12-2018

The Public Health Lens: An Introduction to Population-Based Care in Athletic Training

Jenna L. Allocco
University of Nebraska Medical Center

The Public Health Lens: An Introduction to Population-Based Care in Athletic Training

Jenna Allocco, LAT, ATC

Bachelor of Science in Athletic Training, Western Carolina University Honor's College, 2015

University of Nebraska Medical Center, College of Public Health

December 3, 2018

Abstract Historically, the athletic training profession has been focused on the individual; however, potential exists to drive large-scale prevention efforts in the athletic community with a population-based, public health approach. Relationship between the two professions has been acknowledged in in previous literature to do with educational competencies and opportunities for research, as well as in policy development involving sudden cardiac death, sport-related concussion and osteoarthritis prevention. Incorporating public health concepts such as the ecological model, health literacy, health behavior and evidence-based program planning and evaluation may improve athletic training health outcomes and prove beneficial to each respective discipline.

Key Words: athletic training, athletic trainer, prevention, injury prevention, public health, population-based health, evidence-based practice, ecological model, health literacy, health behavior, program planning, intervention, assessment

Introduction

The first domain of athletic training is prevention. The remaining five domains, clinical evaluation and diagnosis, immediate care, treatment, rehabilitation and reconditioning, organization and administration and professional responsibilities, are made lesser when a safe competitive environment exists and risk of injury is minimized. Athletic trainers (ATs) are allied health professionals who work under the scope of physicians to ensure the overall wellbeing of the athletic population, which is not limited to orthopedic injury. Athletic trainers are often the first contact point for their patients regarding a multitude of conditions, including general medical, mental health and nutrition.

Historically, the profession has been mostly focused on the individual; however, potential exists to drive large-scale prevention efforts in the athletic community with a population-based, public health approach. While most ATs can be found working with collegiate athletic programs, the profession has grown drastically in recent years to include roles with hospitals, physical therapy clinics, secondary schools, industrial occupations, performing arts, public safety (law/fire departments) and military populations. With such an increase in accessibility, ATs hold potential to extend the arm of public health with adequate partnership and education.

Public Health and Athletic Training

The Center for Disease Control and Prevention employs the first definition of public health by C.E.A Winslow in 1920 that says public health is "the science of protecting and improving the health of families and communities through promotion of healthy lifestyles, research for disease and injury prevention and detection and control of infectious diseases."[1] The Yale professor's definition remains one of the most comprehensive descriptions of the five foundations which are behavioral sciences/health education, biostatistics, environmental health sciences, epidemiology and health services administration.[2] Each public health discipline is derived from these foundational concepts and drives healthcare efforts rooted in research and focused on prevention rather than treatment at multiple levels of the ecological model.

The ecological model depicts determinants of a person's health starting with the individual and expanding to proximal influences such as sociocultural environments, community, organizational and policy shown below in Figure A. From the outermost layer working inward, "policy" includes a broad sociocultural environment, legislative conditions and policies; "community" encompasses psychosocial, socioeconomic status, education, income, and physical environments; "organizational" includes the social environment, family and community networks; "interpersonal" regarding the individual's behavior and health choices and finally, "intrapersonal" includes the genetic, unchangeable characteristics of a person. While it may not always be possible to produce change at every level, the ecological perspective highlights the effect of a person's environment to better aid population-health movements.

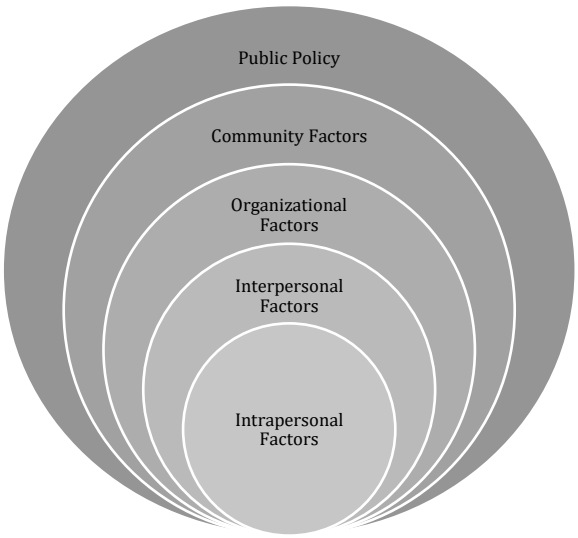


Figure A: Basic Ecological Framework

This concept is at the heart of many public health efforts and is attainable in the athletic training realm considering existing policies in sudden cardiac death, concussion and osteoarthritis prevention are all proximal-determinant quality improvements lead by ATs. The Journal of Athletic Training released a communications publication in 2016 that summarized the 2015 Athletic Training and Public Health Summit (ATPHS) hosted by Oregon State University[3]. The summit discussed the legislative efforts in sudden cardiac death prevention, sport-related concussion program and policy evaluation and osteoarthritis prevention as they relate to public health. The ATPHS encouraged the growth of a public health partnership as such work may improve design and dissemination efforts put forth by ATs. Movements toward licensure in every state and policy development to require ATs in secondary schools also reflect public health ideals, as increasing accessibility to healthcare and decreasing healthcare costs are large-scale examples of initiatives rooted in the ecological framework.

The partnership between the NCAA and Datalys Center for Sports Injury should also receive mention, as research is a cornerstone of public health. The Datalys Center mission is to "collect and translate-often in collaboration with others-sports participation, injury and treatment data into more effective programs, policies, rules and education aimed at preventing, mitigating and treating sports injuries more effectively"[4]. Publications by the Datalys Center are often fueled by the work and documentation of collegiate ATs, and provide progressive sports epidemiology information essential to improving sport safety. Through ongoing research and policy development, ATs are practicing public health professionals united by the mission to improve health and create a safe sport environment.

The purpose of this paper is not to recognize ATs as public health providers for work they have already done, but instead to introduce public health methods and ecological perspective for daily use by ATs in order to propel primary prevention efforts at the sport, team or even position-specific level. With added focus to the inner rings of the ecological

model, the following topics are potential opportunities to integrate public health concepts into athletic training practice. These recommendations are empirical in nature, based on successes observed in this author's athletic training practice attributed to the completion of public health masters coursework.

Effective Health Education: Health Literacy

Proximal determinants (cultural, social and economical environments) and knowledge of health topics all influence an individual's abilities to understand their condition(s). Health literacy is an individual's ability to obtain, process, and understand basic health information and services needed to make appropriate health decisions[5]. A patient's health literacy influences their comfort and confidence to share personal information such as pertinent health history, their likelihood to engage in self-care or preventative services and their understanding of probability and risk of injury and illness[5]. These considered—improving health literacy is an instrumental step in improving health outcomes in athletic training.

Surprisingly, the average American has an 8th grade reading level, and according to a 2006 report, only 12% of adults had "Proficient" health literacy skills on four-level scale from Below Basic, Basic, Intermediate and Proficient[6]. Therefore, when communicating verbal or written health information, keep health messages simple and succinct, prioritizing the most important points. Using plain language aids understanding for lower literacy levels and speeds reading time for advanced levels. Athletic trainers should avoid using medical jargon and replace words like "take" with "swallow", "contusion" with "bruise" and "scapula" with "shoulder blade", to reduce risk of misinterpretation while providing explanation or instruction.

Info-graphics are an excellent tool for ATs to disseminate health information when designed properly. Health literate graphics (1) include only the most pertinent information necessary (2) in plain language (3) with images to guide and simplify comprehension and (4) promote action. A sample info-graphic about hydration is provided in Appendix A. Key characteristics include a large title "Are you hydrated?" to gain attention, a urine-color scale to teach hydration status evaluation and dehydration recognition skills, followed by pre, mid and post-activity liquid intake recommendations with image-based guidance. Posting health literate info-graphics such as the one provided on stall-room doors or above urinals passively promotes healthy behaviors in environments conducive to taking action. Other possibilities for relatively large-scale dissemination include hand-washing standards above sinks, recovery techniques near hot and cold plunge tanks (or other static treatment areas), nutrition guidance near fueling stations and hygiene guidelines in locker rooms.

Pre-season meetings often provide pertinent information regarding the institution's sports medicine policies and protocols, patients' injury reporting responsibility and concussion education. Supplemental materials such as a discussion outline or concussion info-graphic may aid information retention. Health literate ATs will not only acknowledge their audience's various backgrounds, ethnicities, ages and experience levels, but also the reality

that many incoming student-athletes have never had access to an AT. Misunderstanding the AT's role can pose a threat to patient care and communication so ATs are encouraged to clarify their responsibilities as a healthcare provider annually.

Regardless of communication type or audience size, similar guidelines apply: provide the most important information first, as simply as possible. Athletic trainers should also be aware of non-verbal communication. Positioning of computer screens, multitasking with phones or tablets, sitting behind a desk versus sitting next to their patient can all influence patient comfort and openness with their clinician. Practicing active listening, eliminating distractions and facing the patient as they speak may all enhance communication. Lastly, ask the patient "how will you explain this to your parents/friends" assure their understanding before ending conversations or physician consults.

Health literacy strategies can help ATs improve outcomes through open communication and increasing health knowledge. Every health message a person receives influences their respective community. Sports teams are close-knit, and often one athlete's understanding or misunderstanding becomes their teammates' understanding or misunderstanding, making every interaction a contribution to health knowledge.

Leading Health Behavior Change: Applying the Ecological Model

Specific sport culture or communities unfamiliar with prevention efforts can be some of the hardest to reach. In collegiate athletics, non-traditional sports such as rowing, cheer, gymnastics, bowling and fencing rarely have access to ATs prior to their collegiate careers and are often resistant to sports medicine practices as a result. Athletic trainers may become frustrated with non-compliant individuals but may not be equipped to recognize or transform the cultural environment that enables non-compliance. Applying intervention components at each level of the ecological model can aid in overcoming this obstacle and improving individual health outcomes. To introduce this strategy, a simple casual chain to aid behavior change is shown below in Figure B.

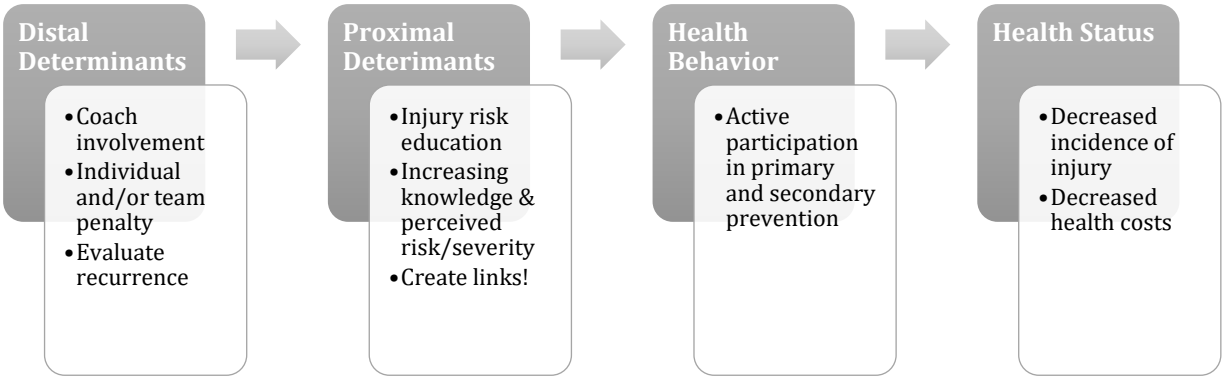
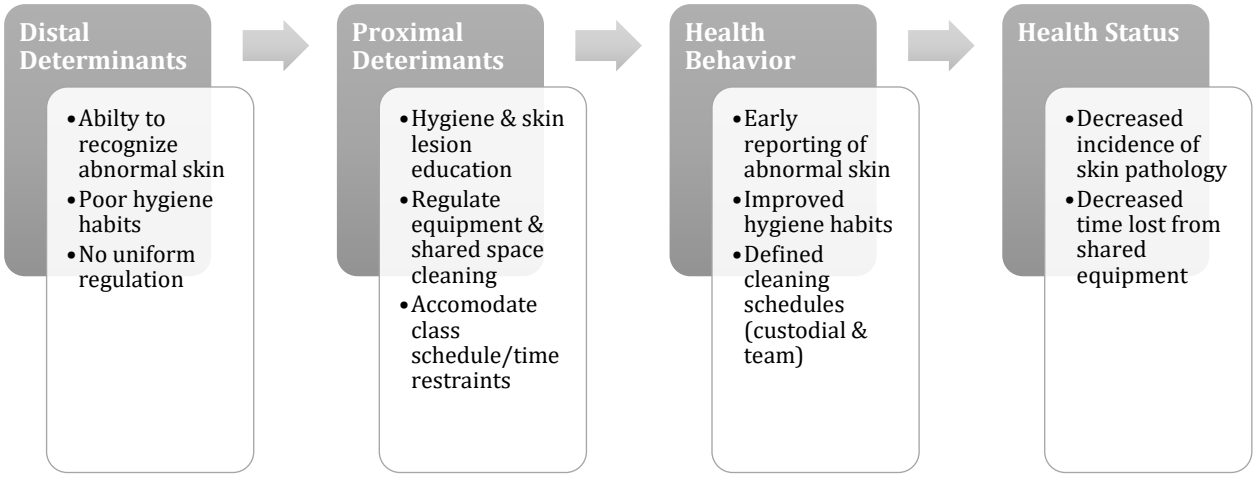


Figure B: Simple Casual Chain to Guide Prevention Programs

This graphic can serve as a thought-mapping guide and can be applied to most health problems. To demonstrate more problem-specific use of a simple casual chain, two

examples based on this author's experience with a collegiate men's gymnastics team are given below.

Example 1: Unusually high incidence of various skin conditions



In this example, various skin conditions include but are not limited to plantar warts, fleabites and Methicillin-resistant Staphylococcus aureus (MRSA). Athletic trainers specialized in wrestling are often well versed in skin disorders considering the amount of contact between players/opponents and competitive surface types that allow pathogen growth over time. There are often established policies and focused effort to control these environmental conditions to prevent disease. Men's gymnastics does not typically have such issues, so the prevalence of skin conditions among this population was surprising.

Although approximately 25% of the team had a diagnosed skin condition sometime during the semester, the diagnoses were variable—indicating each case had been treated appropriately and was not a result of uncontrolled or untreated lesions. Therefore individual hygiene patterns and health knowledge were the most likely contributors to pathological patterns. Once a pathological pattern was identified, simple, population-based efforts to reduce disease were implemented.

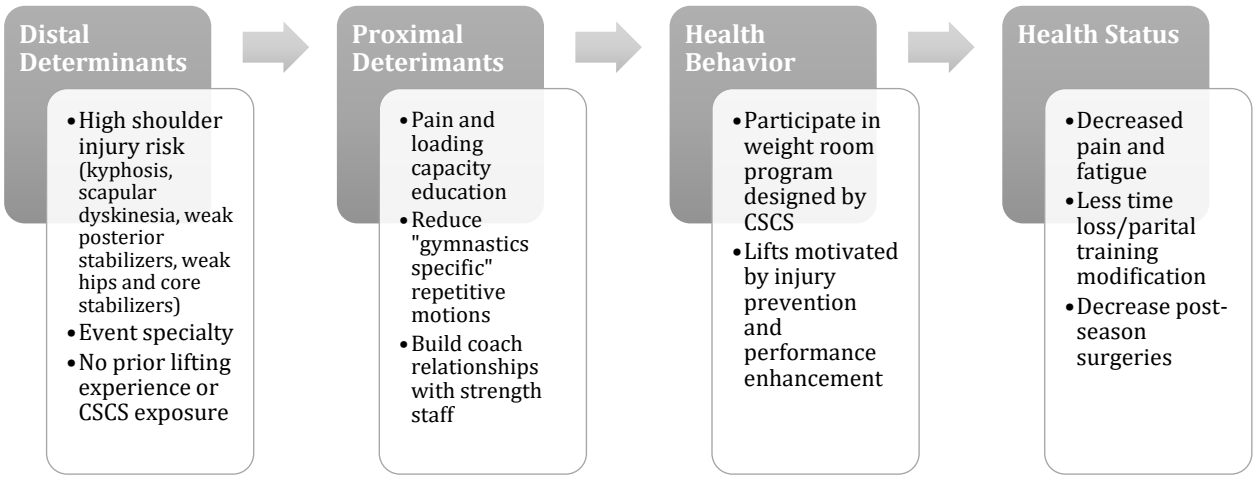
On an individual level, the patients' ability or inability to recognize and report abnormal skin, showering habits and attire choices were targeted. Athletes often waited more than three days to report lesions and would usually repeat practice attire across multiple practices within a day or even consecutive days. The first action step to rectify these factors was involving the coach and create penalty for poor health behavior. The team was warned that any individual caught wearing dirty or chalky clothing at the start of practice would result in mandating matching team attire during all team activity. Additionally, the team was encouraged to shower between each practice and immediately report any potential skin condition.

Proximal or environmental issues were related to dissociation between skin pathology and hygiene, perceived ability to achieve desired health behaviors and cleaning techniques.

Action steps to correct environmental factors included (verbal) healthy hygiene education to individuals and groups, which seemed to promote discussion, improve patient comfort reporting lesions and increase association between habits and health. To address locker room conditions, the team participated in clearing surfaces and retrieving all used clothing for independent laundering. Laundry bins containing shower towels (that had not previously been regulated) were included in the manager's weekly cleaning responsibilities and surface cleaners were switched from prepared antiseptic wipes to a spray-bottle bleach water solution. Lastly, any individual who intended to shower but couldn't due to class schedule was encouraged to employ time-efficient hygiene practices, such as packing a gym bag with extra clothing, showering at the facility or using cleansing wipes after activity.

Health status improved rapidly and the policies implemented have been maintained. Re-wearing attire remains an issue for select individuals but is less prevalent overall. These interventions engaged the team in improving themselves and their environment. Education exposed the direct relationship between habits and health status revealing perceived risk of illness, while involving leaders and peers in team-wide environment reform minimized perceived barriers to improve health status.

Example 2: High incidence of shoulder pain secondary to anterior chain dominance



Abbreviation: CSCS, Certified Strength and Conditioning Specialist

For this example, "shoulder pain" includes tendinopathy, labrum pathology and muscular strains. Four of the six events in men's gymnastics are upper-extremity intensive, making shoulder pain quite common and even normalized within the sport. Shoulder pathologies in gymnastics tend to be chronic and are not frequently associated with acute events. Labral tears or tendon ruptures are often preceded by ongoing pain and dysfunction in the joint, indicating high potential for early recognition and prevention of such severe injuries. For this reason, the incidence and severity of shoulder injuries with this particular group was considered high, with 55% of the active roster affected by a time-loss shoulder injury

between the 2017 and 2018 competitive seasons, and shoulder cases accounting for 36% of all surgical cases in this same time frame.

In this case, distal determinants were sculpted by sport and sport mechanics. Like most elite athletes, male gymnasts typically have similar body types and postural patterns due to years of specific, intense training. Common postural tendencies such as forward-head posture, excessive kyphosis, forward-rolled shoulders and lumbar lordosis are rooted in muscular imbalances forged by sport skills that demand anterior chain dominance. Specializing in certain events during the collegiate career can exacerbate existing imbalances as the gymnast becomes more focused on a smaller selection of skills and positions. Unlike traditional sports like soccer and football, many gymnasts train in clubs independent from their secondary schools, meaning they are rarely exposed to a full training regimen with strength and conditioning coaches and ATs until they reach college. The result is an injury-prone sport community grossly unfamiliar with injury prevention and balanced training regimens. Reversing the effects of distal determinants required an extensive examination of this specific sport's perspective and culture.

To address distal determinants related to unchangeable sport conditions (high risk and event specialty), the first action step was to design individual prevention plans for the entire team that were required at least twice per week. In most cases the programs were secondary or tertiary and laminated copies of primary prevention plans were available in the practice facility. The shoulder-specific plan is attached for reference in Appendix B. Using before and after photos of a current team member sparked conversation and initial interest in the program. The final distal determinant is essentially a worldview that gymnastics only improves with more gymnastics. This perspective has led to using strength programs exclusively to recreate and overload apparatus tasks with weight. Such repetitive overload only aids in mechanical deterioration over time, instead of using complimentary movement to balance deficits and build well-rounded strength.

Many gymnasts believe pain is synonymous with gymnastics and injury is synonymous with rest, so the concept of injury prevention was met with much resistance. Without access to medical care during their junior careers, gymnasts typically have to rely on parents and coaches to manage their pain, making pain education and injury management skills imperative building blocks in addressing proximal determinants. Open discussion about specific skills, descriptive "red flags" for pain management and continued use of the zero to ten pain scale became key conversation tools in pain and loading-capacity education. Special attention to respect the uniqueness of the sport was essential while exposing its repetitive nature, as many protective therapies such as scapular stabilizing and landing drills initially felt foreign and irrelevant to gymnasts. Additionally, to increase exposure to strength and conditioning staff, late-stage rehab patients would "graduate" from the athletic training room to the weight room. These patients worked individually with the strength coach to build functional strength and reach gymnastics goals, thus serving as a small-sample trial to complete multi-disciplinary training, promoted

discussion amongst coaching staff and teammates, while the success of returning to gymnastics served as testimony to their novel experience.

Clear investment in program stakeholders was essential prior to proposing the strength coach lead weight room activities. Regular meetings with the strength coach to discuss opportunities for injury prevention and program goals built a strong partnership between athletic medicine and performance enhancement. These meetings, coupled with regular practice attendance, helped establish a strength and conditioning presence within the program, proving demonstrated interest in increasing involvement and building rapport with both the coaching staff and team members. The program was designed to enhance sport-specific performance while preventing injury without exceeding load-capacity during the pre-season. After months of careful planning and program revision, the coaching staff accepted the opportunity to utilize the assigned strength coach for the first time in decades.

At present, the team continues therapy sessions with the AT twice per week. The laminated sheets are not typically used at will, but most athletes have incorporated their favorite exercises into their daily warm-up. Overall, the team has reported less pain and fatigue than in previous pre-seasons and contrary to previous years do not attribute any current pain to weight room activities. Tentatively, the coaches intend to work with strength staff next year and approximately half of the team has requested individualized strength plans during season, which has not previously been attempted.

Being that these prevention efforts were only introduced within the last year and the team has not yet experienced a competitive season since implementing the new weight-room regimen, continued assessment is necessary to determine the true influence of these interventions. However, from 2017 to 2018, post-season surgeries decreased from eleven to two, post-season shoulder surgeries from four to one, and time lost from non-surgical shoulder injury decreased from six to one. It should also be noted that the one time-loss case treated conservatively was secondary to non-gymnastics activities.

Evidence-Based Intervention Planning and Assessment

The traditional public health approach to program planning is a four-step process first defined by van Mechelen in 1992[7]. This model instructs: (1) establish the extent of the problem (2) define mechanisms of injury and risk factors (3) develop preventative measures for identified risks and (4) assess effectiveness by repeating Step-1. In 2016, Hoffman et al. introduced this population-focused approach along with the six-step Transitioning Research Into Injury Prevention Practice (TRIPP) framework to the Journal of Athletic Training[3]. The TRIPP framework builds on van Mechelen's with two additional steps: (5) describe the intervention context to understand what can actually be implemented in real-world settings and (6) implement and evaluate the effectiveness of efficacious interventions[3]. The TRIPP framework aimed to correct the discrepancy between the lab and the athletic training room and is frequently referenced in sports medicine literature[3,7]. However, the simplistic and cyclical nature of van Mechelen's

framework is applicable for those interventions never intended for formal lab study and therefore may be more relevant to everyday use by ATs.

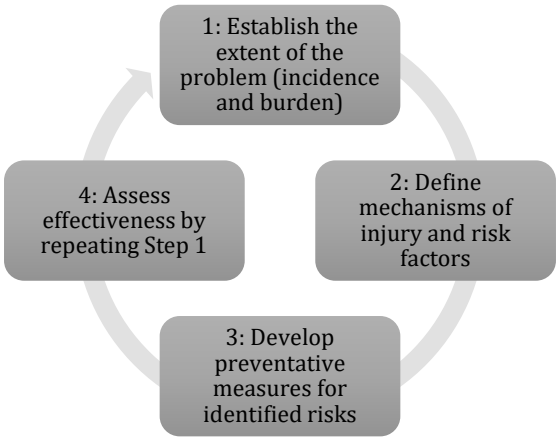


Figure C: van Mechelen: Intervention Planning and Evaluation[3,7]

In public health practice, the first step in correcting a health problem is to define the incidence and burden. Documentation review or, injury surveillance, will allow ATs to observe rates and types of injuries to determine incidence, while time lost or days of therapy help identify burden. Determining a team's annual healthcare costs per season or academic year can also help determine burden. While most ATs can summarize injury trends in terms of nature (acute/chronic), type, severity, recurrence, time of season, diligent documentation is required for effective program planning because the metrics that define the problem become the objective outcome-measures post-intervention.

When a priority problem is chosen and described, objectively define injury mechanisms and risk factors throughout the ecological model to help sculpt program objectives. Investigate trends by reviewing institutional data such as injury event film and medical records. Mechanisms and risk factors in a non-contact anterior cruciate ligament (ACL) injury prevention program would likely be knee position, trunk control, sex and sport as the top injury risks. These items become the program's action items or corrective tasks.

Once a list of risk factors is comprised, refer to literature. Rely heavily on scientific evidence to interrupt injury recurrence. Identify the interventions or exercises believed to be most effective in balancing the defined deficit and apply an evidence-based correction. For example, improve trunk control and knee position with posterior chain strengthening and select protocol parameters proven effective in literature. Regardless of the problem or intervention, primary prevention programs in athletic training should be brief and packed with science.

Step-4 refers to the first step's metrics to measure success. Ask: "has the proposed program reduced the incidence and burden of this injury/illness?" If not, refer to literature for

alternative solutions. Consider surveying participants for their feedback on which components they felt were most beneficial. If the intervention was successful, further evaluation is warranted. All policies and protocols should be continually evaluated to avoid complacency and expediency. Ongoing evaluation is a cornerstone of public health and essential to the success of any intervention. Even established programs are at risk of losing function over time.

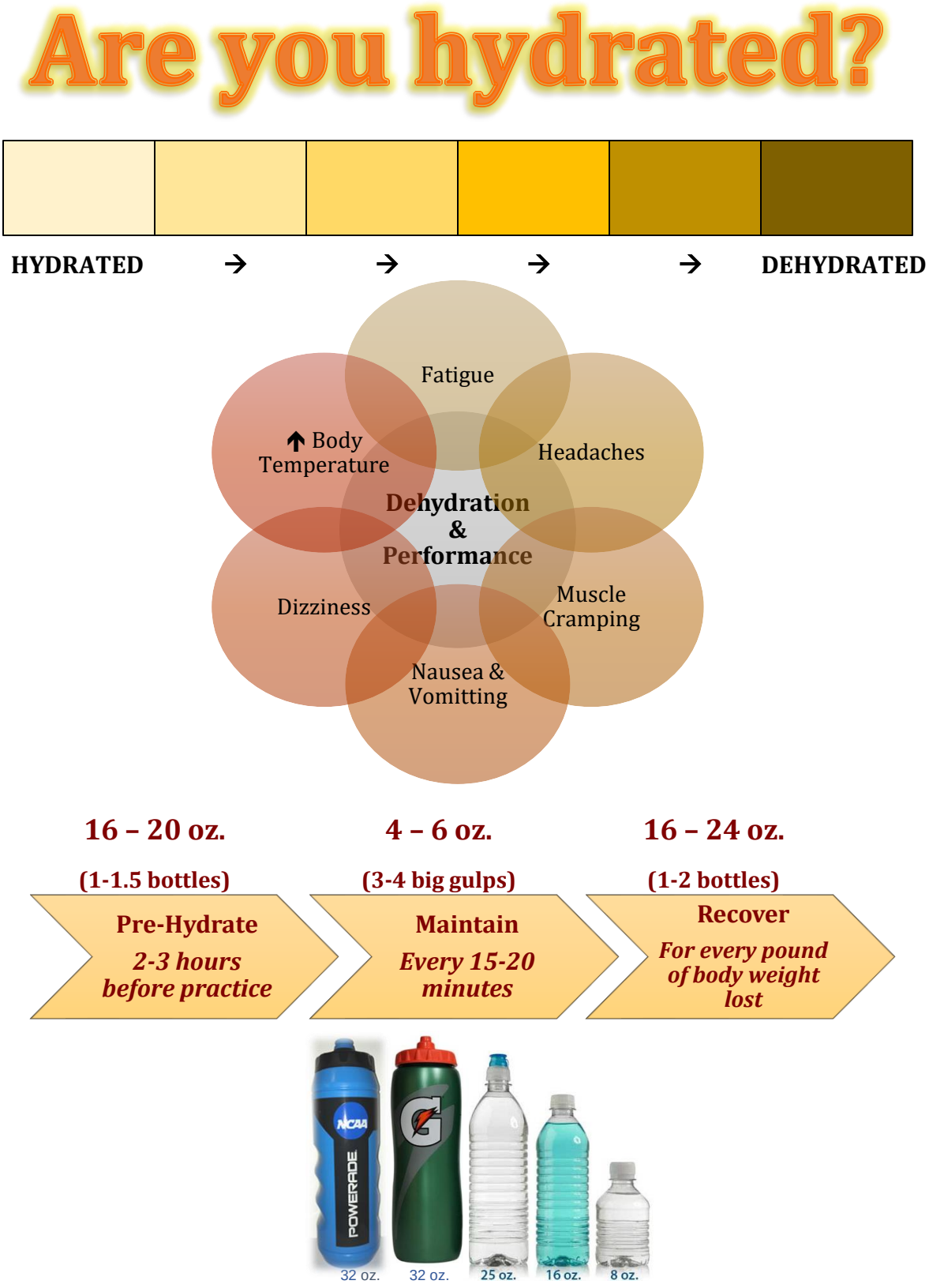
Conclusion

Public health and athletic training are brought together by the common goal of preventing injury. As ATs become more accessible in non-traditional communities such as military and public safety, there is great opportunity to align with public health ideals and pursue population-based prevention efforts. While much of public health is inherently political, an ecological perspective can improve day-to-day athletic training practice.

Incorporating public health concepts such as the ecological model, health literacy, health behavior and evidence-based program planning and evaluation can prove beneficial to each respective discipline. Health literacy practices may increase health knowledge and communication between patients and providers. Creating and distributing info-graphics can help an AT introduce or reiterate pertinent information to their teams. Using a simple casual-chain to apply intervention components at each level of the ecological model can aid in overcoming sport-culture issues and improve individual health outcomes. Finally, employing a cyclical assessment process for evidence-based program development will help ensure an intervention is effective and elicit growth in areas of weakness.

In summation, population-based efforts employed by public health practitioners are translatable to athletic training practice. While the recommendations given in this document are empirical, ATs are encouraged to utilize these tools and to continue growing partnership with public health professionals. Athletic trainers play a vital role in keeping people active and promoting healthy lifestyle. With foundational public health knowledge, ATs are positioned to create significant population-based health improvements.

Appendix A: Sample Info-Graphic



Appendix B: Primary Prevention Plan (distributed throughout practice facility)

Build Better Handstands... With Science!

Left 11/9/17 → Rehab 2x per week for 10 weeks → Right 1/24/18

- Thoracic mobilizations 15x each
  - (1) Extensions: Place the roller just below the point of your shoulder blades, lift your butt & hold a pelvic tilt (so your belly is tight & low back is flat). With the roller as your axis, arch backward while breathing out. Hold for a second, then return up to neutral. Repeat another set with the roller right on your shoulder blades.

  - (2) Rotations: Lay on your side with the roller parallel to your body & your top hip/knee at 90°. With your shoulders stacked and palms facing each other, slide the top arm forward & rotate to stretch your mid-back. Return to the start position & "unslide" the top arm back into neutral.

- I, T, Y, W on Physioball 3 x 10 each
  - With your belly on the top of the ball and your upper traps relaxed ("like jello"), draw your shoulder blades down, back, and in – like you're pulling each one towards the opposite side pocket. Then:
  - I: <10 degree angle at the armpit, palms facing in

  - Y: 120 degree angle at the armpit, thumbs up

  - T: 90 degree angle at the armpit, thumbs up

  - W: Bent elbows & approximately 60 degrees at your armpit, palms down

References:

1. Introduction to Public Health. Centers for Disease Control and Prevention Website. https://www.cdc.gov/publichealth101/public-health.html. Accessed October 7, 2018.
2. Public Health Resources. Association of Accredited Public Health Programs Website. http://www.aaphps.org/public-health-resources.html. Accessed October 7, 2018.
3. Hoffman M, Bovbjerg V, Hannigan K, Hootman, JM, Johnson ST, Kucera KL, Norcross MF. Athletic Training and Public Health Summit. JOAT. 2016; 51(7):576-580. doi: 10.4085/1062-6050-51.6.01
4. About Us. Datalys Center for Sports Injury Research and Prevention Website. http://www.datalyscenter.org. Accessed October 7, 2018.
5. A Quick Guide to Health Literacy. U.S Department of Health and Human Services. https://health.gov/communication/literacy/quickguide/factsliteracy.htm. Accessed October 30, 2018.
6. Kutner M, Greenberg E, Jin Y, Paulsen C. The health literacy of America's adults: Results from the 2003 National Assessment of Adult Literacy. (NCES 2006–483). Washington, DC: National Center for Education Statistics; 2006. doi:10.1592/phco.22.5.282.33191
7. Finch C. A new framework for research leading to sports injury prevention. JSAMS. 2006; 9(1-2):3-9. doi: https://doi.org/10.1016/j.jsams.2006.02.009