TO EXERCISE OR NOT TO EXERCISE IN ACUTE UPPER RESPIRATORY TRACT INFECTIONS?

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Abstract:

The paper deals with the problem of acute viral infections of the upper respiratory tract in sport and recreational exercise. Regarding these infections, important factors are biological age and the previous health status – the existence of one or more chronic diseases, particularly respiratory and cardiovascular ones. Described are virus types, ways of their transmission, disease course and possible complications. Special attention is paid to influenza. The risk of the upper respiratory tract diseases is increased during intensive endurance training sessions, marathon and ultramarathon races, as well as in the cases of overtraining and chronic fatigue. Cited are changes in the individual components in the immune system, which happen in intensive long-lasting high volume training, and which are related to neuroendocrinologic changes. Recommendations for the prevention of increased risk of upper respiratory tract infections are listed. The duration of a certain viral disease is particularly stressed, as well as which circumstances condition the restart of training.

Key words*: infections, viral, upper respiratory tract, influenza, exercise, immunity, protection, recommendations*

SPORT ZU TREIBEN ODER NICHT WÄHREND AKUTER INFEKTIONEN VON OBEREN ATEMWEGEN?

Zusammenfassung:

Diese Arbeit befasst sich mit dem Problem akuter Virusinfektionen von oberen Atemwegen während sportiver Betätigung oder während Erholungsübungen. In Bezug auf diese Infektionen sind die Faktoren wie, zum Beispiel, das biologische Alter und der vorherige Gesundheitsstatus – das heißt, das Vorhandensein einer oder mehrerer chronischen Krankheiten, insbesondere der Atemwege- und Herz-Kreislauferkrankungen, von großer Bedeutung. Verschiedene Virustypen, die Art und Weise ihrer Übertragung, der Erkrankungsverlauf und mögliche Komplikationen wurden beschrieben. Der Influenza wurde besonderer Nachdruck verliehen. Das Risiko der Erkrankung oberer Atemwege nimmt während intensiven Ausdauertrainings, des Marathons und der Ultramarathonläufe zu, sowie in Fällen von Übertrainiertheit und chronischer Erschöpfung. Die Veränderungen von individuellen Komponenten des Immunsystems wurden angeführt, die im Lauf intensiven, langwierigen und hohen Trainingsumfangs zustande kommen und die mit neuroendokrinologischen Veränderungen zu tun haben. Außerdem wurden die Empfehlungen zur Vorbeugung gegen den erhöhten Erkrankungsrisiko der oberen Atemwegeinfektionen angeführt. Große Bedeutung wurde der Dauer einer bestimmen Viruserkrankung beigemessen, genauso wie den Umständen, die den Wiederbeginn des Trainings beeinflussen.

Schlüsselwörter: *Infektionen, viral, obere Atemwege, Influenza, Sporttreiben, Immunität, Schutz, Empfehlungen*

Acute viral infections of the respiratory tract

Acute infections of the respiratory tract are the most frequent reason of morbidity and inability to work and to exercise in a population, especially in late autumn and in the winter months, i.e. during significant temperature changes in the surroundings. Their frequency has reached over 65% of all infections. Among these diseases, mild viral infections of the respiratory tract are dominant. Those are states when a physician's intervention is rarely asked for. Viral infections are thus the most frequent cause of the diseases of the upper respiratory tract, while bacterial infections are the frequent cause of the lower respiratory tract diseases, particularly of pneumonia: they annually affect about 1-1.5% of the population. It is a fact that bacterial respiratory infections often occur after viral infections. Here important facts are the biological age of a patient, the previous health and functional status, particularly the existence of one or more chronic diseases, as respiratory tract diseases (for example, chronic obstructive lung disease: chronic bronchitis, pulmonary hyperinsuflation, bronchial asthma, but also brochiectasis, interstitial lung diseases, etc.), chronic cardiovascular diseases, and others (Duraković, 2003). According to the site, these diseases can be divided into those affecting the upper and those affecting the lower respiratory tract, but it is often difficult to draw a definite line between them. Regarding etiology, clinical presentations and pathological anatomic changes, these diseases can be classified into viral, bacterial, rickettsial, chlamydial, fungal, and "chemical pneumonitis" due to aspiration.

The upper respiratory tract infections spread by droplet infection, i.e. through a contact with the respiratory virus-containing secretion of another person, while incubation is short. The onset of a disease, especially in epidemic form is helped by climatic conditions: cold months with high humidity, staying indoors in crowded rooms, density, speed and intensity of patient traffic, particularly in the incubation phase etc. This is valid for the occurrence of influenza (flu). A virus can enter the respiratory tract by aerosol, direct or indirect contact including a contaminated object. The potential of infection spreading from a person with the respiratory infection is significant eight days at least, while viruses can generate even for two to three weeks. A large number of viruses and their numerous serotypes are the causative agents of the upper respiratory tract infections. Rhinoviruses (with more than a hundred serotypes) are responsible for about 40% of common cold infections with a well-defined prevalence in autumn and in spring, but they can also occur during the winter months. Corona viruses are the second group of common cold agents during late autumn, winter and early spring, and are considered to be the most frequent causes of a winter cold. The upper respiratory tract infections are also caused by Coxackie viruses, Echo viruses (which can also induce myocarditis), adenoviruses, sintitial respiratory virus $(ABC)_3$, influenza virus, parainfluenza virus, Epstein-Barr virus causing infectious mononucleosis (Roberts, 1986; Weidner, 1994). The immunity created after the acute phase of the upper respiratory tract disease is often short, thus an adult person averagely has one to six episodes of the common cold (Beneson, 1975). The upper respiratory tract infections cause the occurrence of more acute disabilities than all other diseases together (Schouten, Verschuur, & Kemper, 1988).

Out of the listed agents, herpes simplex, measles, chickenpox, cytomegalovirus and mumps lead to the so-called general symptoms as fever, headache, sweating, muscle and "bone" pain, fatigue, etc. Local symptoms, like nasal secretions, headache (due to affected paranasal sinuses), laryngitis, difficulties in swallowing (tonsillitis), etc. are caused by viruses which are parasites of the respiratory tract mucus, as are influenza and parainfluenza viruses, rhinoviruses, adenoviruses, sintitial respiratory viruses, and others. After a virus enters the organism via droplet infection and affects the mucus of the upper respiratory tract, it causes inflammatory changes, degeneration and necrosis of the epithelial cells. On such substrate bacteria localize and multiply leading towards bacterial super-infection. These diseases can sometimes be classified into four groups: to the first belongs flu (influenza), followed by the common cold, "febrile catarrh" and finally viral pneumonia.

Flu (influenza)

Flu should be considered separately, because it occurs epidemically, sometimes even pandemically. It is caused by the influenza virus, being transmitted by droplet infection from person to person. Pandemic morbidity amounts to even 40-60%. Incubation time lasts 1-3 days, and the disease usually lasts 3-5 (7) days, according to the old saying: "treated flu lasts seven days – untreated flu lasts a week". It starts abruptly with general symptoms of infection and fever, intense headache, loss of appetite, mialgia, fatigue, exhaustion, prostration, sleepiness and sometimes even with the loss of consciousness. Local symptoms of eye conjunctiva inflammation (conjunctivitis), as well as of the upper respiratory tract are not particularly expressed. Further can develop a nasal secretion, a "sore throat", a hoarse and husky voice (laryngitis) and a non-productive cough (tracheitis and acute bronchitis). It often passes as a 'common cold'", but sometimes cardiogenic shock can develop, with a fast course and lethal outcome. This disease can be very severe and accompanied

by a series of complications, usually at the end of the disease, like bacterial super-infections with the occurrence of purulent ear inflammation, purulent paranasal sinuses inflammation, laryngitis, tracheitis, bronchitis, bronchiolitis. Pneumonia can occur very early during the course of flu (in the viral phase), thus it is called 'flu pneumonia'. It is caused by the influenza virus itself. Also, secondary bacterial infections are possible, having a very severe course causing abscesses, lung gangrene and pleural empyema. Pneumonia can also occur in the period of recovery after flu, i.e. during recuperation (the so-called 'post-flu pneumonia') which is often lobar, caused by: pneumococcus.

Exercise and viral infections of the upper respiratory tract

Top athletes, trainers and sport physicians observe that athletes in the periods of intensive training and after highly strenuous competitions are more often affected by the upper respiratory tract infections, as is, for example, the common cold. Simultaneously, those engaged in recreational exercising consider that such regular workout protects them from these infections, and that they are less frequently ill than the inactive population (Shepard, Kavanagh, Mertens, Qureshi, & Clark, 1995; Shepard & Shek, 1998; Peters, 1997; Mackinnon, 2000; Nieman, 2000; Konig, 2000; Weber, 2003). These ambiguous observations have found confirmation during the last decades in a long series of professional and scientific papers, arousing interest about the influence of intense high volume training upon the immune system functions. Knowledge has been accumulated in numerous experimental animal and in human studies, through epidemiological data, transversal studies of athletes and non-athletes, and in the analyses of the chronic impact of exercise and intensive training upon the immune functions and occurrence of the upper respiratory tract infections.

Several randomized studies of the influence of physical exercise in previously sedentary women have shown that an everyday 40-45-minute fast walk over 12 to 15 weeks reduces the number and duration of cold symptoms by half in connection with the increased activity of natural killer cells (Nieman, Nehlson-Cannarella, Markoff et al.1990; Nieman, Henson, Gusewitch et al., 1993; Nieman, 1998; Nieman, Nehlson-Cannarella, Henson, Butterworth et al., 1998). Jedrychowski and associates (2001) studying data on respiratory health of preadolescent children concluded that physical exercise may lessen the risk of acute respiratory infections. Kostka and associates (2000) found that in healthy elderly people the occurrence of symptoms of the acute upper respiratory tract infections was inversely correlated with the energy consumption during moderate physical exercise.

Several epidemiological studies point to the increased risk of morbidity from the upper respiratory tract infection in athletes during intensive endurance training sessions, and one to two weeks after a marathon and ultramarathon race (Peters, Goetzsche, Grobbelaar, & Noakes, 1993; Peters, Goetzsche, Joseph, & Noakes, 1996; Peters, 1997), while the incidence of infections is connected with the duration of the race and with the training volume preceding it.

Similar is observed in the cases of overtraining (Fisher, 1998) and in athletes who exceed their individual exercise limits (Tomasi, Tradeau, & Czerwinski, 1982; Berk, Tan, & Nieman, 1985). In shorter races and lower rate competitions such risk is not elevated. These findings point to the relation of physical exercise and training with the occurrence of infections, having the shape of a "j" curve. It means that the risk of infection in the upper respiratory tract, as is the common cold, can be lower in persons who exercise moderately than in the average inactive population, while the risk rises above average along with intensive high volume training (Heath et al., 1991; Nieman, 2000).

Infections, changes in the immune system and exercise

What happens to the immune system under the impact of exercise with various volumes and intensities? Numerous investigations during the last decade have revealed changes in many components of the immune system under the influence of intense, long-lasting (chronic) high volume training. It can be followed by a decrease in the immunoglobuline A concentration (IgA) in the nasal mucus and saliva. Neutrophilia and lymphocytopenia, an increase of granulocyte and monocytice phagocytosis, but a decrease of neutrophil phagocytosis in nasal mucus could be seen. A decrease in granulocyte oxidative activity and a decrease in mitogen-induced lymphocyte proliferation could also be seen. A decrease in the cytotoxic activity of "natural killer cells", an increase in the concentration of pro-inflammatory and anti-inflammatory cytokins, a decrease in the production of cytokins ex vivo and a decrease in the delayed-type hypersensitivity response are seen often (Nieman et al., 1990,1993, 1998, 2000; Pyne & Gleeson, 1998; Mackinnon, 2000).

These changes show a mild decrease in the immune function, transient after repeated (chronic) long-lasting exhaustive exercise. These changes, however, are not observable after moderate training. Moreover, moderate activity seemingly has a positive influence on the immune functions. The direction and size of change in particular immunological parameters depends on the volume and intensity of exercise and on the level of a person's physical fitness. It must be stressed that a mild decrease in the immunological functions, observed in

chronic long-lasting exhaustive endurance training sessions, is connected only with the occurrence of mild diseases affecting the upper respiratory tract, like the common cold, and does not mean immunodeficiency.

It seems that many cited immunological changes are related to neuroendocrine changes (stress hormone levels, number of hormone receptors or receptor sensitivity). Chronic intensive exercise training along with psychological and emotional stress has an untoward impact upon the immune system and the incidence of the upper respiratory tract infections. Thus top athletes engaged in exhaustive disciplines after long-lasting races, which are at the same time psychological, emotional and body stress, are particularly prone to an increased risk of upper respiratory tract infections. Although many of the above cited immunological changes are known in the described conditions, for the time being the load threshold under which and above which physical activity, exercise and training are protective or unfavorable is not known yet.

How to be protected from acute viral infections of the upper respiratory tract?

Top athletes subjected to chronic long-lasting high intensity training, in order to protect themselves from the increased risk of upper respiratory tract infections should, according to Weidner (1994) and Nieman and associates (1998, 2000), take adequate, well balanced nutrition with special attention paid to sufficient intake of carbohydrates. This has to be done before, during and after long intensive activity, because carbohydrates maintain the glucose level in the plasma, prevent the rise of stress hormones cortisol and the growth hormone, in this way reducing the occurrence of immunological changes. It is necessary to take vitamins adequately, particularly ascorbic acid (vitamin C), minerals: sodium, potassium, calcium, magnesium in the first place, and glutamine, because a non-essential amino-acid, according to some investigations lessens the rate of lymphocyte proliferation. The carbohydrates avoid any abrupt loss of body mass. There must be careful monitoring of the training intensity and volume to avoid chronic fatigue and prevent overtraining. Quality, regular rest and recovery must be planned within training cycles, as well as quality and regular sleep before scheduled competitions. It is necessary to reduce the stress of everyday living to a minimum, because psychological stress is a well known modulator of the immune functions. Before the winter months (October) vaccination against flu has to be done. It is necessary to avoid contact with sick people and staying in crowded areas before any important competitions, to avoid contact with contaminated sporting equipment and to prevent viral self-inoculation by the contact of nasal and eye mucus.

When to exercise, and when not to exercise in acute infections of the upper respiratory tract?

In the case of infection with the common cold symptoms, but without systemic signs of a disease, the majority of clinicians suggest resuming regular training a few days after the symptoms' cessation (Roberts, 1986; Weidner, 1994; Nieman, 2000; etc.). Moderate exercise during the common cold does not seem contraindicated (Weidner, 1997; Weidner & Schurr, 2003). Such infections, most frequently caused by rhinoviruses, without signs of a systemic disease do not decrease the short-term submaximal and maximal physical abilities. Also, moderate training will not influence the symptoms of the "common cold". However, rhinoviruses are responsible for only 40% of the upper respiratory tract infections. So, many clinicians warn that if there are symptoms or signs of systemic viral diseases (fever, excessive fatigue, muscle pain, swollen lymph nodes, etc.) intensive training can be resumed only after two to four weeks, in order to avoid complications such as viral myocarditis. Training should be adjusted and an athlete should be carefully flowed-up daily during convalescence (if one feels tired, has muscle pain, quality of sleep, etc.).

In the states after flu with moderate clinical features and without complications, only seven days after the cessation of symptoms an evaluation can be done when to continue with recreational or sport exercise. In the development of complications like pneumonia, the continuation of exercise can be evaluated only after 14 days upon the cessation of symptoms, the disappearance of lung infiltrations, as well as upon the normalization of the erythrocyte sedimentation in the first hour and of the white blood count. In the case of acute myocarditis, the return to exercise can be discussed after 6 months at the earliest, depending on a whole series of parameters, like the loss of subjective symptoms, normalization of clinical status and of clinical parameters (pair viral titers), normalization of electrocardiogram, dynamic 24-hour electrocardiogram, echocardiogram, ergometric analysis, etc. The best followed course of recovery and the question of getting back to full activity in young athletes has been described in infectious mononucleosis caused by the Ebstein-Barr virus. Due to the risk of the splenic rupture, being particularly actual during the first three weeks of the disease and/or later, the majority of clinicians recommend avoidance of greater strains a month after the disease's onset. Regular check-ups, particularly a spleen ultrasound examination, belong to the measures of safe recovery and return of the spleen size within its normal limits (Metz, 2003).

During the acute upper respiratory tract infection muscle respiratory and circulatory function alteration have been observed, such as a significant decrease in the isometric muscle strength (Friman, 1977), decreased enzymatic muscle activity and muscle ultrastructure abnormalities (Astrom, Friman, Pilstrom, 1976), altered muscle energy utilization (Roberts, 1989) and inspiratory muscle weakness (Mier-Jedrzejowicz, 1988). Decreased heart stroke volume is observed during fever, while cardiac output is compensated by the elevated heart frequency. A series of complications can be associated with the acute upper respiratory tract infections. The predilection of Coxsackie virus to cause acute myocarditis (myopericarditis) increases the risk of acute malignant ventricular arrhythmias, which can cause sudden cardiac death. Although exceptionally rare, lethal complications in young health people subjected to exhaustive training during acute viral disease have been described. In the 2 out of 48 subjects who suddenly died during exercise (Duraković et al., 2004) a history of recent respiratory tract infection was found.

It must be reminded that intensive physical activity during disease incubation may deteriorate the course of the illness. So, an athlete feeling that he/she is going to be sick ("will catch a cold") should reduce the intensity and volume of training for a few days. But this is strictly individual, and should be evaluated from case to case. Namely, viral infections can have an unrecognized, subclinical course, but with accompanying decreased physical ability (Roberts, 1989).

To conclude, the recognition of viral diseases, especially those affecting the upper respiratory tract, and of their natural course and complications is indispensable. It is important for the estimation when to continue with recreational and sport exercise after the disease. However, all estimations should be individual, bearing in mind all the above mentioned facts.

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VJEŽBATI ILI NE VJEŽBATI U AKUTNIM INFEKCIJSKIM BOLESTIMA GORNJIH DIŠNIH PUTOVA?

Sažetak

Akutne bolesti dišnih putova vrlo su učestale (više od 65% svih infekcija) i najčešći su uzročnik pobolijevanja i razlog nesposobnosti za rad i tjelovježbu pučanstva, napose u kasnu jesen i u zimskim mjesecima, odnosno u vremenima znatnih pomjena temperature okoliša. Akutne se bolesti dišnih putova šire kapljičnom infekcijom, tj. kontaktom s respiratornim sekretima druge osobe koji sadrže virus. Inkubacija je kratka. Razvoju bolesti, napose epidemijama, pogoduju klimatski uvjeti: hladni mjeseci s visokom vlagom u zraku, boravak u jako napučenom prostoru, gustoća, brzina i intenzitet prometa bolesnika, napose u fazi inkubacije i dr. Virus može u dišni sustav dospjeti aerosolom, direktnim I indirektnim kontaktom koji uključuje kontaminirani objekt. Potencijal za širenje infekcije od osobe oboljele od respiratorne infekcije znatan je najmanje 8 dana, a virusi se mogu stvarati i tijekom 2-3 tjedna. Brojni virusi i njihovi brojni serotipovi uzročnici su infekcija gornjih dišnih putova.

Rhinovirusi, kojih ima više od 100 serotipova, odgovorni su za oko 40% infekcija tzv. obične prehlade, s dobro definiranom prevalencijom, napose u jesenjim i proljetnim mjesecima, ali se prehlade mogu javljati i tijekom zimskih mjeseci. Coronavirusi su druga skupina uzročnika tzv. obične prehlade tijekom kasne jeseni, u zimskim i ranoproljetnim mjesecima. Najčešći su uzročnici zimske prehlade. Coxackievirusi i echovirusi uzročnici su infekcija gornjeg dišnog sustava, a potonji mogu biti uzročnicima akutne upale mišića srca (akutnog miokarditisa). Do toga mogu dovesti i adenovirusi, respiratorni sincicijski virus, virus influence, virus parainfluence, Epstein-Barrov virus (koji uzrokuje infektivnu mononukleozu). Imunost je po preboljeloj akutnoj infekciji gornjih dišnih putova kratka pa odrasla osoba preboli 1-6 takvih infekcija godišnje.

Gripa (influenca) se pojavljuje u epidemijama, ali i u pandemijama, zbog čega je treba napose izdvojiti. Uzrokovana je virusom influence. Prenosi se kapljičnom infekcijom s čovjeka na čovjeka. Vrijeme inkubacije je 1-3 dana. Započinje naglo s općim simptomima. Lokalni simptomi nisu napose izraženi. Često protječe poput obične prehlade, no tijek može biti i napose težak s razvojem brojnih komplikacija pred kraj bolesti, kao što su bakterijske superinfekcije, ali i s razvojem upale pluća kao i akutnog miokarditisa s kardiogenim šokom i smrtnim ishodom.

Osobe koje se bave tjelovježbom u periodima intenzivnih treninga češće obolijevaju od infekcija gornjeg dišnog sustava, poput obične prehlade. No osobe koje se bave rekreacijskom tjelovježbom od tih bolesti obolijevaju rjeđe nego tjelesno neaktivno pučanstvo. Funkcija imunološkog sustava se mijenja pod utjecajem dugotrajnog treninga velikog volumena. Događaju se sljedeće promjene: neutrofilija i limfocitopenija, što je uvjetovano povišenom koncentracijom katekolamina u plazmi, kao i hormona rasta i kortizola; povećanje granulocitne i monocitne fagocitoze, ali sniženje neutrofilne fagocitoze u sluznici nosa; smanjenje granulocitne oksidativne aktivnosti; smanjenje učinkovitosti mukocilijarnog sustava nosa; smanjenje citotoksične aktivnosti "stanica prirodnih ubojica"; smanjenje limfocitne proliferacije inducirane mitogenom (što je mjera funkcije T-limfocita); smanjenje odgovora kasne preosjetljivosti; porast koncentracije proupalnih i protuupalnih citokina; smanjenje proizvodnje citokina *ex vivo* u odgovoru na mitogene i endotoksin; smanjenje koncentracije imunoglobulina A (IgA) u sluznici nosa i u slini. Te promjene upućuju na blago smanjenje imunološke funkcije, prolazno nakon ponovljenog kroničnog iscrpljujućeg napora. Čii se da su mnoge nabrojene imunološke promjene rezultat neuroendokrinoloških promjena: porast razine hormona, broja hormonskih receptora, kao i receptorske osjetjivosti. Za sada nije dovoljno poznat prag opterećenja ispod odnosno iznad kojega tjelovježba štiti, odnosno djeluje nepovoljno.

Osoba koja se bavi vrhunskim sportom, koja se, dakle, podvrgava dugotrajnim treninzima visokog intenziteta, da bi se zaštitila od povećane opasnosti obolijevanja od infekcija gornjeg dišnog sustava, treba: svesti stres svakodnevnog življenja na najmanju mjeru (psihološki stres poznati je modulator imunološke funkcije); koristiti dobro uravnoteženu prehranu s osobitom pozornosti na dostatan unos ugljikohidrata prije, za vrijeme i nakon dugotrajne intenzivne aktivnosti; primjereno unositi vitamine, napose askorbinsku kiselinu (C-vitamin), minerale, glutamine (neesencijalna aminokiselina, čime se može smanjiti stopa proliferacije limfocita); izbjegavati nagli gubitak tjelesne mase; izbjegavati kronični umor i priječiti stanje pretreniranosti; priječiti samoinokulaciju virusa dodirom sluznice nosa i oka; izbjegavati susrete s bolesnim osobama i boravak u napučenom prostoru prije velikih natjecanja; osiguravati dobar redoviti odmor i oporavak tijekom trenažnih ciklusa, kao i kvalitetan i redovit san prije natjecanja; prije zimskih mjeseci (listopad) cijepiti se protiv influence.

U slučaju obolijevanja od obične prehlade, a bez znakova sustavne bolesti, sportaš se može uključiti u trening nekoliko dana nakon prestanka simptoma. Umjereno vježbanje u običnoj prehladi obično nije kontraindicirano. Ako se radi o preboljeloj gripi srednje teške kliničke slike, a koja protječe bez komplikacija, tek nakon 7 dana po prestanku simptoma može se ocjenjivati kada ponovno započeti sa sportskim ili rekreacijskim treningom. Ako se radi o komplikacijama, kao što je upala pluća, nastavak tjelovježbe može se ocjenjivati tek 14

dana nakon nestanka kliničkih simptoma bolesti, po nestanku infiltrata na plućima, normalizaciji bijele krvne slike te normalizaciji sedimentacije eritrocita u prvom satu. U slučajevima obolijevanja od akutnog miokarditisa, vraćanje aktivnostima tjelovježbe može se razmatrati najranije nakon 6 mjeseci, što ovisi o brojnim kliničkim i laboratorijskim parametrima.

Niz komplikacija može biti povezan s akutnim infekcijama gornjih dišnih putova. Iako iznimno rijetke, smrtne su komplikacije u mladih, prethodno zdravih osoba, podvrgnutih iscrpljujućem treningu tijekom akutne virusne bolesti gornjih dišnih putova opisane u svijetu i u nas.

Zaključno se može reći da treba znati prepoznati virusne bolesti gornjih dišnih putova, njihov tijek i možebitne komplikacije. To je važno i zbog odlučivanja o tome kada nakon takve bolesti sportaš ili vježbač može nastaviti s kompetitivnom ili rekreacijskom tjelovježbom, a što treba uvijek pojedinačno ocjenjivati. Tu ocjenu treba donijeti liječnik specijalist u suradnji s kineziologom.