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The authors reported no potential conflict of interest relevant to this article.

This article is an expansion of a poster session presented at the 12th annual Northeastern Ohio Universities College of Medicine Department of Surgery Resident Research Day in May 2009 and at the American College of Preventive Medicine Annual Meeting in February 2010.

Did too much Wii cause your patient's injury?

Motion-controlled game consoles like Wii may be used to play virtual sports, but the injuries associated with them are real. Here's what to watch for—and a handy table linking specific games to particular injuries.

PRACTICE RECOMMENDATIONS

› Ask patients with repetitive motion injuries (RMIs) whether they use interactive game consoles and, if so, how much time they spend playing virtual sports each day. **C**

› Be aware that RMIs associated with video game use are similar to injuries associated with the sports they simulate. **A**

› Advise patients to take the same precautions with virtual sports as they would with any physical activities, including warm-up exercises and moderation. **A**

Strength of recommendation (SOR)

- A** Good-quality patient-oriented evidence
- B** Inconsistent or limited-quality patient-oriented evidence
- C** Consensus, usual practice, opinion, disease-oriented evidence, case series

The release of the Wii—Nintendo's 4th generation gaming console—in 2006 revolutionized the video game industry. By March 31, 2010, more than 70 million units had been sold worldwide, earning Wii the title of “fastest-selling game console of all time.”¹⁻³

Today, there are several game consoles that, like Wii, allow the user not only to push buttons or move levers, but to control the game using physical movements (TABLE 1). And the devices and the many sports they simulate—once popular primarily among adolescents—are in widespread use by people of all ages, including the young and fit, out-of-shape “arm chair” athletes, and elderly people in senior housing, rehabilitation centers, and long-term care facilities alike.⁴

Not surprisingly, simulated sports play has spawned an array of repetitive motion and overuse injuries. To identify and treat them, ask all patients who present with musculoskeletal injuries whether they engage in game console sports activities; if so, identify the type of game and how much time they spend playing it each day. Although injuries associated with specific video games are often given names like “Wii-itis,”⁵ “Nintendinitis,”⁶ and “Playstation thumb,”⁷ the types of injuries caused by playing simulated sports are generally the same as (or similar to) injuries sustained by those engaging in the sport itself.

Video game pathology is well established

In 1987, Osterman et al published the first report of a musculoskeletal disorder associated with electronic games—a case of volar flexor tenosynovitis (“joystick digit”) trigger finger.⁸ Several years later, a physician coined the term “Nintendinitis” to describe video game-related overuse syndrome⁶—acute



In a review of self-reported Wii injuries, patellar dislocation was the fourth most common injury (hand lacerations were first, followed by periorbital hematoma and forehead lacerations/ecchymoses).

tendinopathy of the extensor pollicis longus tendon after prolonged play with early versions of the thumb-activated game controller.^{9,10} In 2002, a child using a vibrating Sony Playstation for up to 7 hours a day received a diagnosis of vibratory syndrome of the hand.¹¹ A few years later, a report of “Playstation thumb,” an overuse syndrome associated with later generations of game consoles, followed.⁷

Several other reports of game-related injury patterns can be found in medical journals, including pressure ulcer formation (“ulcerative Nintendinitis”),¹² the “How!” sign of central palmar blistering,¹³ “mouse elbow” secondary to epicondylitis,¹⁴ and other tendinopathies associated with various gaming consoles.^{10,15,16} All the reports clearly describe the relationship between video game use and the pathology, and clinical improvement after cessation of the activity.

Many manifestations of Wii-itis

An epidemiologic review of the National Electronic Injury Surveillance System (<http://www.cpsc.gov/library/neiss.html>) found that in the Wii’s first year, 67% of the

musculoskeletal injuries reported (29% were defined as sprains and strains and 38% as overuse injuries) involved the use of the Wii to play simulated sports.¹⁷ Overuse syndrome associated with Wii was initially called “acute Wii-itis,”⁵ a description of acute tendinopathy of the infraspinatus.¹⁸ (Infraspinatus tendinopathy is most commonly associated with games involving intense arm activity, including Wii baseball, bowling, and boxing (TABLE 2).⁵ However, Wii-itis is now widely used to describe any acute inflammatory syndrome associated with use of this popular game console.

■ **Wii knee**, for example, refers to an acute patellar dislocation associated with simulated bowling.¹⁹ Multiple cases of patellar injury, including associated osteochondral fracture, have been reported in association with a variety of game titles, including Raymond Raving Rabbids and Brunswick Pro Bowling.¹⁹ In a review of self-reported Wii injuries, patellar dislocation was the fourth most common injury (hand lacerations were first, followed by periorbital hematoma [“black eye”], and forehead lacerations/ecchymoses).²⁰

■ **Wii shoulder**, another variant of Wii-

Tendinopathy of the infraspinatus, also known as acute Wii-itis, involves pain and weakness associated with active external rotation of the arm.

TABLE 1

Popular motion-controlled games: A partial list

| | Type of game console | | |
|-------------------------------------|---|---|---|
| | Nintendo: Wii | Microsoft Xbox 360: Kinect | Sony Playstation 3: Move |
| Motion-control mechanism | Handheld remote | Full body | Handheld remote |
| Games bundled with console | Wii Sports | Kinect Adventures | PS3 Sports Champions |
| Popular games | Wii Fit Wii Play Mario Kart Super Smash Bros Brawl Guitar Hero III: Legends of Rock | Kinect Sports Dance Central Your Shape: Fitness Evolved The Biggest Loser: Ultimate Workout Kinectimals | Sports Champions Time Crisis: Razing Storm Killzone 3 Little Big Planet 2 Sorcery |
| Manufacturer-recommended game space | ≤6 feet using wireless sensor | ≥6 feet from device | ≥6 feet from device |

Sources: 1. Nintendo (<http://www.nintendo.com/consumer/wiisafety.jsp>). 2. Microsoft Xbox 360 (<http://www.xbox.com/en-US/Kinect/PrivacyandOnlineSafety>). 3. Sony Playstation (<http://us.playstation.com/support/answer/index.htm>).

itis, is an acute inflammation of the upper extremity musculature after repetitive motion. This injury is most often associated with games that require swinging of the controller, such as Wii tennis or bowling. Upper extremity magnetic resonance imaging (MRI) of one Wii enthusiast revealed inflammatory swelling of the shoulder joint that extended to the suprascapular region, corresponding to a diagnosis of delayed-onset muscle soreness (DOMS).⁹

■ **DOMS**, which is often associated with acute injury patterns, is a well-accepted diagnosis among patients who play physically interactive sports and, by extension, video games.¹⁷ Usually lacking frank deformity on plain radiographs, DOMS is a disorder of the soft tissue that can best be visualized with MRI delineation of tissue planes and musculature compartments. Clinical signs and symptoms of DOMS can include edema of the affected extremity, rubor, and tenderness to palpation during active range of motion. Treatment for DOMS, like all RMIs, includes cessation of the offending activity.

Another recently reported variant of Wii-itis is the acute onset of carpal tunnel syn-

drome²¹ after playing Wii bowling for long periods of time. The case involved a 19-year-old woman who presented with swelling over the volar wrist and had positive Tinell and Phalen signs. She received conservative treatment with etodolac, a nightly volar splint, cold compresses, and rest.

■ **Achilles Wii-itis** refers to a partial or complete rupture of the Achilles tendon during simulated sports activity.²² This injury has been reported in people using the Wii Fit exercise pad for virtual running and stretching, and is diagnosed clinically with a positive Thompson sign (failure to plantar flex the foot while compressing the gastrocnemius). Complete Achilles rupture requires surgical repair, but less severe cases can be treated conservatively, with cold compresses, lifestyle modification, and nonsteroidal anti-inflammatory drugs (NSAIDs).

Categorizing Wii-type injuries

Game-related injuries typically fall into 4 broad categories: tendinopathy, bursitis, enthesitis, and epicondylitis. (See TABLE 2 for

TABLE 2

Repetitive motion injuries (and possible causes)*30,36

| Type of injury | Games with potential for injury† | Possible injury sites | Common physical exam findings |
|----------------|---|--|--|
| Tendinopathy | Guitar Hero III: Legends of Rock The Legend of Zelda: Twilight Princess Wii Fit | Achilles tendon Patella Supraspinatous Forearm Extensors | Pain or stiffness in the local area of the tendon. Progression can lead to redness and swelling at the joint of the inflamed tendon |
| Bursitis | Kinect Sports: Soccer Dance Dance Revolution Star Wars: The Clone Wars Wii Fit | Subacromial bursa Trochanteric bursa Patellar bursa | Burning pain over the joint during and after activity, with delayed-onset joint stiffness due to local inflammation |
| Enthesitis | Wii Sports Sports Champions Kinect Sports | Achilles tendon Tuberosity of the tibia Iliac crest | Pain at joint on palpation or during range-of-motion exam. Calcification or fibrosis can be identified in chronic, nonacute presentations that are generally autoimmune mediated |
| Epicondylitis | Wii: Major League Baseball Grand Slam Tennis Tiger Woods PGA Tour | Olecranon process, lateral epicondyle (tennis elbow) | Point tenderness over the lateral epicondyle with acute pain on arm extension |
| | | Olecranon process, medial epicondyle (golf elbow) | Point tenderness over the medial epicondyle with acute pain on wrist flexion or resisted forearm pronation |

*The authors have included games that, in their opinion, have the potential for injury based on the biomechanics involved (eg, running, jumping, waving, etc).

†Many of these games are bundled and incorporate multiple activities (eg, baseball, bowling, boxing, soccer, track and field, tennis, volleyball).

a list of games with the potential to cause particular types of injuries.)

■ **Tendinopathy.** Overuse tendon injuries, or tendinopathies, account for up to 50% of all sports-related injuries.²³ By extrapolation, physically interactive game systems that simulate actual sports can be expected to increase tendon overuse injuries.

Most major tendons are vulnerable to overuse injury, including the Achilles (FIGURE), as noted earlier; and the patellar, rotator cuff, and forearm extensor tendons, among others. Repetitive motion, or strain, injuries to these tendons are often thought to be cumulative, with hypoperfusion, local inflammation, and neuropathy contributing to the degree of tendinopathy. Other risk factors for tendon injury include age and sex (men have a higher relative risk than women; older people, in their fourth and fifth decades of life, also face an increased risk), postmeno-

pausal status, obesity, use of fluoroquinolone antibiotics or corticosteroids, and playing on nonpadded surfaces.²⁴⁻²⁹

Conservative therapy, with cessation of the offending activity and rest of the affected extremity, is the initial treatment of choice for tendinopathy. Severe cases of compound injuries or tendon reinjury can also be treated with splinting, taping, cryotherapy, electrotherapy, deep tissue tendon massage, pharmaceuticals (NSAIDs and corticosteroid injections), and early rehabilitation.^{15,30} Surgery may eventually be required to remove fibrotic tissue, modify the vascularity, or reconstruct the tendon.¹⁵

■ **Bursitis.** Bursitis is characterized by inflammation of the subacromial, olecranon, trochanteric, prepatellar, suprapatellar, infrapatellar, pes anserine, or iliotibial bursa—synovial-lined cavities overlying bony prominences that minimize the friction of

FIGURE
Achilles tendon injury



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An MRI reveals anterior bulging and thickening of the Achilles tendon (arrow)—the type of injury you might see in a patient using the Wii Fit exercise pad for running and stretching.

movement.³¹ Patellar and olecranon bursitis are most frequently associated with sports, particularly soccer and golf.

Clinically characterized by pain on flexion, bursitis can also present with localized tenderness, stiffness, and swelling of the affected joint. Bursitis generally responds to RICE (rest, ice, compression, elevation) therapy, but can potentially advance to a chronic disease state if the activity that caused the inflammation continues.³¹

■ **Enthesitis.** Characterized by inflammation of the bony insertions of a tendon or ligament, enthesitis is generally linked to an autoimmune disease such as ankylosing spondylitis or rheumatoid arthritis. But it can also be an acquired condition associated with repetitive motion. Sports-related activity is the most common cause of acquired enthesitis,³² with injury most likely to occur at the Achilles tendon, the insertion point of the tibial tuberosity, or the iliac crest.³³ Like most RMIs, acquired

enthesitis can usually be treated simply by stopping the offending activity. If not properly recognized or treated, however, permanent injury can occur.³⁴

■ **Epicondylitis.** This RMI results in pain or ipsilateral weakness of the upper extremity due to repetitive strain at the musculotendinous junction and its origin at the epicondyle. Neuropraxia is often associated with epicondylitis due to posterior interosseous nerve, median nerve, or ulnar nerve involvement at either the medial or lateral epicondyles.³⁵

Commonly affecting computer users who perform repetitive motion via mouse manipulation, the term “mouse elbow” was first described in 1992.¹⁴ Golfer’s elbow (with involvement of the medial epicondyle), and tennis elbow (involving the lateral epicondyle) are also common, and individuals who frequently play simulated golf or tennis games are at risk.

Tell patients how to prevent injury

Older patients and deconditioned “arm chair” athletes who are unaccustomed to prolonged physical activity face an increased risk for injuries related to video game sports. You can help by pointing out that because simulated activities require a fraction of the strength and endurance required to play the actual sport, people who might normally tire easily are apt to overdo it.

In fact, Nintendo has a dedicated safety page regarding the use of game consoles on its Web site (<http://www.nintendo.com/consumer/wiisafety.jsp>). The company advises Wii users to take a 10- to 15-minute break every hour, even if they don’t think they need it, to prevent repetitive motion and eye-strain injuries, and to stop playing for several hours if they experience tingling, numbness, burning, or stiffness. Some software titles, including Wii Fit, are programmed to remind users to take a break after they’ve been playing nonstop for 45 minutes to an hour. You can help by reminding patients of all ages that warm-up exercises, moderation, and hydration are crucial, whether the sports they’re engaging in are virtual or real. **JFP**

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ACKNOWLEDGMENT

The authors would like to thank Dan Dunlany for his invaluable research assistance.

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