THE MATRIXX POWER SUIT CO. LLC

Presents

Wearable Wellness Technology That Improves Your Health & Performance

Private Research Study
By Dr. Bijan Najafi PhD
Baylor College of Medicine

Global Wellness Summit 2017
Private Research Study conducted by:

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Dr. Najafi is currently conducting an in-house study at Baylor with Matrixx technology. He is using game-based exercise combined with Matrixx technology to magnify benefits of several interactive and personalized Balance training interventions for in-hospital, in-clinic, and in-home body and mind exercises for Diabetes Patients with pain, balance problems and lost feeling in the feet and ankles.
“Demography is destiny“
August Compte, 1798-1857

- By 2015, one in five people will be aged 60+ in the world, they will outnumber people under 14!
Every second, an older adult falls in the US

Every 1 second
An older adult falls every second of every day.

Every 20 minutes
An older adult dies from a fall in the US. Many more are injured.

1 in 4
One in four older adults reported a fall in 2014.

$31 billion
Annual direct medical expenses for older adult falls cost over $31 billion, these costs will surge unless preventive measures are adopted.

#1
Falls are the # cause of hip fractures.

http://www.cdc.gov/steadi, Stopping Elderly Accidents, Deaths & Injuries (STEADI) (updated on Oct 12, 2016)
Non-communicable disease (NCDs) have become the leading cause of global mortality (60%).

Zarocostas J. Non-communicable diseases must have greater priority, says WHO [news]. BMJ 2009;339:b2857. doi:10.1136/bmj.b2857
Annual cost of Diabetes in USA is $322b

**US$ billions, 2015**

- Walmart: 485.9
- Diabetes: 322
- Berkshire: 223.6
- Apple: 215.6
- ExxonMobile: 205

**Global Direct cost of Diabetes (2016)**

**Cost of Diabetes Compared to National Economies**

- Australia: 1,205
- Mexico: 1,045
- Indonesia: 932
- Turkey: 857
- Diabetes: 825
- Netherlands: 770
- Switzerland: 660
- Saudi Arabia: 646

Sanofi

Harvard T.H. Chan School of Public Health
Diabetes increases risk of falling

- **Individuals with diabetes are prone to fall** for reasons such as decreased sensorimotor function, musculoskeletal/neuromuscular deficits, foot and body pain, pharmacological complications, and specialty (offloading) footwear devices.

- **High risk of fall** in the diabetic peripheral neuropathy (DPN) population, with an overall incidence of **1.25 fall/person-year**, 5-12 times higher than general older adults.

- Over 70% of adults, age 65+ with diabetes reported **a mobility limitation**, which will limit their ability to treatment management like wearing offloading for the purpose of wound healing.

Najafi et al (2012), Diabetes Management
How to explain poor balance in diabetes patients

How underlying balance mechanism alters with diabetes based on dependency on sensory feedback?

- **Central-control:** Central mechanism in longer intervals of body sway by recruiting sensory feedback from visual, vestibular and/or somatosensory systems

- **Local-control:** Local postural muscle control works without recruiting sensory feedback by setting an activity level required for postural muscles to control the short-term body fluctuations

Toosizadeh,…, Najafi (2015), PLOS ONE
By practice, our Brain learns how to deftly and robustly command motor activation patterns that allow us to talk and sing; sit and stand; run and jump; and throw and catch - often without even paying attention or receiving any information from sensory feedback.
Balance Training
~ Conventional Methods

- **Physiotherapy**
  
  Aerobic exercise, Resistance exercise, and Flexibility exercise

  • The major gap in conventional exercise programs is lack of **brain exercise**

  • The conventional exercise programs do not provide interactive motor-error information to assist the patient to compensate motor-deficit via perception of errors in particular among those with sensory deficits (e.g. diabetes with neuropathy complication)

Najafi, Patel, Armstrong (2017), Contemporary Diabetes (Series Ed.: A. Veves)
“Exercise Programs to Improve Quality of Life and Reduce Fall Risk in Diabetic Patients with Lower Extremity Disease”
Balance Training
~ Conventional Methods

- Foot & Ankle Exercises

While these exercises are effective and suitable for those with poor balance, it lacks of **brain exercise**

Schwenk, …, Najafi (2013), JAPMA
Balance Training
~ Conventional Methods

Motor-Cognitive Exercises
Tai-Chi, Yoga, Pilates exercise, etc...

- These exercises include cognitive exercise and has been demonstrated to be more effective than conventional exercise in patients with cognitive problems (e.g. Stroke, diabetes, etc...). But they are not suitable for frail patients and in-home applications.

Najafi, Patel, Armstrong (2017), Contemporary Diabetes (Series Ed.: A. Veves) “Exercise Programs to Improve Quality of Life and Reduce Fall Risk in Diabetic Patients with Lower Extremity Disease”
Balance Training
~ Conventional Methods

- Instrumental Exercises
  - Weight Shifting, Virtual Reality Walking,

- Recent advances in technologies open new doors for designing personalized and game-based exercise programs, which include both body and mind exercises. But they are expensive and unsuitable for home-based exercise programs

Najafi, Patel, Armstrong (2017), Contemporary Diabetes (Series Ed.: A. Veves)
“Exercise Programs to Improve Quality of Life and Reduce Fall Risk in Diabetic Patients with Lower Extremity Disease”
New Horizon ~ Exergaming

- Entertainment & Engagement
- Perception of motor-error
- Motor-Cognitive Exercise
- Personalized Exercise – Game Level

Conventional game-system may not be safe for frail patients
Sensor-based (wearable) balance training could be the future of home-based personalized exercise programs.
Using game-based exercise to improve motor-cognitive performance

Game-based foot and ankle exercise programs are effective to improve balance in people with diabetes

Grewal, …, Najafi (2015), Gerontology
Filling the gap by Matrixx Wearable Wellness Technology

• While recent advances in wearable and gamification have opened new avenues to deliver body and mind exercise, they lack an important exercise component: Resistive-Exercise

• Matrixx technology could be used in verities of game-based exercise to magnify benefit of these interactive and personalized balance training interventions for in-hospital, in-clinic, and in-home body and mind exercises

**Ongoing study at the Baylor College of Medicine, Houston, Texas**
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