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Is the exercise effective for the prevention of upper respiratory tract infections?

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Abstract

Introduction

Upper respiratory tract infections are one of the main causes of medical consultation in the world. Considering the lack of specific treatment, prevention becomes essential. It has been postulated that exercise could have a preventive role, but its clinical effectiveness remains a topic of discussion.

Methods

To answer this question we used Epistemonikos, the largest database of systematic reviews in health, which is maintained by screening multiple information sources, including MEDLINE, EMBASE, Cochrane, among others. We extracted data from the systematic reviews, reanalyzed data of primary studies, conducted a meta-analysis and generated a summary of findings table using the GRADE approach.

Results and conclusions

We identified four systematic reviews including fourteen studies overall, of which six were randomized trials. We concluded it is not clear whether exercise of moderate intensity prevents or not upper respiratory infections, because the certainty of the evidence is very low.

Problem

Upper respiratory infections have a high prevalence, and impose important financial burden to the systems through costs derived from frequent consultations and absenteeism. It is estimated that each year a child suffers about five upper respiratory infections, and an adult between two and three[1].

It has been suggested that the relationship between exercise and upper respiratory infections follows a "type j" curve, where moderate and regular exercise would improve the ability to resist infections and reduce the number of symptomatic days of those who suffer them[2]. This effect would be mediated by varying concentration of different cells or cell products that affect immune system, especially immunoglobulin A and natural killer cells[3]. On the other hand, high intensity or chronic exercise would decrease the ability to resist infections, which could constitute a potential risk.

The role of regular physical activity in preventing diseases, such as colds or other upper respiratory diseases, is not well defined. The objective of this summary is to evaluate the existing evidence, in order to improve our understanding of this problem.

Key messages

- Is not clear whether moderate intensity exercise decreases the risk of developing upper respiratory infections because the certainty of the evidence is very low.

About the body of evidence for this question

What is the evidence. See evidence matrix in Epistemonikos later	We found four systematic reviews[4-7] including 14 primary studies (reported in 18 references)[8-25], of which six corresponded to randomized trials (included in 10 references)[8-15,21,25]. This table and the summary in general are based on the latter, since the observational studies did not increase the certainty of the existing evidence, or provide relevant additional information.
What types of patients were included*	Four trials included only women, between 25 and 75 years, sedentary (less than 60 minutes per week of moderate or vigorous physical activity), without allergies, without using medications and with no previous illnesses[9,10,11,14]. Two trials included adults of either sex[8,25], between 67 to 85 years[25] and 56 years on average[8], sedentary, non-smokers, not using medications that affect the immune system. All trials excluded people vaccinated against influenza, or with chronic diseases, history of cardiovascular disease or tobacco consumption in the last two years. No trial reported the period of the year in which the intervention was carried out.
What types of interventions were included*	Five trials evaluated the effect of moderate intensity physical activity, from 30 to 45 minutes, during five days per week, with an increase of 60% to 75% of their maximum heart rate. Among the exercises performed, all of the trials included rapid treadmill walking and one trial used a stationary bicycle[10]. In all the trials heart rate and distance traveled were monitored, and supervised by an instructor. In two trials, the control group performed stretching sessions during the period of the intervention [25,10] and in three trials heart rate was recorded during their daily activities[9,14,11]. All trials compared against placebo or standard treatment.

Methods

To answer the question, we used Epistemonikos, the largest database of systematic reviews in health, which is maintained by screening multiple information sources, including MEDLINE, EMBASE, Cochrane, among others, to identify systematic reviews and their included primary studies. We extracted data from the identified reviews and reanalyzed data from primary studies included in those reviews. With this information, we generated a structured summary denominated FRISBEE (Friendly Summary of Body of Evidence using Epistemonikos) using a pre-established format, which includes key messages, a summary of the body of evidence (presented as an evidence matrix in Epistemonikos), meta-analysis of the total of studies when it is possible, a summary of findings table following the GRADE approach and a table of other considerations for decision-making.

What types of outcomes were measured	The trials measured several outcomes, which were grouped by the systematic reviews in the following way: • Incidence of upper respiratory infections, registered as the number of recorded episodes during the period of follow-up. • Severity and duration of episodes of acute respiratory infections. • Adverse effects, measured as injuries caused by exercise. In two trials the average follow-up was 12 weeks[25,11], in two trials the follow-up was 15 weeks[9,14], one trial had a follow-up of 12 months[10] and one trial had a follow-up of only 8 weeks[8].

* The information about primary studies is extracted from the systematic reviews identified, unless otherwise specified.

Summary of Findings

Information about the effects of exercise for the prevention of upper respiratory tract infections is based on five randomized trials involving 311 participants in total[8-10,14,25]. It was not possible to incorporate the information of one trial[11], because it did not have data that could be incorporated into the meta-analysis. Five trials reported the effect of exercise on the incidence of upper respiratory tract infections (311 participants) and only one trial[25] measured adverse effects of exercise (injuries associated with the practice) (30 participants).

The summary of findings is as follows:

- It is not clear whether moderate intensity physical exercise decreases the risk of developing upper respiratory infections because the certainty of the evidence is very low.
- It is not clear whether there are adverse effects associated with moderate intensity physical exercise in the prevention of upper respiratory infections because the certainty of the evidence is very low.

Exercise for the prevention of upper respiratory tract infections

Patients Healthy adults
Intervention Moderate intensity physical exercise
Comparison Placebo or stretching

Outcome	Absolute effect*		Relative effect (IC 95%)	Certainty of evidence (GRADE)
	WITHOUT moderate exercise	WITH moderate exercise		
	Difference: people per 1000			
Incidence of Upper respiratory tract infections	448 per 1000	376 per 1000	RR 0.84 (0.65 to 1.10)	⨁◯◯◯[1,2] very low
	Difference: 72 people less (margin of error: 157 less to 45 more).			
Adverse effects	Only one trial [25] reported injuries secondary to exercise, in which there was no significant differences between the two intervention groups (RR 5.67; 0.29 to 108.91).			⨁◯◯◯ [3,4] very low

Margin of error: Confidence interval of 95% (IC 95%).
RR: Relative risk.
GRADE: Evidence grades of the GRADE Working Group (see later).
*Risks **WITHOUT moderate exercise** are based on the risks of the control group in the trials. The Risk **WITH moderate exercise** (and its margin of error) is calculated from the relative effect (and its margin of error).

[1] The certainty of the evidence was downgraded in two levels due to very serious limitations in the design of the trials (randomization, allocation concealment and blinding of participants and personnel)
[2] The certainty of evidence was downgraded in one level due to imprecision, since at the extremes of the confidence interval the effects were opposite.
[3] The certainty of the evidence was downgraded in one level because of risk of bias
[4] The certainty of the evidence was downgraded in two levels due to imprecision, since the confidence interval is broad, because there is only one trial with a very small population.

About the certainty of the evidence (GRADE)*

⊕⊕⊕⊕
High: This research provides a very good indication of the likely effect. The likelihood that the effect will be substantially different† is low.

⊕⊕⊕◯
Moderate: This research provides a good indication of the likely effect. The likelihood that the effect will be substantially different† is moderate.

⊕⊕◯◯
Low: This research provides some indication of the likely effect. However, the likelihood that it will be substantially different† is high.

⊕◯◯◯
Very low: This research does not provide a reliable indication of the likely effect. The likelihood that the effect will be substantially different† is very high.

* This concept is also called 'quality of the evidence' or 'confidence in effect estimates'.

† Substantially different = a large enough difference that it might affect a decision

Other considerations for decision-making

To whom this evidence does and does not apply

To whom this evidence does and does not applyThe evidence presented in this summary is broadly applicable to an adult population, for both women and men, without chronic diseases.

An important limitation of the evidence is the lack of mention of the period of the year during which the intervention was conducted, which is fundamental considering the seasonality of upper respiratory tract infections.

None of the trials included high-intensity exercise, which has been suggested could increase the incidence of upper respiratory tract infections[6].

About the outcomes included in this summary

The outcomes presented in the summary of findings table are those critical for the decision-making, according to the opinion of the authors of this summary. In general, they coincide with the outcomes selected by the systematic reviews identified.

Balance between benefits and risks, and certainty of the evidence

It is an intervention with an uncertain benefit and poorly reported adverse effects, which although may not be serious, could have relevance in the decision-making process. It is not possible to make an adequate balance between benefits and risks due to the existing uncertainty.

Resource considerations

The practice of exercise is a low-cost intervention, with benefits in other health related areas and quality of life. However, its effect on respiratory infections is not clear, so for this particular purpose it is not possible to make an adequate cost-benefit balance.

What would patients and their doctors think about this intervention?

Considering the high levels of sedentary lifestyle in developed countries, most patients and their physicians should lean in favor of performing physical exercise. However, the evidence provided in this summary does not allow to ascertain if there is an effect in the prevention of upper respiratory tract infections, so other behaviours with proved preventive effects should be reinforced.

Differences between this summary and other sources

The conclusions of this summary agree with those presented by the identified systematic reviews.

Neither the NICE guideline (National Institute for Health and Clinical Excellence)[26] nor the IDSA guideline (Infectious Diseases Society of America)[27] analyze physical exercise as a measure for prevention of upper respiratory tract infections.

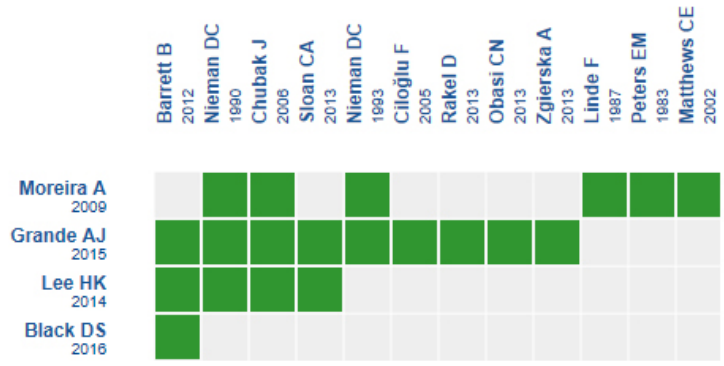
Could this evidence change in the future?

The probability of future evidence changing the conclusions of this summary is high, due to the uncertainty about the benefits.We did not identify a high quality systematic review including all of the trials identified in this summary, so a future review could summarize all the relevant information.

We did not identified relevant ongoing trials in the International Clinical Trials Registry Platform of the World Health Organization.

How we conducted this summary

Using automated and collaborative means, we compiled all the relevant evidence for the question of interest and we present it as a matrix of evidence.



An evidence matrix is a table that compares systematic reviews that answer the same question.
Rows represent systematic reviews, and columns show primary studies.
The boxes in green correspond to studies included in the respective revisions.
The system automatically detects new systematic reviews including any of the primary studies in the matrix, which will be added if they actually answer the same question.

Follow the link to access the **interactive version:** Exercise for prevention of upper respiratory tract infections

Notes

The upper portion of the matrix of evidence will display a warning of "new evidence" if new systematic reviews are published after the publication of this summary. Even though the project considers the periodical update of these summaries, users are invited to comment in *Medwave* or to contact the authors through email if they find new evidence and the summary should be updated earlier.

After creating an account in Epistemonikos, users will be able to save the matrixes and to receive automated notifications any time new evidence potentially relevant for the question appears.

This article is part of the Epistemonikos Evidence Synthesis project. It is elaborated with a pre-established methodology, following rigorous methodological standards and internal peer review process. Each of these articles corresponds to a summary, denominated FRISBEE (Friendly Summary of Body of Evidence using Epistemonikos), whose main objective is to synthesize the body of evidence for a specific question, with a friendly format to clinical professionals. Its main resources are based on the evidence matrix of Epistemonikos and analysis of results using GRADE methodology. Further details of the methods for developing this FRISBEE are described here (http://dx.doi.org/10.5867/medwave.2014.06.5997)

Epistemonikos foundation is a non-for-profit organization aiming to bring information closer to health decision-makers with technology. Its main development is Epistemonikos database

www.epistemonikos.org.

Referencias

1. Arroll B. Common cold. BMJ Clin Evid. 2008 Jun 9;2008. pii: 1510. Review. | PubMed | PMC |
2. Nieman DC, Henson DA, Austin MD, Sha W. Upper respiratory tract infection is reduced in physically fit and active adults. Br J Sports Med. 2011 Sep;45(12):987-92. | CrossRef | PubMed |
3. Akimoto T, Kumai Y, Akama T, Hayashi E, Murakami H, Soma R, Kuno S, Kono I. Effects of 12 months of exercise training on salivary secretory IgA levels in elderly subjects. Br J Sports Med. 2003 Feb;37(1):76-9. | PubMed | PMC |
4. Grande AJ, Keogh J, Hoffmann TC, Beller EM, Del Mar CB. Exercise versus no exercise for the occurrence, severity and duration of acute respiratory infections. Cochrane Database Syst Rev. 2015 Jun 16;(6):CD010596. | CrossRef | PubMed |
5. Lee HK, Hwang IH, Kim SY, Pyo SY. The effect of exercise on prevention of the common cold: a meta-analysis of randomized controlled trial studies. Korean J Fam Med. 2014 May;35(3):119-26. | CrossRef | PubMed | PMC |
6. Moreira A, Delgado L, Moreira P, Haahtela T. Does exercise increase the risk of upper respiratory tract infections? Br Med Bull. 2009;90:111-31. | CrossRef | PubMed |
7. Black DS, Slavich GM. Mindfulness meditation and the immune system: a systematic review of randomized controlled trials. Ann N Y Acad Sci. 2016 Jun;1373(1):13-24. | CrossRef | PubMed | PMC |
8. Barrett B, Hayney MS, Muller D, Rakel D, Ward A, Obasi CN, Brown R, Zhang Z, Zgierska A, Gern J, West R, Ewers T, Barlow S, Gassman M, Coe CL. Meditation or exercise for preventing acute respiratory infection: a randomized controlled trial. Ann Fam Med. 2012 Jul-Aug;10(4):337-46. | CrossRef | PubMed | PMC |
9. Nieman DC, Nehlsen-Cannarella SL, Markoff PA, Balk-Lamberton AJ, Yang H, Chritton DB, Lee JW, Arabatzis K. The effects of moderate exercise training on natural killer cells and acute upper respiratory tract infections. Int J Sports Med. 1990 Dec;11(6):467-73. | PubMed |
10. Chubak J, McTiernan A, Sorensen B, Wener MH, Yasui Y, Velasquez M, Wood B, Rajan KB, Wetmore CM, Potter JD, Ulrich CM. Moderate-intensity exercise reduces the incidence of colds among postmenopausal women. Am J Med. 2006 Nov;119(11):937-42. | PubMed |
11. Ciloğlu F. The effect of exercise on salivary IgA levels and the incidence of upper respiratory tract infections in postmenopausal women. Kulak Burun Bogaz Ihtis Derg. 2005;15(5-6):112-6. | PubMed |
12. Rakel D, Mundt M, Ewers T, Fortney L, Zgierska A, Gassman M, Barrett B. Value associated with mindfulness meditation and moderate exercise intervention in acute respiratory infection: the MEPARI Study. Fam Pract. 2013 Aug;30(4):390-7. | PubMed | PMC |
13. Obasi CN, Brown R, Ewers T, Barlow S, Gassman M, Zgierska A, Coe CL, Barrett B. Advantage of meditation over exercise in reducing cold and flu illness is related to improved function and quality of life. Influenza Other Respir Viruses. 2013 Nov;7(6):938-44. | CrossRef | PubMed | PMC |

14. Sloan CA, Engels HJ, Fahlman MM, Yarandi HE, Davis JE. Effects of exercise on S-IGA and URS in postmenopausal women. Int J Sports Med. 2013 Jan;34(1):81-6. | CrossRef | PubMed |
15. Zgierska A, Obasi CN, Brown R, Ewers T, Muller D, Gassman M. Randomized controlled trial of mindfulness meditation and exercise for the prevention of acute respiratory infection: possible mechanisms of action. Evidence-Based Complementary and Alternative Medicine. 2013;1:1-14. | Link |
16. Linde F. Running and upper respiratory tract infections. Scand J Sport Sci. 1987; 9:21–23. | Link |
17. Peters EM, Bateman ED. Ultramarathon running and upper respiratory tract infections. An epidemiological survey. S Afr Med J. 1983 Oct 1;64(15):582-4. | PubMed |
18. Matthews CE, Ockene IS, Freedson PS, Rosal MC, Merriam PA, Hebert JR. Moderate to vigorous physical activity and risk of upper-respiratory tract infection. Med Sci Sports Exerc. 2002 Aug;34(8):1242-8. | PubMed |
19. Schouten WJ, Verschuur R, Kemper HC. Physical activity and upper respiratory tract infections in a normal population of young men and women: the Amsterdam Growth and Health Study. Int J Sports Med. 1988 Dec;9(6):451-5. | PubMed |
20. Heath GW, Ford ES, Craven TE, Macera CA, Jackson KL, Pate RR. Exercise and the incidence of upper respiratory tract infections. Med Sci Sports Exerc. 1991 Feb;23(2):152-7. | PubMed |
21. Hayney M, Coe C, Muller D, Obasi C, Backonja U, Ewers T, et al. Age and psychological influences on immune responses to trivalent inactivated influenza vaccine in the meditation or exercise for preventing acute respiratory infection (MEPARI) trial. Human Vaccines and Immunotherapeutics. 2014;10 (1):2759–67. | Link |
22. Nieman DC, Johanssen LM, Lee JW. Infectious episodes in runners before and after a roadrace. J Sports Med Phys Fitness. 1989 Sep;29(3):289-96. | PubMed |
23. Nieman DC, Johanssen LM, Lee JW, Arabatzis K. Infectious episodes in runners before and after the Los Angeles Marathon. J Sports Med Phys Fitness. 1990 Sep;30(3):316-28. | PubMed |
24. Spence L, Brown WJ, Pyne DB, Nissen MD, Sloots TP, McCormack JG, Locke AS, Fricker PA. Incidence, etiology, and symptomatology of upper respiratory illness in elite athletes. Med Sci Sports Exerc. 2007 Apr;39(4):577-86. | PubMed |
25. Nieman DC, Henson DA, Gusewitch G, Warren BJ, Dotson RC, Butterworth DE, Nehlsen-Cannarella SL. Physical activity and immune function in elderly women. Med Sci Sports Exerc. 1993 Jul;25(7):823-31. | PubMed |
26. Centre for Clinical Practice at NICE (UK). Respiratory Tract Infections - Antibiotic Prescribing: Prescribing of Antibiotics for Self-Limiting Respiratory Tract Infections in Adults and Children in Primary Care. London: National Institute for Health and Clinical Excellence (UK); 2008 Jul. | PubMed |
27. Chow AW, Benninger MS, Brook I, Brozek JL, Goldstein EJ, Hicks LA, Pankey GA, Seleznick M, Volturo G, Wald ER, File TM Jr; Infectious Diseases Society of America. IDSA clinical practice guideline for acute bacterial rhinosinusitis in children and adults. Clin Infect Dis. 2012 Apr;54(8):e72-e112. | CrossRef | PubMed |

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