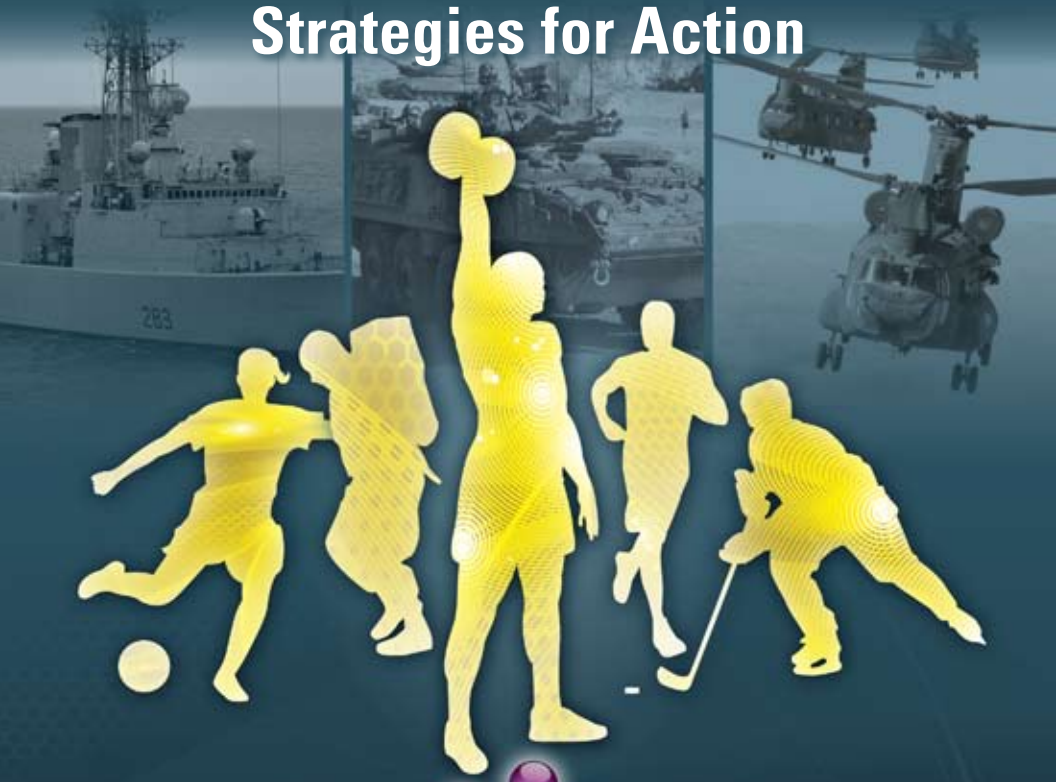
National Defence / Défense nationale

Health Promotion in the Canadian Forces
STRENGTHENING THE FORCES
ENERGISER LES FORCES
Promotion de la santé dans les Forces canadiennes

Injury Reduction Strategies

for Sports and Physical Activity

Strategies for Action



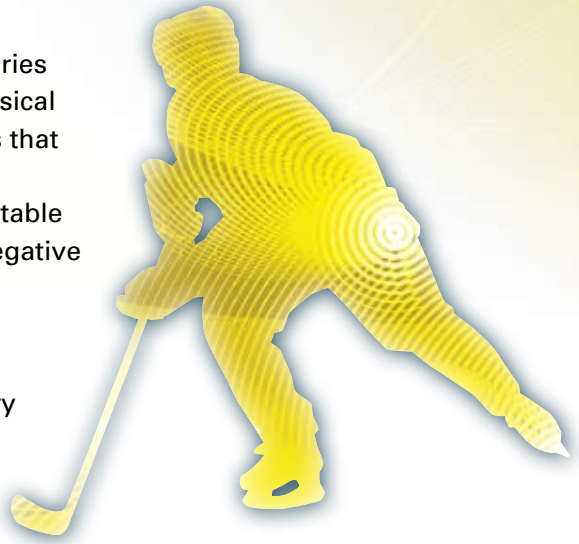
SCIENCE WORKING FOR YOU

A-MD-050-SA1/JD-002 (2012-02)

Canada

Program Partners

This booklet is intended to supplement the presentation *Injury Reduction Strategies for Sports and Physical Activity*. For more information on this presentation, contact your local Strengthening the Forces health promotion office or consult http://cmp-cpm.forces.mil.ca/health-sante/ps/hpp-pps/ipal-pbva/irs-srb-eng.asp.



Overview:

50% of Canadian Forces injuries occur during sports and physical activity[1] and research shows that 80 to 95% of all injuries are preventable.[2,3] These preventable injuries have a significant negative impact on the operational readiness of the CF.

Considering the above, injury prevention is an important responsibility that is shared by everyone in the CF. After carefully reviewing the scientific literature, 21 **strategies**[4] were identified to help reduce the incidence of injuries to yourself, your unit and the CF in general. Please note that these strategies may need to be adapted to the unique operational needs of the CF.

Strategies for your Sports and Physical Activities

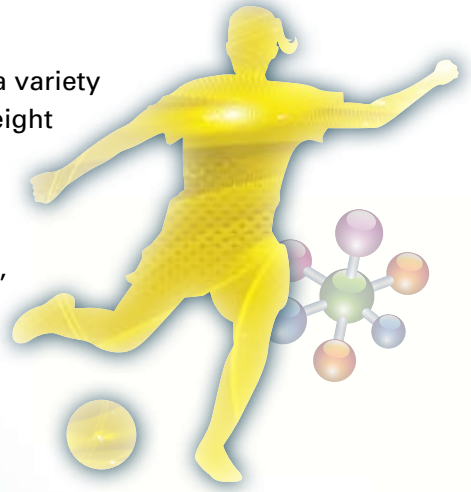
Training:

1) **Do daily fitness training** – This can reduce the incidence of injury and chronic diseases such as diabetes 50%, obesity, high blood pressure 50%, cancer 50-60%, depression and heart disease 40%.[5]

2) **Alternate high and low impact training days** – Running, jumping and drill subject your musculoskeletal system to considerable impact which is why they are called high impact activities. Depending on the amount of impact, the body needs a minimum of 48 hours[6,7] to recover from this type of stress and it is recommended you alternate high and low impact training days. An example of this would be: Mon – run, Tues – gym routine, Wed – run, Thurs – low impact aerobics, Fri – run, Sat – bicycle and Sun – rest. Speak to your PSP fitness staff to receive suggestions for high and low impact training days adapted to your fitness level.

3) **Always do an active warm-up** – before fitness training or sports. Your warm-up should be specific to the planned activity/sport and this means it should involve doing similar movements at a slower pace and then gradually increasing the intensity. Passive stretching is not a warm up and has not been shown to prevent injuries.[4]

4) **Cross train regularly** – Doing a variety of fitness activities such as weight lifting, rucksack marching, swimming, running, biking, aerobics, spinning, wall climbing, cross country skiing, snow shoeing, etc – will help you stay fit[8], keep your program fresh and help you develop a wide range of operationally useful skills.



5) **Progress slowly** – Research shows how often, how long and how hard you train are important factors in determining your risk of injury.[9] This is true for everyone but it's especially true for someone who is starting a fitness program. Be careful to slowly increase your training load in terms of the following factors: intensity, frequency and duration. A good guideline is not to increase your workload more than 5-10% per week[10] and never more than one factor at a time. For example: if you don't run regularly, your musculoskeletal system isn't used to absorbing impact forces. It takes two to three months for your body to adapt to high impact activities and until this occurs you are at much greater risk of being injured if you run too much.

6) **If you don't run regularly** – You can avoid injury and allow time for adaptation by trying the following: (Running regularly has been defined as running a minimum of 30 minutes three times per week for at least 2 months without injury[11].)

   a) Start with fast walking. When you are ready try alternating running and walking – run 1 min – walk 1 min and slowly progress your running time over 6 to 8 weeks until you can run 10 min and walk 1 min.[12]

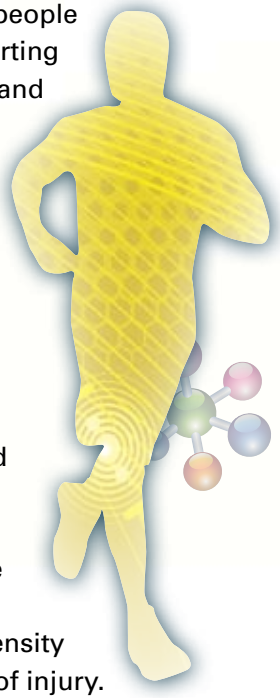
   b) Limit your runs to 30 minutes and no more than 3 times per week. This will give your musculoskeletal system time to adapt to the impact forces of running and decrease the risk of injury by 50-70%.[12,13]

   c) Reduce or eliminate running on days when you do other high impact activities such as drill, jumping, rucksack marching and running related sports.[13,14]

7) **Avoid *endurance* running in combat boots or carrying a rucksack** – These things change your running biomechanics and increase your risk of injury by more than 30%[15,16]. You can refer to CANLANDGEN 006/98 312030Z Mar 98 and CANLANDGEN 026 121530Z Jul 02.

8) **Introduce interval running** – It can produce great improvements in aerobic fitness while limiting running times to 30 minutes.

This strategy reduces injury risk especially for people unaccustomed to high impact activities. Try starting with 4 intervals of "30 seconds of fast running and 60 seconds of walking" once per week.[13]



9) **Limit unit runs** – to avoid injury unit runs should be limited to once per month, no longer than 30 minutes[14] and be led by someone who ensures a slow pace. While unit runs may be good for team building, they are not very useful for fitness development.

10) **Try ability-based running groups** – It is safer and more effective when unit runs are organized by dividing participants into 4 or more groups based on running ability.[13,14] This allows people to run at their own speed, ensures everyone progresses their workouts at an acceptable intensity for their fitness level and also reduces the risk of injury.

11) **Do sport-specific exercises** – Exercises focused on skills such as jumping, landing, balance and changing direction will reduce injury rates in many sports. For example, 20 minutes of specific direction changing exercises can reduce a player's risk of injury between 30 and 80% in soccer, basketball or handball.[17,18] Something as basic as learning to jump and land without letting your knees dip inward can prevent injuries to the stabilizing ligaments of the knee.

12) **Limit load carriage** – Research has shown that if you carry greater than 30% of your body weight you are at greater risk of being injured.[19,20] If operational demands require that you exceed this limit you must train very specifically and progress carefully to be able to safely achieve this goal.

13) **Keep a natural low back curve** – Exercises with repetitive bending forward of your trunk put enormous pressure on your back and weaken its structures leaving you at risk of back injuries.[21] Select your exercises carefully.

14) **Do core strengthening activities** – as part of your daily workouts. Core strength is easily lost! Adopt new exercises like planks to challenge your trunk muscles while protecting your lower back. Avoid doing repetitive sit-ups and other exercises requiring repetitive bending forward at your trunk.[21]

Equipment:

15) **Semi-rigid ankle braces** – reduce the risk of ankle injury during high risk activities such as soccer, ball hockey, basketball and obstacle course for healthy individuals, but especially for people with previous ankle injuries.[4]

16) **Outside or inside boot ankle braces** – reduce the risk of paratrooper ankle injuries by 50%.[22]

17) **Wear a helmet** – whether you bike to and from work, as part of your fitness program, for family fun or as part of a competitive team. This is also good advice for skiers and snowboarders.[23]

18) **Wearing a mouth guard** – reduces the risk of facial and dental injury for activities such as hockey, basketball, unarmed combat and confidence/obstacle courses.[24]

19) **Wrist braces** – reduce your risk of injury while snowboarding and in-line skating.[4,25]

20) **Baseball breakaway bases** – reduce up to 33 times the risk of lower body injuries in softball.[4]

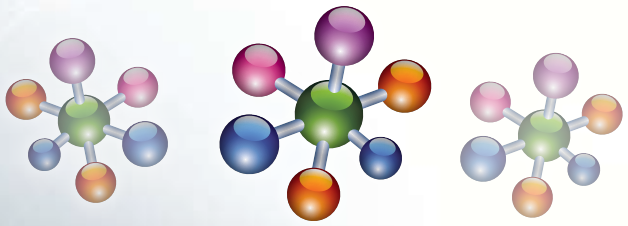
Nutrition:

21) **Healthy nutrition** has been shown to maximize and improve consistency in performance, and enhance recovery between training thus reducing the risk of injury and illness.[26,27]

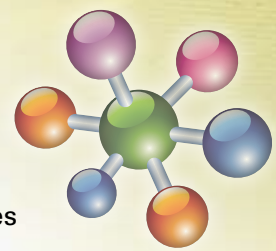
- **Nutrition and stress fractures** – there is a greater risk for lower bone density and stress fractures in female athletes and military recruits.[28,29] Known nutritional factors are: inadequate intakes of total energy, calcium, vitamin D and possibly protein due to calorie restriction and low intake of milk products.[28,30,31]

- **Eat a well balanced diet** as this is the best way to meet your energy and nutrient needs. Consume milk products and/or calcium-rich alternatives such as fortified soy beverages, canned fish (with bones), almonds and dark leafy greens. When it is difficult to meet your calcium and vitamin D requirements by diet alone, a supplement may be warranted.[27,29-35] For more information, consult your doctor, dietitian or pharmacist.

- Learn more about healthy nutrition by participating in the *Top Fuel for Top Performance* workshops offered by your local Strengthening the Forces Health Promotion office: http://cmp-cpm.forces.mil.ca/health-sante/ps/hpp-pps/nw-mn/tf-bs-eng.asp.



References



Please note that the list provided is an overview of the available references and does not include all of the references available on this topic :

[1] Health and Lifestyle Information Survey 2008/9 (2011), Canadian Forces Health Services Group Headquarters.

[2] Tator CH (2008), Catastrophic injuries in sports and recreation: causes and prevention, a Canadian study, University of Toronto Press.

[3] Ministry of Health Promotion (2007), Ontario's Injury Prevention Strategy: Working Together for a Safer, Healthier Ontario, Queen's Printer for Ontario.

[4] Moloughney B (2004 and 2008), The Primary Prevention of Unintentional Injuries – A Systematic Review of the Literature, Directorate Force Health Protection, CF H Svcs Gp.

[5] ACSM, The most powerful step in medicine has your name written all over it, Exercise is Medicine http://www.exerciseismedicine.org/documents/EIMbrochure_HR.pdf (viewed 2010-06).

[6] Chen TC, Chung C-J, Chen H-L, Wu C-J (2007), Effects of a 4-day low intensity run after downhill running on recovery of muscle damage and running economy, J Exerc Sci fit, 5(1):24-32.

[7] Dartnall TJ, Nordstrom MA, Semmler JG (2011), Adaptations in biceps brachii motor unit activity after repeated bouts of eccentric exercise in elbow flexor muscles, J Neurophysiol., 105(3):1225-35.

[8] Iwamoto J, Sato Y, Takeda T, Matsumoto H (2009), Role of sport and exercise in the maintenance of female bone health, Journal of Bone and Mineral Metabolism, 27(5):530-7.

[9] Jones BH, Thacker SB, Gilchrist J, Kimsey CD Jr, Sosin DM (2002), Prevention of lower extremity stress fractures in athletes and soldiers: A Systematic Review. Epidemiologic Reviews, 24(2):228-47.

[10] Warburton DER, Katzmarzyk PT, Rhodes RE, Shephard RJ (2007), Evidence-informed physical activity guidelines for Canadian adults, Appl. Physiol. Nutr. Metab. 32(S2E):S16-S68.

[11] Directorate of Force Health Protection (2010), Injury Reduction Strategies for Sports and Physical Activity, Canadian Forces Health Services Group Headquarters.

[12] Pollock ML, Gettman LR, Milesis CA, Bah MD, Durstine L, Johnson RB (1977), Effects of frequency and duration of training on attrition and incidence of injury, Medicine and Science in Sports, 9(1):31-36.

[13] Knapik J, Darakjy S, Scott SJ, Hauret KG, Canada S, Marin R, Rieger W, Jones BH (2005), Evaluation of a standard training program for basic combat training, Journal of Strength & Conditioning Research, 19(2):246-53.

[14] Ruscio B et al (2006), Military Injury Prevention Priorities Working Group: Leading Injuries, Causes and Mitigation Recommendations, Defence Safety Oversight Council, Office of the Secretary of Defence, Health Affairs, US.

[15] Institute of Medicine (1998), Reducing stress fractures in physically active military women, National Academy Press, Washington DC.

[16] Stacy RJ, Hungeford RL (1984), A method to reduce work-related injuries during basic recruit training in the New Zealand army, Military Medicine, 149(6):318-320.

[17] Fradkin A, Gabbe BJ, Cameron PA (2006), Does warming up prevent injury in sport? The evidence from randomized control trials? J Sci Med Sport, 9(3):214-220.

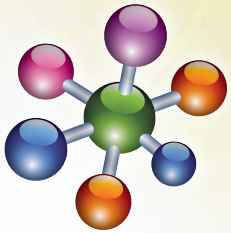
[18] Olsen OE, Myklebust G, Engebretsen L, Holme I, Bahr R (2005), Exercises to prevent lower limb injuries in youth sports: cluster randomised controlled trail. BMJ, 330(7489): 449.

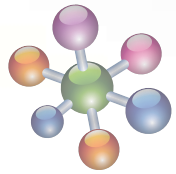
[19] Pelot RP, Stevenson JM, Reid S, Barrick CM, Day J, Reid S. (1995). Background Document for Advanced Personal Load Carriage Systems for Canadian Armed Forces. Ergonomics Research Group, Queen's University.

[20] US Army Physical Fitness School (2005), IET Standardized Physical Training Guide.

[21] McGill S (2006), Ultimate Back Fitness and Performance, Backfitpro Inc, Waterloo, Second Edition.

[22] Knapik J, Spiess A, Swedler DI, Grier TL, Darakjy SS, Jones BH (2010), Systematic Review of the Parachute ankle brace – Injury Reduction and cost effectiveness, Am J Prev Med, 38(1 Suppl):S182-8 and DFHP communication with US Army Public Health Command.





[23] Thompson DC, Rivara F, Thompson R (2009), Helmets for preventing head and facial injuries in bicyclists. Cochrane Database of Systematic Reviews, 1:1-30.

[24] Knapik J, Marshall SW, Lee RB, Darakjy SS, Jones SB, Mitchener TA, delaCruz GG, Jones BH (2007), Mouthguards in sport activities: history, physical properties and injury prevention effectiveness. Sport Med; 37(2):117-144.

[25] Endres NK, Johnson RJ, Kim S, Ettlinger CF, Shealy JE (2007), Epidemiology of snowboarding and skiing injuries, Conference abstract, International Society of Skiing Safety.

[26] Nutrition Working Group of the International Olympic Committee (2009), Nutrition for Athletes: A practical guide to eating for health and performance. http://productnutrition.thecoca-colacompany.com/media/en-ioc-nutrition-2010.pdf

[27] Burke L, Deakin V (2010), Clinical Sports Nutrition, Fourth Edition, McGraw-Hill, Australia Pty Ltd.

[28] Institute of Medicine of National Academies (2006), Mineral Requirements for Military Personnel, The National Academies Press, Washington DC, 2006.

[29] Wentz L, Liu PY, Haymes E, Ilich JZ (2011), Females have a greater incidence of stress fractures than males in both military and athletic populations: a systemic review. Mil Med, 176(4):420-30.

[30] Dietitians of Canada, Practice-based Evidence in Nutrition (PEN), Bone Health Knowledge Pathway (accessed 2012-01).

[31] Tenforde AS, Savres LC, Sajnani KL, Fredericson M (2010), Evaluating the relationship of calcium and vitamin D in the prevention of stress fracture injuries in the young athlete: a review of literature, Phys Med and Rehab, 2(10):945-9.

[32] Friedl KE, Evans RK, Moran DS (2008), Stress fracture and military medical readiness: bringing basic and applied research, Med Sci Sports Exerc, 40(11 Suppl):S609-22.

[33] Cranney A et al (2007), Effectiveness and safety of vitamin D in relation to bone health, Evid Rep Technol Assess (Full Rep), 158:1-235.

[34] Snow-Harter CM (1994), Bone health and prevention of osteoporosis in active and athletic women, Clin Sports Med, 13(2):389-404.

[35] Lappe J, Cullen D, Haynatzki G, Recker R, Ahlf R, Thompson K (2008), Calcium and vitamin D supplementation decreases incidence of stress fractures in female navy recruits, J Bone and Min Res, 23(5):741-49.