Outline for PT Annual Exam:

Population	**Why**
Athletes	The athletic population at the club, college and professional level undergo intensive training and their bodies are exposed to high demands of physical activity on a regular basis. This makes them prone to chronic overuse injuries, which are caused by repeated microtrauma and acute injuries, which are caused by a specific trauma or mechanism of injury.[1] Each sport requires various levels of physical characteristics, however integration of muscle strength, power, endurance, flexibility, speed, agility, and skill, is required by all athletes to some degree.[2,3] There are several factors and conditions that can affect these components and lead to inefficient and/or compensatory movement tendencies that can ultimately result in injury.[2,3] Moreover, this population participates in high level competition starting from a young age. In addition to the high-pressure environments of game-day, a vast number of athletes are forced to face emotionally abusive coaches and constant pressure from parents and sponsors. This is detrimental to the athletic health, including their physical, mental and social well-being, as well as their performance.[4] These athletes are susceptible not only to physical injuries, but also cardiovascular disease, mental disorders, eating disorders, psychological distress and burnout, and commonly have insufficient resources to cope with these high demands.[4,5,6,7] While coaches are the first line of defense for identifying overtraining symptoms and risk factors for the conditions identified above, many coaches lack awareness and education and are not familiar with optimal prevention strategies.[8,9] An annual physical therapy exam will allow us to screen for potential risk factors and assess physical characteristics specific to the athlete's sport via musculoskeletal and movement screenings.[2,3] It will also allow us to provide patient, coach and family education and appropriate interventions, resources and referrals to prevent injuries and chronic diseases, as well as treat undiagnosed conditions, ultimately enhancing sport performance and the overall health and wellness of the athlete. Secondarily, this can aid in increasing coach and parent awareness, further promoting health and wellness in teams and the athletic community. Health is defined as a state of complete physical, mental and social well-being.[10] Wellness is defined as a state that allows ongoing, balanced growth physically, spiritually, emotionally, intellectually, socially and psychologically.[10]

Annual exam: subjective/objective

Question/test	What testing	Positive finding	Clinical reasoning (Evidence if indicated)
What, if any, are your past and current medical issues/conditions, including previous or upcoming surgeries and previous or current injuries?	Medical history	Current injury = positive Medical history = important to keep in mind with remaining evaluation and findings	This provides the therapist with background information regarding the athlete's medical history, attempts to detect any underlying condition that might predispose an athlete to injury and aids in determining if a more in-depth assessment/questioning is needed.[11] Knowledge of previous injury and/or surgery, including the time-frame of the injury/surgery, supports the need for a closer evaluation of the anatomical area affected. This allows the therapist to determine if the athlete has fully recovered from the injury. The time period following rehab of an initial injury is associated with risk of re-injury since athletes often return to play too early, and a previous injury in itself is a risk factor for future injury.[12]
- How and when did you first start playing? - How is your relationship with your coaches, teammates, parents and trainers? - Are you motivated to participate and compete? - What are some of your goals in	Sport history and current goals	Positive = early age sport specialization, emphasis of weight and appearance in sport, required weight change for sport participation, punitive training environments, low motivation.[13]	The athlete's sport history can contribute to the risk of mental health and eating disorders.[13] Additionally, information regarding family and social relationships is beneficial to identify support systems, if needed. In addition, this information can supplement further information gained from the examination and help identify phycological distress and/or burnout, as well as the athlete's current mental state. Identification of goals will allow the therapist to provide optimal strategies to aid in achieving those goals, if goals are appropriate. Patient-centered goal setting also helps enhance therapeutic alliance and increase trust, which can be beneficial for the remainder of the examination and lead to better adherence.[14]

the upcoming year?			
Visual Analog Scale (VAS)	Acute and chronic pain	Positive > 0	Pain can be an indicator of an injury that may have not been evaluated by the athlete's rehab team. Thus, it is important to acknowledge the athlete's pain, ask further questions such as location, characteristic, time-frame, mechanism of injury, aggravating and easing factors etc., in order to determine if further PT follow-up is needed to treat the problem.
Are you on any medications or dietary supplements?	Medications, supplements, potential side-effects and/or adverse reactions	Illegal substances = positive Polypharmacy (≥ 5 meds) = positive Drug interactions = positive	It is important to be aware of the athlete's current medications, including dosage and duration, as side effects can include, musculoskeletal, psychological and emotional symptoms. Polypharmacy, high doses and long-term use of medications and dietary supplements, especially if the individual does not have a nutrient deficiency, have been associated with adverse events to the individual's health, as well as decreased performance.[15,16] In the case that the athlete is taking illegal substances, including performance enhancing drugs and illicit drugs, the therapist needs to provide education to the athlete, parent and/or coach, of all the negative implications. Additionally, patient education on the importance of medication compliance and strategies for compliance is vital if appropriate. The relationship between oral contraceptive pills (OCP) and bone mineral density (BMD) is unclear, however, some research suggests that the use of OCP is associated with lower BMD.[17] Thus, it is important to identify if the female athlete is utilizing OCP.
Cardiovascular Screening utilizing: 'The 12-Element American	Cardiovascular disease, risk factors, symptoms	Positive ≥ 1 Need for further evaluation and	This is a quick and feasible tool that can be used in an outpatient clinic that includes the assessment of personal and family history, as well as a physical examination portion

Heart Association Recommendations for Preparticipation Cardiovascular Screening of Competitive Athletes.' (Table 1)[7,11]		potential for referral to a cardiologist for an ECG	with the aim of identifying symptoms and/or risk factors of cardiovascular disease.[7] The frequency of sudden deaths in athletes from a variety of unsuspected cardiovascular disease is increasing.[7] One reason that contributes to this is the false perception that athletes are the healthiest individuals, thus cardiovascular screens are unnecessary and signs and symptoms frequently go unnoticed.[7] This further highlights the importance of the role of the physical therapist to be able to effectively screen and identify these signs and symptoms.
Eating disorder Screen for Primary care (ESP):[18] 1) Are you satisfied with your eating patterns? 2) Do you ever eat in secret? 3) Does your weight affect the way you feel about yourself? 4) Have any members of your family suffered with an eating disorder? 5) Do you currently suffer with or have you ever suffered in	Eating disorder	Positive = "no" to question 1 and "yes" to questions 2-5. Any positive responses indicate the need for further assessment and potential for referral.	Eating disorders (ED) and disordered eating behaviors (DEB) among athletes are increasing. Specifically, the prevalence of eating disorders is higher among elite female athletes, and associated with high rates of morbidity and mortality.[19] Several studies have highlighted the importance of early detection, in order to maintain the athlete's health and wellbeing, as well as sport participation and performance.[5,19] ED and DEB are also associated with Relative Energy Deficiency in Sport (RED-S) syndrome.[20] This occurs when energy expenditure exceeds energy intake and can compromise multiple health systems.[20]

the past with an eating disorder?			
Female Athlete Triad Screening Questionnaire (Table 2)[21]	Female athlete triad:[17,21] 1) Lower energy availability with or without disordered eating 2) Menstrual dysfunction 3) Low BMD	The purpose of this questionnaire serves to not only identify females at risk but also stimulate discussion for a more in-depth analysis of the problem. If 1 component of the Triad is found to be positive, it should prompt further investigation for the others.	This is a 12-question screening tool, recommended by the Triad Consensus Panel that addresses disordered eating, menstrual history, body image and BMD.[21] It is a time and cost-effective tool for PTs to screen for the female athlete triad before determining if more in-depth measures are warranted. Moreover, it is important to highlight that screening and early intervention is vital to prevent the progression to more serious conditions of the Triad such as eating disorders, amenorrhea and osteoporosis.[17,21] This is especially important in adolescent females since the majority of peak bone mass is obtained by the age of 18, providing only a small time-frame for optimizing bone health.[21] Based on the findings, a referral to an endocrinologist, gynecologist, sports dietician, mental health practitioner or physician, as well as the need for a dual energy X-ray absorptiometry scan (DEXA) to measure BMD may be warranted.
Mental Health-Related Survey (Table 3)[11,22]	Mental disorder	Any “yes” answer should be followed by a more in-depth conversation, in order to determine if referral for evaluation by a mental health	Early identification of athletes at risk or that are symptomatic is crucial to limit their health burden, as well as the negative effect it will have on their sport performance, including the potential for burnout.[6,22] Elite athletes face ongoing stress, including stress from competition, pressure to perform from coaches, group dynamics in team sports, limited support networks, public scrutiny through social media, psychological impacts of injury, overtraining and potential for injury that would end their career, increasing their risk to mental ill-health.[23]

		professional is needed.	Another benefit of this survey is that it includes a question regarding sleep. Inadequate sleep is associated with a number of negative effects including, increased anxiety, depression, decreased quality of life, increased pain perception and risk of injury.[24] Additionally, physical therapists have the knowledge and resources to educate athletes regarding interventions to address this issue, such as appropriate positioning, meditative movement and sleep-tracking devices.[24] Based on the therapist's clinical judgement and collective information from the subjective exam, the need for completion of the Athlete Burnout Questionnaire (ABQ) may be warranted for more accurate results.[25] This will further aid in guiding optimal interventions and parent/coach education.
Vital Signs	1) Heart rate (HR) 2) Blood pressure (BP) 3) Respiratory rate (RR) 4) SpO_2 – taken only if the patient has a cardiovascular or pulmonary condition.	Normal:[26] <120 and <80 Pre-hypertension: 120-139 or 80-89 Stage 1 HTN: 140-159 or 90-99 Stage 2 HTN: ≥160 or ≥100	These measures can aid in screening for undiagnosed pathologies, identifying risks and provide baseline information regarding the athlete's cardiovascular status. Generally, the following measures are within the range of concern and further exercise should be considered:[27] 40>HR >130, >200 SBP, >110 DBP, 5>RR>40, SpO_2<88% Most athletes tend to have lower at rest vital signs, which should be considered by the therapist, in addition to patient's symptoms and how they are feeling, when determining "normative" values and mobility contraindications. Additionally, communication with the athlete's physician in the case of concerning measures is vital, since an ECG may be warranted to more optimally screen for cardiovascular disease.
Snellen Eye Test	Vision	Positive < 20/20	The Snellen Eye Test is the most common test for visual acuity.[28] It is easy to administer and cheap, thus an effective tool for an outpatient clinic. Additionally, athletes require excellent vision for optimal performance, however this is an area that commonly goes unnoticed.[28] Vision less than 20/20

			should be communicated with the athlete for the potential to see an ophthalmologist for a complete ocular examination. Additionally, poor vision can affect daily life and activities, as well as compromise safety.
90-Second Musculoskeletal Screening Examination (Table 4)[11]	1) Range of motion 2) Muscle strength	Positive = pain, unable to complete full range, limited strength, signs/symptoms of injury	This is an efficient and effective observational screen to assess if a more comprehensive, site-specific evaluation is needed.[11] This will be especially useful for athletes coming in following surgery or injury to see if there are any lingering impairments. Additionally, it serves to clear any contraindications to the remaining objective tests.
Dowel Held Overhead Deep Squat	Assesses bilateral, symmetrical mobility and stability of the hips, knees, ankles, shoulders and thoracic spine.	Positive:[29] - Tibia and torso not parallel - Femur not below horizontal - Knees valgus - Heels elevated - Dowel not aligned over feet	The deep squat includes components and movements required in many sports. It demonstrates coordinated extremity mobility, postural control, pelvic and core stability.[29,30] Benefits of this test include the fact that it is quickly administered and assesses multiple areas at the same time. Potential limiting factors include: poor glenohumeral and thoracic spine mobility, dorsiflexion of ankles, flexion of the hips, and limited motor control of the core.[29] Limitations in any of these areas can lead to increased risk of injury.
Tuck Jump Assessment (Table 5)[3,31]	Lower extremity neuromuscular control and jumping technique	Positive = any checked box in the criteria; The ticked boxes indicate the specific areas that need improvement.	This is a reliable and valid assessment that is used to identify insufficient neuromuscular control of the lower extremities, excessive knee valgus, as well as jump and landing error techniques of the athlete.[3,31,32] Poor technique and neuromuscular control can predispose the athlete to an increased risk of injury, specifically anterior cruciate ligament (ACL) injury in females.[31,32] Thus, it is crucial we identify any limitations, including poor technique, to provide interventions and athlete/coach education to prevent injury.

Running analysis on treadmill	Running mechanics	Positive:[33] - Foot strike pattern - High foot inclination angle - Extended tibia angle at loading response - Limited / extensive knee flexion during stance - Limited hip extension during stance - Forward trunk lean - Overstriding (lateral malleolus anterior to pelvis) - Excessive heel eversion - Knee valgus - Pelvis drop	Running is involved in the majority of sports and is a pertinent daily activity. Running analysis is used to identify the athlete's running biomechanics, including malalignments and poor running technique that can result in injury and poor running economy.[33,34] Coaches and trainers often don't analyze running biomechanics but focus more on more skillful movements of the sport, which is why this often goes unnoticed. The physical therapist can identify biomechanical limitations and provide education and interventions to resolve any issues, including referral to an orthotist if needed.

Table 1.

The 12-Element American Heart Association Recommendations for Preparticipation Cardiovascular Screening of Competitive Athletes[7,11]

Medical history

Personal history

1. Exertional chest pain/discomfort
2. Unexplained syncope/near syncope
3. Excessive exertional and unexplained dyspnea/fatigue, associated with exercise
4. Prior recognition of a heart murmur
5. Elevated systemic blood pressure

Family history

6. Premature death (sudden and unexpected, or otherwise) before age 50 y due to heart disease, in >1 relative
7. Disability from heart disease in a close relative age <50 y
8. Specific knowledge of certain cardiac conditions in family members: hypertrophic or dilated cardiomyopathy, long-QT syndrome or other ion channelopathies, Marfan syndrome, or clinically important arrhythmias

Physical examination

9. Heart murmur
10. Femoral pulses to exclude aortic coarctation
11. Physical stigmata of Marfan syndrome
12. Brachial artery blood pressure (sitting position)

Table 2.

Triad Consensus Panel Screening Questions[21]
1. Have you ever had a menstrual period?
2. How old were you when you had your first menstrual period?
3. When was your most recent menstrual period?
4. How many periods have you had in the past 12 months?
5. Are you presently taking any female hormones (oestrogen, progesterone, birth control pills)?
6. Do you worry about your weight?
7. Are you trying to or has anyone recommended that you gain or lose weight?
8. Are you on a special diet or do you avoid certain types of foods or food groups?
9. Have you ever had an eating disorder?
10. Have you ever had a stress fracture?
11. Have you ever been told you have low bone density (osteopenia or osteoporosis)?

Table 3.

Mental Health–Related Survey[11,22]	
Statement	Yes/No
I often have trouble sleeping.	
I wish I had more energy most days of the week.	
I think about things over and over.	

Mental Health–Related Survey[11,22]	
Statement	Yes/No
I feel anxious and nervous much of the time.	
I often feel sad or depressed.	
I struggle with being confident.	
I don't feel hopeful about the future.	
I have a hard time managing my emotions (frustration, anger, impatience).	
I have feelings of hurting myself or others.	

Table 4.

The 90-Second Musculoskeletal Screening Examination[11]	
Instruction	Observation
Stand facing examiner	Acromioclavicular joints: general habitus
Look at ceiling, floor, over both shoulders, touch ears to shoulder	Cervical spine motion
Shrug shoulders (resistance)	Trapezius strength
Abduct shoulders to 90° (resistance at 90°)	Deltoid strength
Full external rotation of arms	Shoulder motion
Flex and extend elbows	Elbow motion
Arms at sides, elbows at 90° flexed; pronate and supinate wrists	Elbow and wrist motion
Spread fingers; make fist	Hand and finger motion, strength, and deformities
Tighten (contract) quadriceps; relax quadriceps	Symmetry and knee effusions, ankle effusion

The 90-Second Musculoskeletal Screening Examination[11]	
Instruction	Observation
"Duck walk" away and toward examiner	Hip, knee, and ankle motions
Back to examiner	Shoulder symmetry; scoliosis
Knees straight, touch toes	Scoliosis, hip motion, hamstrings tightness
Raise upon toes, heels	Calf symmetry, leg strength

Table 5.

The Tuck Jump Assessment criteria[3,31]			
Tuck Jump Assessment	***Errors***	***Neuromuscular deficits***	***Comments***
Knee and thigh motion			
1. Lower extremity medial knee collapse landing	□	Ligament dominance	
2. Thighs do not reach parallel at peak jump height	□	Trunk dominance/core dysfunction	
3. Thighs not equal side-to-side during jump flight	□	Leg dominance/residual injury deficit	
Foot position during landing			
4. Foot placement not shoulder width apart	□	Ligament dominance	
5. Foot placement not parallel (front to back)	□	Leg dominance/residual injury deficit	
6. Foot contact timing not equal	□	Leg dominance/residual injury deficit	
7. Excessive landing contact noise	□	Quadriceps dominance	
Plyometric technique			
8. Pause between jumps	□	Trunk dominance/core dysfunction	
9. Does not land in same footprint (deviation in flight)	□	Trunk dominance/core dysfunction	

The Tuck Jump Assessment criteria[3,31]			
Tuck Jump Assessment	***Errors***	***Neuromuscular deficits***	***Comments***
10. Technique declines prior to 10 s	□		
Total errors			

Resources/referrals:

Test item	Referral	Reasoning
Eating disorder Screen for Primary care (ESP)	Registered dietician	Eating disorders (ED) and disordered eating behaviors (DEB) in athletes are increasing and are associated with detrimental effects for the athlete's general health and wellbeing, as well as sport performance.[19] In addition, coaches and parents are typically concerned with the results of the athlete and their performance rather than the athlete him/herself. Thus, EDs and malnutrition often go unnoticed. To further support the need for us to be able to screen and address these issues, it is found that athletes with disordered eating rarely self-identify.[35] Additionally, the majority of coaches and athletes have inadequate nutritional knowledge and limited nutritional resources, decreasing the likelihood of early detection or identification of signs and symptoms of ED.[9] Physical therapists have the knowledge and tools to assess, screen and educate athletes regarding their nutritional status.[36,37] Positive responses to the ESP tool support the need for a more in-depth conversation with the athlete, which provides vital information to the therapist to identify when an individual can benefit from referral to a registered dietician for a more in-depth evaluation and further education on nutrition and diet to enhance performance and wellbeing.[36,37]
Female Athlete Triad Screening Questionnaire	Endocrinologist	This questionnaire provides vital information on the 3 components of the Triad. If the therapist identifies concerns regarding the athlete's menstruation then referral to an endocrinologist or gynecologist is warranted.[38] Menstrual dysfunction includes: primary amenorrhea, defined as the absence of

		menstruation by age 15, secondary amenorrhea, defined as the absence of menstruation for 3 consecutive months, and oligomenorrhea, defined as menstrual periods greater than 35 days apart.[38] Early detection and early intervention are vital to prevent the progression to more serious conditions and prevent injury.[17,21] In addition, low estrogen levels in athletes is associated with low BMD, another component of the Triad.[38] This supports the notion that if one component of the Triad is found to be positive, it should prompt further investigation for the others.
Mental Health-Related Survey	Sport psychologist	This survey helps the therapist identify the athlete's psychological status and what exactly the athlete is struggling with (e.g. depression, confidence issues, anxiety etc.), which will ultimately help determine if a referral is needed. Athletes are constantly exposed to stress, whether that is from competition or from the pressure put on them from their coaches and parents, which negatively impacts their mental health.[23] Often time this also goes unnoticed and/or athlete's do not seek support secondary to lack of knowledge and the athlete's stigma.[23] Thus, it is crucial that we are able to effectively screen for signs and symptoms early on to refer the athlete to a mental health practitioner, in order to prevent the progression to more serious conditions that can be detrimental to the athlete's performance and overall quality of life.

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