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Olympian to Novice: Using Evidenced-Based Screening for the Performing Artist

Michigan Medicine-MedSport Ann Arbor, MI
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Combined Sections Meeting – Washington, DC
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- Wife and mom to two (boy and girl).

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DISCLOSURES

No disclosures relevant to this presentation.

Contracted Consultant to Vie Fitness and Spa, Ann Arbor, MI.

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Corey Snyder, PT, DPT

No relevant disclosures to this presentation.

•Consultant for:

DESK JOCKEY

ZIMMER BIOMET

Michigan Medicine - MedSport

- Sports Medicine and Physical Therapy practice headquartered in Ann Arbor, MI
- 43,000 visits per year
- Contract with local high schools, University Athletics, and USA Hockey for athletic training and physical therapy.
- Partner with US Figure Skating and US Rugby.

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Michigan Medicine - MedSport

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MEDSPORT

- Data on MedSport here…

Learning Objectives

1. Learn the differences between screening objectives for performing arts disciplines.
2. Differentiate the common areas of deficits per discipline.
3. Explore home program ideas and progressions delivered through various platforms.
4. Integrate screening into primary prevention initiatives within your performing arts community.

Session Outline

Dance/Musical Theatre Musculoskeletal (MSK) Screening

Dance/Musical Theatre & Drama Neurological Baseline Screening

Gymnastics Screening

Music: Vocal & Instrumentalist Quick Screen

Session Outline

Skating: High Performance Movement Screen vs. STARS Combine Testing

Screening Analysis: Preliminary Findings & Trends

Home Program Instruction: Paper to App

Creating Lasting Partnerships: How to guide for your organization.

Common Thread…Food for Thought

- Analyzed what was available in the research
- Utilized this information, adapted it, or developed our own where none existed
- Look at the areas for the performing arts discipline that have the most injuries—breaking it down by body part
- Then organize screening tools that would best assess those deficits in a quick and easily reproducible manner

Musculoskeletal Screening:
Dancers and Musical Theatre Performers

Why Screen?

- Optimization of performance and wellness
- Prevention of injury and illness
- Lack of research noting effectiveness of counter measures beyond informal opinion/anecdotal evidence
- Lack of standardization in safe teaching practices
- Artistic tradition vs. modern conditioning and biomechanics dictating training
- Prospective studies demonstrate screening may have potential to decrease ACL injury rates in female athletes

Why Screen?

- To establish normative data for a specific group of dancers
- To determine if an individual possesses attributes necessary for participation in that form of dance
- To uncover pathology
- To quantify risk
- To develop characteristics for a given level of performance
- To establish individual baseline data in order to set educational and training or rehabilitative goals

Why Screen?

Distinguishing dance from sports:
- Extreme ankle and hip range of motion
- Lack of specificity and periodicity in training
- Expressive and aesthetic nature

Components of a Functionally-specific Screening tool:
- Epidemiology
- Outcomes
- Ergonomics
- Functional capacity and progressions

Supporting Information

Screening as one element of a comprehensive program including on-site care has been shown to reduce injury rates and workers' compensation claims in both a ballet and modern dance company (reference here)

Decreased incidence and severity of injuries with screening and availability of an athletic trainer for prompt attention to problems (reference here)

Screening Development

Harkness Center for Dance Injuries Screen © Marijeanne Liederbach 1989

MedSport Modifications:
- MMT Hip IR/ER
- MMT shoulder ER
- No bench step test due to integration into daily class sessions
- Providing opportunity for success and noting area of limitation—Airplane
- Rhomberg vs. BESS

Health History Questionnaire

Pre-Participation Examination (PPE)

- 1/10 athletes screened has an existing problem that merits either exclusion, further evaluation, or rehabilitation before participation
- May be the only health examinations for young athletes
- Helps to ID those with previous injury who need further rehabilitation before participation

Our PPEs:

- Michigan Medicine physicians assess Dance Freshmen
- Rule out any condition that may limit dance
- Create a point of contact with a physician for incoming students that may be from out of area

Pertinent Findings

Gaps and Limitations

General:

- Multitude screens available for general athletic population
- Not many available for performing arts
- Lack of findings of effectiveness in screenings on injury prevention
- Injury risk is likely multifactorial

Our Screening-specific:

- Timing/scheduling—academic/dance availability and SWLS affected
- Lack of follow-up
- Location and Transportation

Take Away Message

Participation in dance training is physically and psychologically demanding and injuries are an expected outcome—can we really change this risk of injury?

How can we use the data gained from our screenings?

- Guidance to an appropriate form and level of dance
- Prescribing adjunct activities to reduce injury risk
- Assistance in modification of equipment
- Identification of referral resources as needed/appropriate
- Prediction of performance

Why baseline screening for these populations?

Risk for head injury due to backstage work, combat skill training and tumbling.

- Develops positive relationship with performing artists regarding their well-being.
- Provides baseline information should future neurological injury occur.
- Similar to the MSK screening tool in that no standard screening measure existed for a performing arts specific population.

Why baseline screening for these populations?

Four reasons to have a Neurological Baseline Screen (NeuroPPE) for performing artists:

1. To establish normative data for a specific group
2. To uncover pathology
3. To quantify risk
4. To establish individual baseline data in order to set educational and training or rehabilitative goals

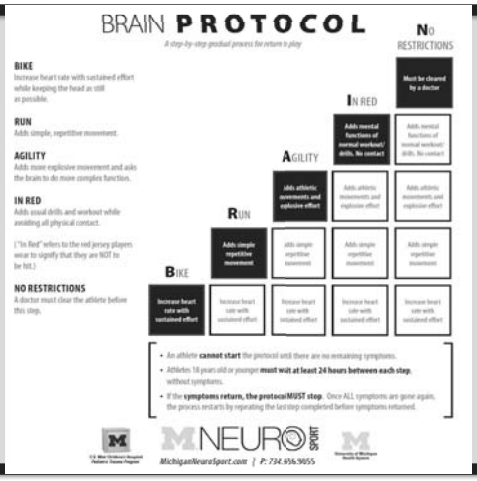
Why baseline screening for these populations?

"Begin with the end in mind…"

Recovery or return to performance/sport follows the BRAIN Protocol for our patient population

- Staged step-by-step return
- Criteria-based
- Progressively more challenging and more "specific" to their sport or performance

Why baseline screening for these populations?



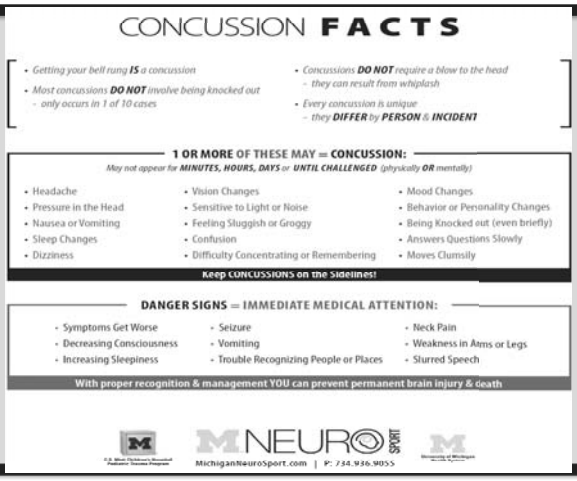
Supporting information

•Ref's

Screening Development

- Developed in partnership with NeuroSport Faculty at Michigan Medicine
- NeuroSport is a comprehensive mild-TBI/post-concussion program that utilizes sport neurology care from physicians in collaboration with physical therapy and vestibular therapy.

Screening Development



Screening Development

Best evidence points to utilizing a multifaceted screening tool that:

- Used in our practice as part of incoming freshman onboarding/orientation and then again annually throughout college career.
- Provides distinct baseline test for physical therapy and medical providers should concussion injury occur.

Screening Components

Subjective intake: Background, Prior History, Symptoms

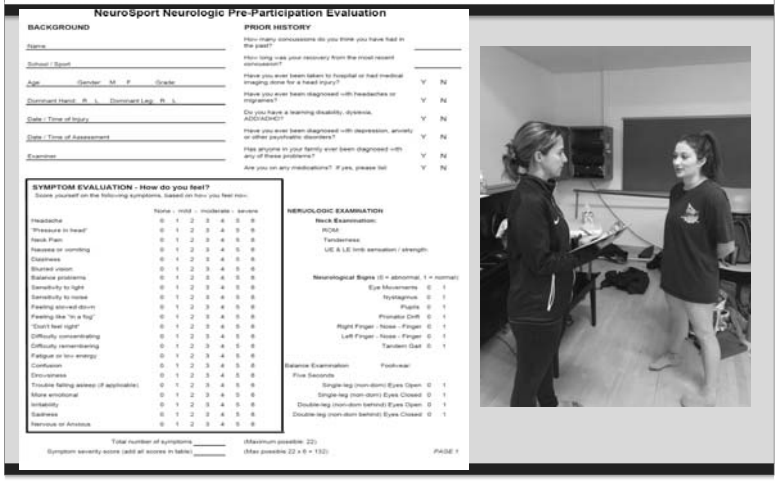
Neurological Examination

Standardized Assessment of Concussion (SAC)

Balance Error Scoring System (BESS)

Satisfaction with Life Scale (SWLS)

Screening Components


NeuroSport Neurologic Pre-Participation Evaluation

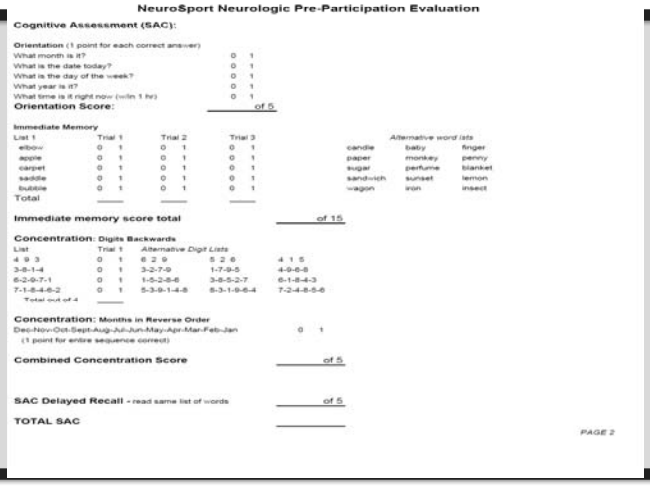
BACKGROUND

PRIOR HISTORY

SYMPTOM EVALUATION - How do you feel?

NEUROLOGIC EXAMINATION

Screening Components


NeuroSport Neurologic Pre-Participation Evaluation

Cognitive Assessment (SAC):

Orientation (1 point for each correct answer)

Orientation Score: ____ of 5

Immediate Memory

Immediate memory score total ____ of 15

Concentration: Digits Backwards

Concentration: Months in Reverse Order

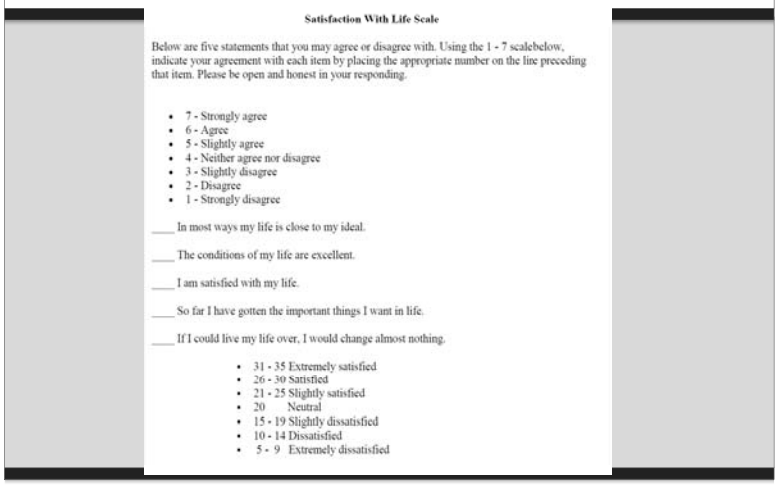
Combined Concentration Score ____ of 5

SAC Delayed Recall - read same list of words ____ of 5

TOTAL SAC ____

PAGE 2

Screening Components


Satisfaction With Life Scale

Below are five statements that you may agree or disagree with. Using the 1 - 7 scalebelow, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

- 7 - Strongly agree
- 6 - Agree
- 5 - Slightly agree
- 4 - Neither agree nor disagree
- 3 - Slightly disagree
- 2 - Disagree
- 1 - Strongly disagree

____ In most ways my life is close to my ideal.

____ The conditions of my life are excellent.

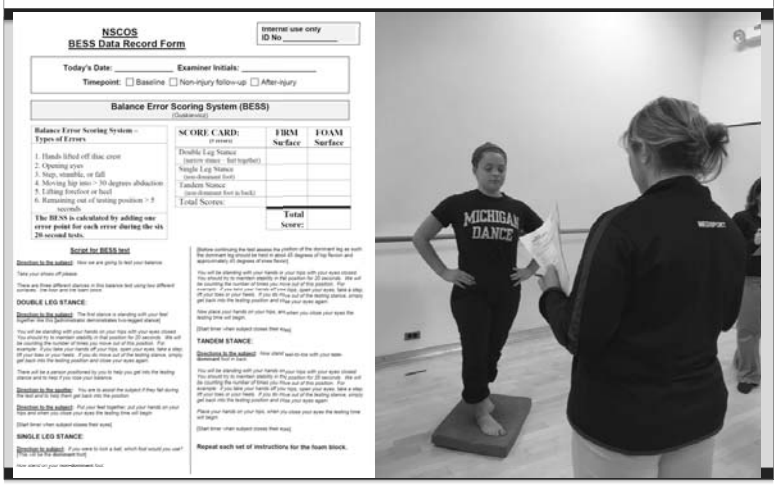
____ I am satisfied with my life.

____ So far I have gotten the important things I want in life.

____ If I could live my life over, I would change almost nothing.

- 31 - 35 Extremely satisfied
- 26 - 30 Satisfied
- 21 - 25 Slightly satisfied
- 20 Neutral
- 15 - 19 Slightly dissatisfied
- 10 - 14 Dissatisfied
- 5 - 9 Extremely dissatisfied

Screening Components


NSCOS
BESS Data Record Form

Balance Error Scoring System (BESS)

Pertinent Findings

- SWLS
- entering school w/ recent concussions
- concussions sustained during year
- BESS

Gaps and Limitations

- Screening data for neurological baselines can be inaccurate. (Testing effect)
- Testing environment
- SWLS timing
- Subjective reporting
- Follow-up

Take Away Message

- NeuroPPE can provide excellent baseline information to manage future neurologic injury.
- Testing is relatively quick and can be completed in 30 minutes or less.
- Some cross-over exists with neuromuscular balance testing for this population.
- Screening process can increase awareness of head trauma injury prevention for performing artists, choreographers, directors, etc.

Why Screen?

- Fitness levels do not match current/future needs
- Tricking into shape
- Forces that reached/exceeded tissue stress and strain limits
- Maximizing muscle strength from minimal muscle size
- Sticking landings—rules change in question
- Poor posture??? From maximum lumbar hyperextension to forward flexed spine and everted foot during landing
- EXAMPLE: Widen BOS, but if failure to absorb the landing —> Achilles rupture, anterior ankle injury/stress fx

Supporting Information

- Education breeds injury prevention
- There is no evidence from formally controlled trials or specific evaluation studies of counter-measures for gymnastics
- Steele and White were able to predict with 79% accuracy “low injury risk status” in their female gymnast athletes by assessing age, body type, body size, and posture
- So, should we screen? helps to ID gymnasts with previous injury who need further rehabilitation before participation

Screening Development

Skill level example:
Level 5 gymnast should be able to perform > 3 handstand pushups, vs Lv 6-8—checking for overdevelopment of chest mm

Per literature review, gymnastics screenings should include:
- Flexibility testing
- SLS w/ ext ROM
- Dynamic lunge test for ankle lack of DF
- MMT abdominal mm weakness?
- Isometrics→ muscular control→ dynamic movement

Screening Development: TOPS vs. GFMT?

TOPS: USAG Talent Opportunity Programs (TOPS) Test
- Multi-test battery designed to measure a gymnasts' strength, endurance, power and flexibility (W. Sands)
- Young club level gymnasts ages 7-10 years of age
- ID competitive potential/aid in the development of the US competitive gymnastics program

Screening Development: TOPS vs. GFMT?

Gymnastics Functional Measurement Tool (GFMT):
- Rope Climb test
- Jump test
- Hanging Pikes test
- Shoulder flexibility test
- Agility test
- Over-grip pullup test
- Splits Test
- Push-up test
- 20 yard sprint test
- Handstand hold test

***5-10min rest between each item

Screening Components

- Posture
- Flexibility
- Strength
- Endurance
- Stability
- Functional Testing

Pertinent Findings

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Gaps and Limitations

How it is different than GFMT--What is missing?
Limited qualitative measurement
Gross functional movements are addressed, but not broken down by muscle group or postural assessment

Take Away Message

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Postural Screening:
Vocalists and Instrumentalists

Why Screen?

- Repetitive nature of practice/training can create neuromuscular and joint symptoms in this population.

- Provides opportunity to collect data on specific population. (injury statistics)

- Provides opportunity to educate specific population about injury risk.

Supporting Information

- Numerous journal articles on the type of injuries sustained by specific instruments, vocalists, conductors, and ergonomic modifications.

- Published grading of injury severity for musicians exists.

- Generally, assessment and examination involves physical exam & screening of psychosocial factors.

Supporting Information

Functional Grading of Severity of Injury - Musicians

Grade	Description
1	Pain is limited to one site and brought on by playing the instrument.
2	Pain occurs in two or more sites with a high workload and possibly some loss of coordination. Physical signs present, however no interference with uses of the hand.
3	Pain persists away from the instrument. There is early involvement of other uses of the hand with loss of coordination and strength. Physical signs include tenderness to upper limb. Difficulty maintaining high workload.
4	Pain persists at rest, at night, or both. Musician has pain with most uses of the hand, including ADLs. A normal workload is challenging.
5	The musician has no functional use of the hand. The musical career stops or is seriously threatened.

Supporting Information

- Instrument played was significant in predicting pain or symptoms in the musician's playing lifetime and pain/symptom severity; best predictor of playing-related health problems were female gender. (ref? Wu)

- Three highest self reported contributing factors to music-related injuries for NEC students were long hours, over-practicing, and technically challenging pieces (ref)

Supporting Information

•BU students--Performing/preparing for performance, pressures from self, school requirements. (ref)

•Performing a warm up prior to playing was protective of first episode PRMD and taking breaks was protective of recurrent PRMD. (ref)

•Total hours of playing time per week during the freshman year was significant. (ref)

Screening Development

- Emphasis on quality of life/stress.
- Emphasis on posture sitting and standing.
- General screen of upper quarter and cervical thoracic mobility.
- Beighton's scale?
- Review of information published by Performing Arts Special Interest Group (APTA)

Screening Development

Prolonged seated posture—upper and lower extremity adaptations

Anterior:
- UE: pectoralis major and minor, anterior and middle scalene and SCM (shortened)
- LE: iliopsoas, rectus femoris, rectus abdominis (shortened)

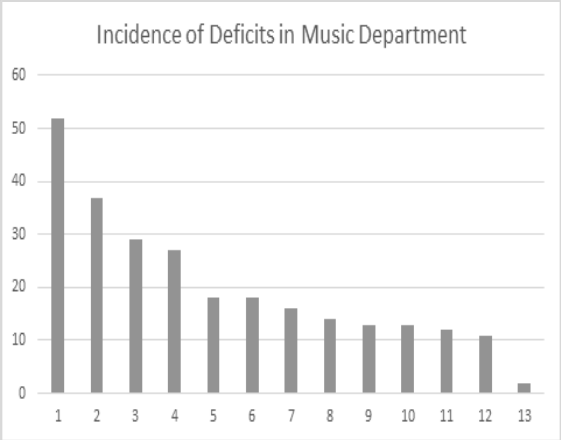
Posterior:
- UE: upper trapezius, levator scapulae, cervical paraspinals (shortened) vs. rhomboid major and minor, and thoracic paraspinals (lengthened)
- LE: Gluteus maximus and medius (lengthened) vs. hamstrings, gastrocnemius (shortened)

Screening Development

Screening Development

- 5-10 minutes in duration, had to be performed in practice room/classroom.
- Generalizations made from screening sent to the professors for those departments, HEP instruction given to each student based on findings.

Pertinent Findings



Pertinent Findings

•SMTD & MedSport partnership allows us to collect injury data so as to better serve our students.

•Most common areas of misalignment for musicians are rounded shoulders and head forward.

•Most common injuries for pianists are shoulder/neck, wrist/hand and forearm.

•Prevention strategies:
- Guide posture at the keyboard
- Teach and encourage warm-up and cool-down routine

Gaps and Limitations

•Limitations on screening for instrumentalists.

•Limitations for applicability to multiple instrument groups.

•Limited carryover for conductors and vocalists.

Take Away Message

Primary Screening can identify potential source of problems.

Education to performing artist can increase awareness of training/practice modifications.

Significant evidence lacking to support postural reasons as rationale for injury.

More research needed in “load management” or training volume as source of injury in this population.

Why Screening?

Research:
- apart from the high rate of ankle sprains, almost 80% of skaters present with an overuse condition in the foot or ankle
- along with foot/ankle conditions, the most prevalent overuse injuries in figure skating include patellar tendinitis, stress fractures and hip pain, all of which can stem from poor ankle mobility
- Ankle mobility is often limited in figure skaters due to training in a stiff boot which decreases the ability to dorsiflex
- however there is no current information regarding off-ice dynamic balance and ankle mobility in figure skating

Why Screening? Champs Camp

ISP athletes resources (type here)
PPE
Psychological assessment
HPMS

Supporting Information

Asymmetrical reach distance on the YBT has been associated with increased risk of noncontact LE injury and may helps screen athletes who are at risk and allow sports medicine staff and strength and conditioning coaches to prescribe exercise intervention to decrease risk

Screening Development: STARS

Standardized Testing of Athleticism to Recognize Skaters (S.T.A.R.S.)

- Off-ice fitness assessment and development
- Designed to support existing testing and competition progressions
- Push/maintain the athletic ability curve ahead of the skills curve
- Ensure that young figure skaters are physically prepared to handle the introduction of new, more complex and more demanding skating skills
- Reduce the potential for injury
- System designed to establish standards of athleticism for figure skaters
- Encourages progression through the system by incorporating a "building" series of tests, achievement awards and improvement certificates

Screening Development: STARS

- Age-, gender- and competitive-matched US assessment data
- Recognition for national performance and individual achievement/personal improvement
- Participation stimulates interest and motivates young skaters to practice the off-ice assessments
- Assist coaches and parents in developing and guiding their skater's potential
- Connect skaters, coaches, and parents with qualified strength and conditioning specialists in their region and around the country

Screening Components: STARS

- Hex Jump
- Vertical Jump
- Timed Tuck Jump
- Single Leg Bound
- Push Ups
- Bent Knee V-Ups
- Side Plank
- Front Split
- Lumbar Extension
- Standing Spiral Balance (open and closed eyes)
- Seated Reach
- Spiral (range of motion)

Screening Development: HPMS

High Performance Movement Screen (HPMS):

- Three key areas: mobility, stability and symmetry
- Assess movement patterns to identify and treat mechanics that may prohibit optimal performance
- Valid and reliable to assess mobility and stability in LE
- Baseline test for concussion
- Program goal: Minimize the risk of injury and maximize performance
- Receive a one-on-one screening completed by a physician, physical therapist or certified athletic trainer
- Detailed report flagging areas of concern, explanation of exercises and resources to correct flagged areas

Screening Components: HPMS

- Y-balance test
- Single leg squat
- Rotary stability
- Shoulder mobility,
- Hip mobility (Thomas Test)
- Balance Error Scoring System

Screening Components: HPMS

http://www.usfigureskating.org/content/HPMS/home.html

https://www.usfigureskating.org/content/HPMS/HPMS%20explanation%20of%20evaluations%20table.pdf

Pertinent Findings

4cm difference between limbs → increased risk of LE injury

Female figure skaters demonstrated approx. 3cm decreased posterolateral reach on the landing leg

Both sexes had decreased normalized anterior reach compared to other healthy populations

Both sexes had 8% decreased normalized anterior reach compared to patients with chronic ankle instability, which may be due to the limited dorsiflexion from the stiff training boot

Exceeded normative values in posterormedial and posterolateral directions in a similar age cohort but were similar to reach distances in high school basketball players

Gaps and Limitations

- Add content here
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Take Away Message

How does this apply to skating skills?

- Female skaters may be at increased risk of injury on the landing leg
- Posterolateral reach has been correlated to skating speed, indicating that females may rely more on the takeoff leg for power generation
- Concern with asymmetry in hip strength in female skaters associated with increased incidence in LE injury and LBP

A Show of Hands? - Questions

- 5 minutes available for questions about patient/athlete screenings and common trends/findings?

Screening Data to Primary Prevention

One key aspect of our programming and time spent in screenings is to connect the performing artist with concept of prevention.

- Acknowledgement that the screenings will help identify commonly identified deficits.
- Health care providers desire to reduce injuries – aka primary prevention.
- Health care providers don't improve "performance." However, not being able to participate/practice/train effects performance.

Home Exercise Program: Dance, Musical Theatre

Home Exercise Program: Gymnastics

Pro's—
having outfitted the Performance Lab, knowing what the dancers have access to for HEP progressions

Home Exercise Program: Voice/Instrumentalists

Pro's—
having outfitted the Performance Lab, knowing what the dancers have access to for HEP progressions

Home Exercise Program: Figure Skating

https://vimeo.com/216531916

https://www.youtube.com/watch?v=2ZsVaqwSh_4&feature=youtu.be

Key to Success: Building Lasting Partnerships

Like many sporting teams, performing artists have a defined culture.

Physical Therapists are in a unique position to assist and enhance the function of this culture from a primary care and wellness perspective.

Creating partnerships for mutual benefit between clinic and organization can be one option.

Key to Success: Building Lasting Partnerships

First step – Identify your network

External:

- Current patient population
- Faculty/staff contact (?)
- Coaches, directors, choreographers, etc. (?)

Internal:

- Physicians
- Physical Therapy specialists
- Psychologist
- Nutritionist

Key to Success: Building Lasting Partnerships

Second step – Match Needs to Strengths

Most performing arts programs lack wellness, recovery, or rehabilitation coordination.

- PTs positioned to provide education/information.
- PTs positioned to develop data collection/management.
- PTs positioned to help reduce liability/injury burden.

Key to Success: Building Lasting Partnerships

Third step – Development of Shared Vision

- Provision of injury screening, monitoring, and trusted source for referral.
- Provision of performing artist/athlete education and collaboration with directors, instructors, and coaches.
  - In the academic setting, a broad net of collaboration can be set to serve students, promote research, and facilitate medical/PT referrals.
- Program “enhancement” for performing arts programs.

Key to Success: Building Lasting Partnerships

Fourth step – Contracting/Service Execution

- Establish clear expectations for program/PT service.
- Define clear terms (time, financial support, referral network).
- Consistent reporting to stakeholders.

Key to Success: Building Lasting Partnerships

Fifth step – Planned and consistent review.

- Data analysis of injury trends.
- Reporting to performing artists, Faculty/stakeholders, and medical/rehab partners.
- Identify opportunities to improve or become more efficient with screenings, data collection, or resources.

Key to Success: Building Lasting Partnerships

Completion of these 5 steps will yield trust in your professional care and decisions.

- Places PTs in strong position as influencers of health care (primary prevention).
- Directs care through PT triage clinics and referral source for greater health care system.

Key to Success: Building Lasting Partnerships

Wellness Initiative @ UMich SMTD

To serve the School of Music, Theatre & Dance in the following key areas:

•EDUCATION: Injury-preventative education on various topics including physical and mental health by presenting workshops, lectures and offering courses.
•RECOVERY: Support students in injury recovery by hosting on-site clinics and connecting students to the appropriate health provider.
•RESEARCH: Developing research on the topic of wellness for the performing artist.

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Weber MD, Woodall WR. Spondylogenic Disorders in Gymnasts. JOSPT 1991; 14(1): 6-13.

www.STOPSportsInjuries.org

http://www.hybridperspective.com/

http://www.hybridperspective.com/?s=screening&x=0&y=0

Compton, B: Gymnastics injury and prevention presentation.