Davies, Nugent. 2012*

## Validation of measures from the smartphone sway balance application: a pilot study.

Patterson JA<sup>1</sup>, Amick RZ<sup>2</sup>, Thummar T<sup>1</sup>, Rogers ME<sup>1</sup>.

### Author information

#### Abstract

**PURPOSE/BACKGROUND:** A number of different balance assessment techniques are currently available and widely used. These include both subjective and objective assessments. The ability to provide quantitative measures of balance and posture is the benefit of objective tools, however these instruments are not generally utilized outside of research laboratory settings due to cost, complexity of operation, size, duration of assessment, and general practicality. The purpose of this pilot study was to assess the value and validity of using software developed to access the iPod and iPhone accelerometers output and translate that to the measurement of human balance.

**METHODS:** Thirty healthy college-aged individuals (13 male, 17 female; age =  $26.1 \pm 8.5$  years) volunteered. Participants performed a static Athlete's Single Leg Test protocol for 10 sec, on a Biodex Balance System SD while concurrently utilizing a mobile device with balance software. Anterior/posterior stability was recorded using both devices, described as the displacement in degrees from level, and was termed the "balance score."

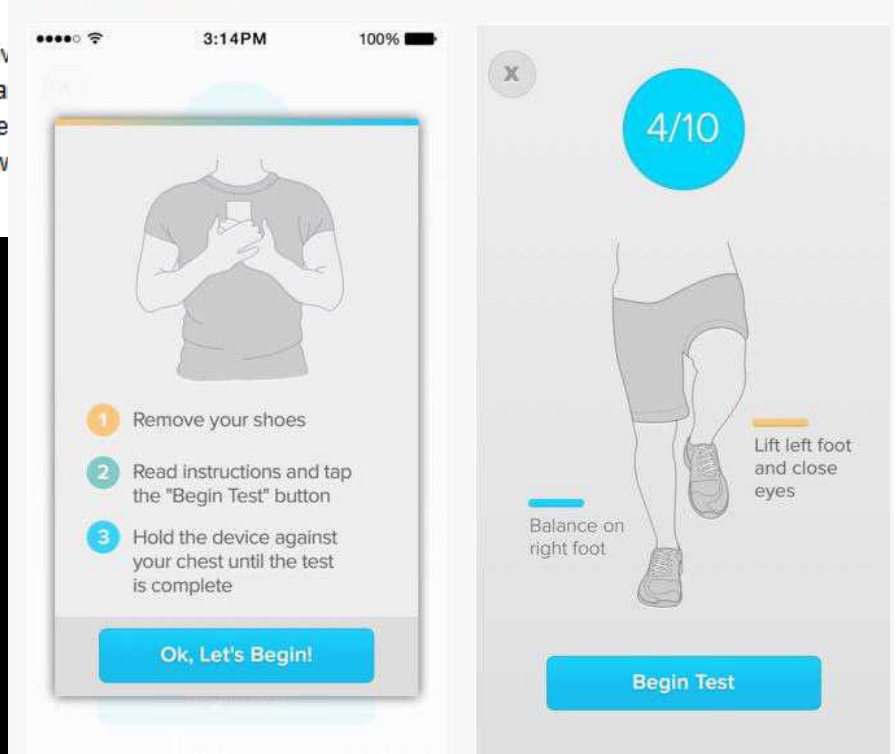
**RESULTS:** There were no significant differences between the two reported balance scores ( $r = 0.949$ ). Mean balance score on the balance platform was  $1.41 \pm 0.90$ , as compared to  $1.38 \pm 0.72$  using the mobile device.

**CONCLUSIONS:** There is a need for a valid, convenient, and cost-effective tool to objectively measure balance. Balance scores derived from the Smartphone accelerometers were consistent with balance scores derived from the Biodex Balance System. However, further investigation is necessary as this version of the mobile software is currently only available for the iPhone. Additionally, further testing is necessary on a healthy populations and as well as those with balance impairments.

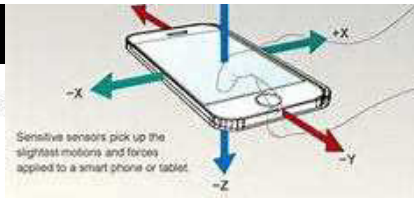
**LEVEL OF EVIDENCE:** Level 2b (Observational study of validity)(1.)

IPHONE

#### iPhone Screenshot







## Reliability and Validity of the Postural Balance Application Program Using the Movement Accelerometer Principles in Healthy Young Adults

Seong-doo Park<sup>1</sup>, MSc, PT, Ji-seon Kim<sup>2</sup>, MSc, PT, Suh-yeop Kim<sup>3</sup>, PhD, PT

<sup>1</sup>Dept. of Physical Therapy, Woosuk University Oriental Hospital,

<sup>2</sup>Dept. of Physical Therapy, Yuseong Hanjajok Rehabilitation Hospital,

<sup>3</sup>Dept. of Physical Therapy, College of Natural Science, Daejeon University

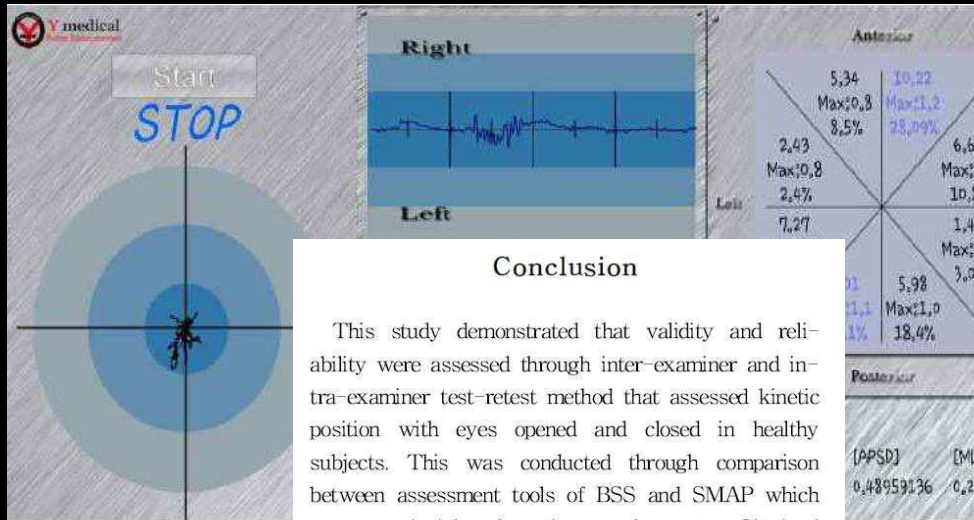


Figure 2.

### Conclusion

This study demonstrated that validity and reliability were assessed through inter-examiner and intra-examiner test-retest method that assessed kinetic position with eyes opened and closed in healthy subjects. This was conducted through comparison between assessment tools of BSS and SMAP which uses a principle of motion accelerometer. Obtained coefficients of intraclass correlation of SMAP through intra-examiner test-retest methods based on built in SMAP displayed high levels of reliability in both static and kinetic balance while displaying high levels of reliability with BSS indicated by coefficient of intraclass correlation. Based on this result, it is assumed that the program will be practical considering that SMAP created results similar to that of BSS through balance assessment in EOSML, EODA, EODML, ECDAP, and ECDML and it has an ability to assess overall, rear and front, and left and right balance in static and kinetic condition with eyes opened.



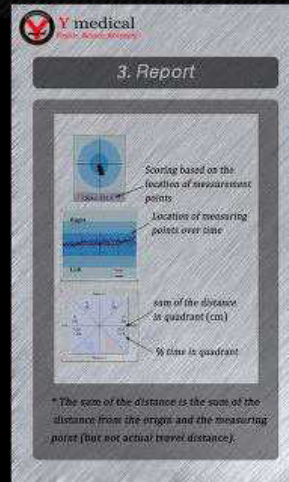
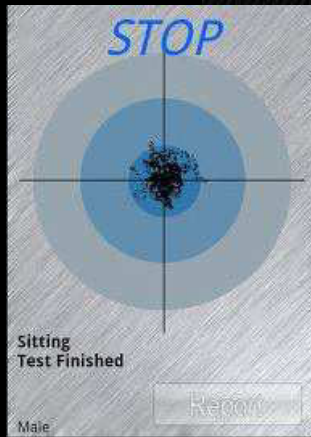
Figure 3. Biodex stability system and Smartphone measurement.



# Y medical

## Posture, Balance, movement

4,45€



Balance Test



**Balance**

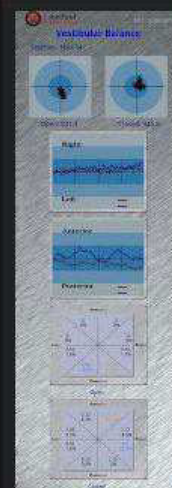
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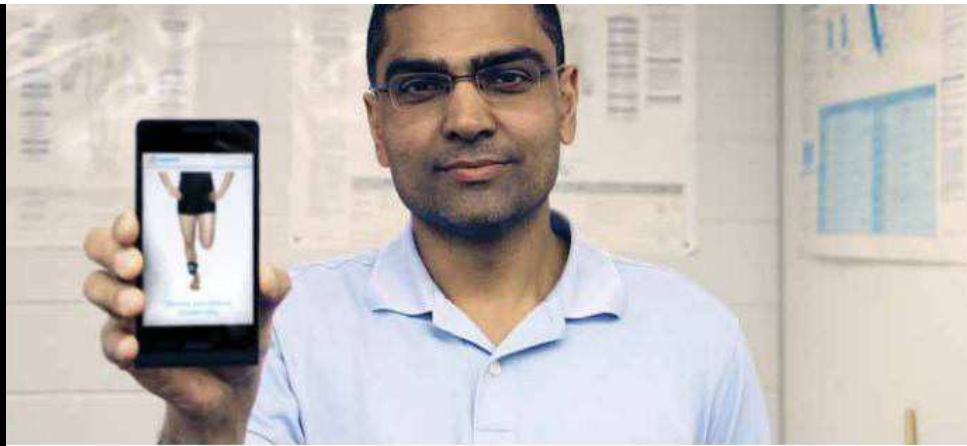
Gender:  Male  Female

Age:

**ASSESSMENT**

Physio tools  
Posture, Balance, Movement





<http://www.myankle.ca/>

## Finding balance with a new mobile app

A new way to measure balance is right in your pocket.

Together with his colleagues, Nirtal Shah, a master's student and physiotherapist at the David L. MacIntosh Sport Medicine Clinic, has created the myAnkle application (app). Using a smartphone's accelerometer – the feature that detects when a user tips or turns a device – myAnkle is able to detect the stability of a user's leg by simply tucking a smartphone into a sock.

The app is the result of a course Shah enrolled in three years ago, offered by the Department of Electrical and Computer Engineering. Focused on mobile app creation, the course (ECE1778) paired master's students with computer-programming skills with those from non-programming disciplines. The goal was to create an app that would enhance the non-programming student's field of study.


Shah's focus was clear: create an easy way to track the rehabilitation of patients with lower-body injuries.

"I wanted to make health care accessible," said Shah, "to be able to pass on information in a normal, reliable way and let people measure their own progress."

The app is free and all users have the option of participating in valuable research. It's also a useful tool for clinicians who typically rely on visual assessments.

"Newer phones measure 100 times per second through the accelerometer," said Shah. "Using that measurement over 30 seconds gives a much better assessment of a client's balance than I can."

The app is quite an achievement for Shah, who thanks his colleagues for their dedication to the project. Engineers Ivan So and Lyndon Carvalho, Professor Jonathan Rose and his PhD student Braiden Brousseau, and undergraduate student Vivian Liu were instrumental in the creation of this tool.

To download the free app, visit the Google Play store. –SR 

Nirtal Shah's new mobile app measures balance with a smartphone's accelerometer.

On January 15, 2014, MyAnkle was released on the Google Play Store. This first release allows people to measure their good ankle's stability, and to compare it with the their injured ankle, and thereby to track its progress over time. The app also sends anonymous information on the measurements back to our servers.

# The Centre for Inter-Disciplinary Mobile Software and Hardware

In the University of Toronto

## Story behind the app

We didn't start off in a basement or a garage and none of us dropped out of high school or university to start myAnkle. Our team consists of a physical therapist, engineers and researchers who all work at the University of Toronto. myAnkle started as a project dreamed up in a graduate course and has evolved to become an app capable of objectively measuring your balance in order to increase the quality of home rehabilitation and thus your overall recovery from ankle injuries. We wanted to make physical therapy and balance measurements accessible to everyone by using the capabilities of a smartphone.

myAnkle is a way to change the way physical therapy and rehabilitation are provided and accessed. We don't believe that rehabilitation from injuries should be a luxury for those who can afford it we believe that it should be available to everyone. We are currently conducting research to determine the validity and reliability of myAnkle compared to expensive laboratory equipment and so far the results look very promising.



**Braiden Brousseau**  
Lead Developer  
Ph.D. Candidate ECE UofT



**Nirtal Shah**  
Physiotherapist  
Faculty of Kinesiology, UofT



**Jonathan Rose**  
Professor of ECE, UofT  
Director of Cimsah

### ? Why was myAnkle created?

During the past 12 years working as a physical therapist, I often assess and treat patients with balance problems. I currently assess patients' balance by watching them perform balance exercises and scoring them on simple scales that tell me how good their balance is. The unfortunate thing about this method is that my patients can't measure balance on their own. As a result, people may not do balance exercises because they do not know when they are improving and they can't track their progress. myAnkle is the solution to this problem: people (patients and clinicians) can now measure and improve their balance with the use of this app.

### ? What does my Balance Number really mean?

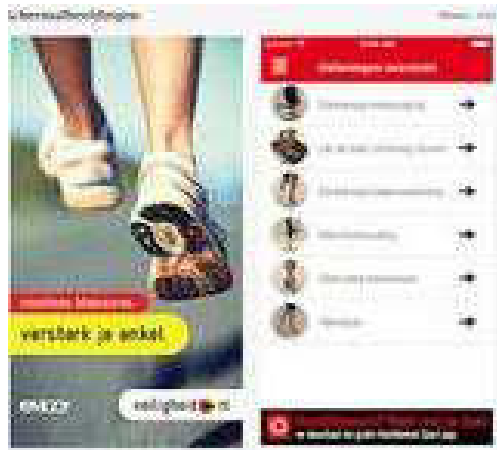
The BN or Balance Number is your average acceleration for a specific balance exercise. Acceleration is how much your velocity changed divided by time. Velocity is how fast you are moving in a certain direction. The equation for average acceleration is: Average Acceleration = Change in velocity / time. myAnkle calculates your acceleration several times per second to determine an average acceleration. By applying average acceleration to balance exercises, the lower your average acceleration or your BN, the better you performed on a balance exercise.

### ? Is myAnkle really free?

Yes!

### ? How is the phone able to measure balance?

myAnkle uses the accelerometer within your mobile phone to measure balance. An accelerometer is a device which measures acceleration in three planes of movement (x, y and z). These planes represent movement up and down, side to side, and back and forth. myAnkle takes these numbers and gets the average acceleration for every exercise that you perform. Accelerometers have been used in clinical practice and in research to quantify human movement. myAnkle is simply taking this concept and allowing anyone with a smartphone to be able to do what clinicians and researchers already do. Yes, the accelerometer in your mobile phone is not as expensive and fancy as the ones that are used in research labs but based on some preliminary results of our research, we are finding that even the accelerometer in your mobile phone is quite good at determining your balance.



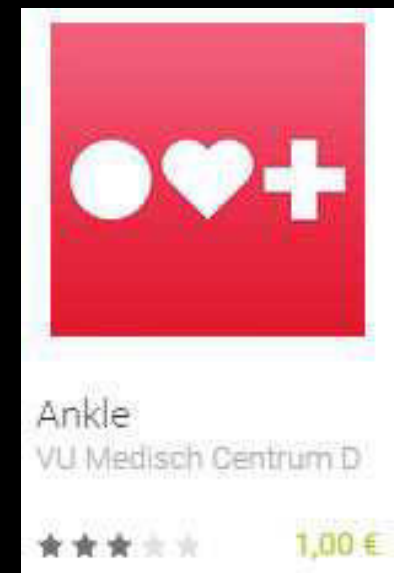
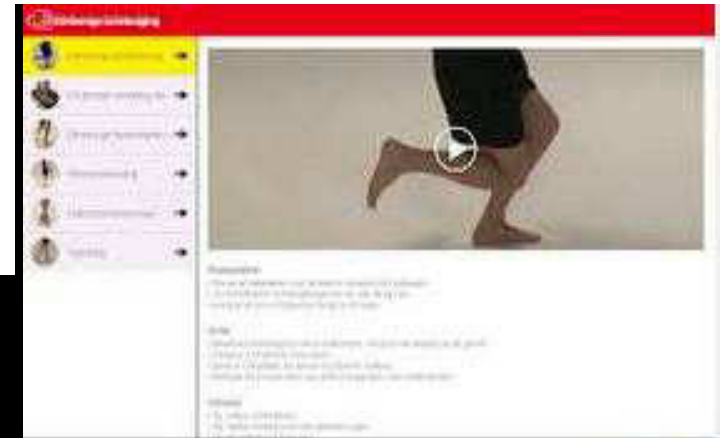
Br J Sports Med 2015;49:484-488 doi:10.1136/bjsports-2013-092896

Original article

## Implementation of an App-based neuromuscular training programme to prevent ankle sprains: a process evaluation using the RE-AIM Framework

Editor's choice

Ingrid Vriend<sup>1</sup>, Iris Coehoorn<sup>1</sup>, Evert Verhagen<sup>2</sup>



## 2BFIT PROPIO TOBILLO



Exc	Difficulty level	Exc	Difficulty level
A	1. on even surface 2. on even surface; eyes shut 3. on balance board	E	1. on even surface; with handhold 2. on even surface; without handhold 3. on even surface; eyes shut and without handhold 4. on balance board
B	1. on high surface; with handhold 2. on high surface; without handhold	F	1. on even surface; walking 2. on even surface, jumping
C	Same 3 levels as exercise A.		
D	Same 3 levels as exercise A.		

	Week 1		Week 2		Week 3		Week 4		Week 5		Week 6		Week 7		Week 8									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
B	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
C	1	1	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
D	1	1	1	1	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
E	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	4	4	4	4	4	4	4	4
F	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2

[BMC Musculoskelet Disord.](#) 2008 May 20;9:71. doi: 10.1186/1471-2474-9-71.

**The 2BFit study: is an unsupervised proprioceptive balance board training programme, given in addition to usual care, effective in preventing ankle sprain recurrences? Design of a randomized controlled trial.**

Hupperets MD<sup>1</sup>, Verhagen EA, van Mechelen W.

[Am J Sports Med.](#) 2004 Sep;32(6):1385-93. Epub 2004 Jul 20.

**The effect of a proprioceptive balance board training program for the prevention of ankle sprains: a prospective controlled trial.**

Verhagen E<sup>1</sup>, van der Beek A, Twisk J, Bouter L, Bahr R, van Mechelen W.

Mila esker!!

