

Methods of Promoting Physical Activity

This is a summary of SBU's systematic review of the literature concerning methods of promoting physical activity. The report is not about how physical activity correlates with health, but the effectiveness of various methods of promoting it.

The summary and Conclusions of the report, presented in the booklet, have been approved by the SBU Board of Directors and the Scientific Advisory Committee.

Methods of Promoting Physical Activity

A Systematic Review

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Summary and Conclusions of the SBU Report on:

Methods of Promoting Physical Activity

A Systematic Review

March 2007

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Following is a summary of SBU's systematic review of the literature concerning *methods of promoting physical activity*. This report is *not* about how physical activity correlates with health, but the effectiveness of various methods of promoting it.

SBU's Conclusions

Advice and Counselling

- ❑ Advice and counselling of patients in everyday clinical practice increases physical activity by 12–50% for at least six months after the counselling session (Evidence Grade 1).
- ❑ More frequent, intensive counselling by means of repeated sessions for several months additionally boosts physical activity (Evidence Grade 3).
- ❑ Counselling supplemented by prescribed physical activity, diaries, pedometers, informational brochures, etc, increases activity by another 15–50% (Evidence Grade 3).

Supervised Exercise in Group and Individualized Programs

- ❑ A six-month group exercise program for patients with coronary artery disease promotes physical activity (Evidence Grade 3).
- ❑ A six-month supervised exercise program for patients with peripheral arterial disease increases physical activity in terms of walking distance and/or time (Evidence Grade 3).

Theory-Based Behavioural Intervention

- ❑ Theory-based behavioural intervention increases physical activity 10–15% more than usual care and as much as structured exercise programs (Evidence Grade 3).
- ❑ More extensive behavioural interventions further boost physical activity, though with a diminishing marginal effect (Evidence Grade 3).
- ❑ Interventions that include a person's entire lifestyle, focusing on diet and stress management as well as physical activity, reinforce the increase in activity (Evidence Grade 3).

Methods for Children and Adolescents

- ❑ Devoting greater resources to school curricula in areas such as health education, textbooks, study materials and teacher training increases activity by 5–25% during physical education classes – even more so for boys than for girls. (Evidence Grade 1).
- ❑ School-based interventions that include multiple components – such as teacher training, curriculum modifications, extra activity sessions during class periods and/or recess, support for behaviour changes, improved health education and the involvement of parents – favourably impact the physical activity of children and adolescents during the school day and sometimes during after-school hours and weekends as well (Evidence Grade 2).
- ❑ School-based interventions for groups at greater risk of cardiovascular disease increase physical activity by approximately 10%. (Evidence Grade 3).

Fact Box 1. Study Quality and Relevance, Evidence Grade.

Study quality and relevance refers to the scientific quality of a particular study and its ability to reliably address a specific question.

Evidence Grade refers to the total scientific evidence for a conclusion, ie, how many high-quality studies support the conclusion.

Evidence Grade 1 – Strong Scientific Evidence

A conclusion assigned Evidence Grade 1 is supported by at least two studies with high study quality and relevance among the total scientific evidence. If some studies are at variance with the conclusion, the Evidence Grade may be lower.

Evidence Grade 2 – Moderately Strong Scientific Evidence

A conclusion assigned Evidence Grade 2 is supported by at least one study with high study quality and relevance, as well as two studies with medium study quality and relevance, among the total scientific evidence. If some studies are at variance with the conclusion, the Evidence Grade may be lower.

Evidence Grade 3 – Limited Scientific Evidence

A conclusion assigned Evidence Grade is supported by at least two studies with medium study quality and relevance among the total scientific evidence. If some studies are at variance with the conclusion, the Evidence Grade may be lower.

Insufficient Scientific Evidence

If no studies meet the study quality and relevance criteria, the scientific evidence is rated as insufficient to draw any conclusions.

Contradictory Scientific Evidence

If different studies are characterized by equal study quality and relevance but generate conflicting results, the scientific evidence is rated as contradictory and no conclusions can be drawn.

Health Economic Aspects

- ❑ The availability of health economic studies that address the project's questions is highly limited, permitting no conclusions about the cost-effectiveness of the methods under consideration.

SBU's Summary

Background

A physically active lifestyle is associated with reduced risk of developing conditions such as cardiovascular disease, type 2 diabetes, osteoporosis and cancer. Once disease has set in, physical activity often has a therapeutic and/or secondary preventive effect. Unfortunately, that potential is not being fully exploited – most people (particularly those who would most benefit from exercise) lead overly sedentary lives. According to the Swedish National Board of Health and Welfare Public Health Report 2005, no more than 20% of Swedes over the age of 30 engage in physical activity that is enough from a health point of view. Physical inactivity contributes both directly and indirectly to the community's total disease burden. In addition to human suffering, it gives rise to considerable socioeconomic costs as the result of disease and premature death.

In the spring of 2004, SBU decided to conduct a systematic review of the scientific literature concerning various methods of promoting physical activity. The basic assumption was that there is a well-documented positive correlation between physical activity and health. *The purpose* of the project was to assess the effectiveness and cost implications of various methods for the healthcare system to promote physical activity.

Figure 1 illustrates the correlation between methods of promoting physical activity, actual activity levels and health/quality of life. This report deals with the left part, ie, the relationship between methods of promoting physical activity and actual activity levels.



Figure 1 Schematic diagram of correlation between methods of promoting physical activity, actual activity levels and health/quality of life.

Defining Physical Activity

“Physical activity has been defined as any bodily movement produced by skeletal muscles that results in energy expenditure. Exercise can be defined as a subset of physical activity that is planned, structured, repetitive, and purposeful in the sense that improvement or maintenance of physical fitness is the objective”¹. Physical activity refers to all body movement that results from muscular contraction and leads to greater energy expenditure. Thus, the concept of physical activity includes body movement during work, school and leisure, as well as all types of callisthenics, physical education, exercise and outdoor activity.

Main Question and Inclusion/Exclusion Criteria

The focus of this project – *interventions by healthcare professionals* to promote physical activity – essentially restricts the report to methods that are designed to achieve that particular purpose. But it does not exclude preventive measures. Primary and secondary prevention, as well as treatment and rehabilitation, are all among the duties of healthcare professionals – promoting physical activity can be incorporated into each of those areas. The project also

¹ Shephard RJ, Balady GJ. Exercise as Cardiovascular Therapy. *Circulation* 1999;99:963-72.

examined school-based interventions. The main question to be considered was:

- What methods are suitable and cost-effective for promoting physical activity in people who have, or are at risk of developing, a disease and who would benefit from it?

Content of the Report and Target Groups

This report presents the results of a systematic review of the scientific literature concerning methods of promoting physical activity. As background material, Chapter 2 offers an overview of the current state of knowledge concerning the correlation between actual activity levels and health/quality of life (the right part of Figure 1). Chapter 3 examines some methodological issues and describes the methodology applied in the systematic review of the literature. Because the project was oriented toward assessing methods of promoting physical activity, the review of the literature proceeded from that focus. Thus, the report was broken down into three primary types of methods – advice and counselling (Chapter 4), supervised exercise programs (Chapter 5) and theory-based behavioural interventions (Chapter 6). The health economic literature concerning the cost-effectiveness of a particular method is presented along with the other literature about it. Chapter 7 is devoted to methods of promoting physical activity in children and adolescents.

Chapter 8 looks at the ethical and social aspects of the healthcare system's role in promoting physical activity. Chapter 9 presents an overview of occupational, school, hospital and primary healthcare practice for promoting physical activity. Based on the conclusions drawn from the review of the literature, the chapter also discusses some conceivable changes to current practice.

Chapter 10 concludes the report by identifying gaps in our knowledge about promoting physical activity, as well as urgent topics of future research. The report is intended primarily to serve

as a basis for the healthcare system to choose methods that promote physical activity of various types. Healthcare professionals represent the main target group. Among other key target groups are the staffs of schools, recreation centres and volunteer organisations, political and administrative decision makers in the healthcare system, and training directors at schools and care facilities.

Methodology for the Systematic Review of the Literature

To start off with, the availability of systematic overviews concerning the questions under consideration was examined. The Cochrane Library databases were searched, followed by PubMed, PsycInfo, Eric, SportDiscus and the Campbell Collaboration Library. The bibliographies of relevant publications were also checked in order to identify additional studies.

Inclusion Criteria

For a study to be considered as scientific evidence in addressing the various questions under consideration, it had to meet the following criteria:

- The purpose of the study was to examine the efficacy of methods of promoting physical activity.
- A relevant control group was treated with another intervention or no intervention.
- The outcome measure was a change in physical activity or, secondarily, physical performance.
- The follow-up period was at least six months from the start of the intervention.

If it was a systematic review, the probability that it had missed any relevant studies was low and the validity and reliability of the studies that were included had been assessed.



Measuring Physical Activity

Physical activity is difficult to measure objectively. Large epidemiological studies often use a questionnaire to assess the physical activity of their subjects. Pedometers (step counters) and accelerometers more objectively measure both everyday and strenuous activities. Estimated energy expenditure is a common indirect measure of physical activity. Among other indirect measures, which focus on performance or physical capacity, are walking distance and maximum oxygen uptake based on an exercise test.

One problem is that measurement methods differ significantly from study to study and are often inadequately described. That leads to major difficulties when it comes to estimating the effect size of various methods of promoting physical activity.

Quality Assessment and Evidence Grading

Two independent reviewers examined the abstracts identified by database searches in order to determine which studies met the predetermined inclusion criteria. If at least one of the reviewers concluded that a study was relevant, both of them read it in full-text format on an independent basis. Essential data from the included studies were then compiled in tables. Each study was reviewed on the basis of special, predetermined criteria and assigned high, medium or low study quality and relevance.

For each question addressed by the project, the results of the studies were combined in order to draw conclusions that were assigned evidence grades as follows:

- Strong Scientific Evidence (Evidence Grade 1)
- Moderately Strong Scientific evidence (Evidence Grade 2)
- Limited Scientific Evidence (Evidence Grade 3).

If not enough studies met the predetermined criteria, a conclusion was considered to have insufficient scientific evidence. The evidence grade was reduced if the results of the studies were heterogeneous in a way that was inexplicable on the basis of design or the selection of subjects (see Fact Box 1).

The review of health economic studies essentially followed the above process. For a study to be included, it had to deal with both costs and effects, be relevant to Swedish conditions and make comparisons with the best alternative. Quality was assessed on the basis of SBU's checklist for health economic studies.

Results

Advice and Counselling

The terms advice and counselling refers to direct advice from a healthcare professional to a patient, and a dialogue between two equivalent partners or "experts" (the professional and the "personal" expert respectively).

The project included 15 studies on advice/counselling, conducted primarily in primary care settings with patients and ordinary caregivers. Most of the reviewed studies were conducted in everyday clinical practice and concerned the effectiveness of advice/counselling in promoting physical activity. The design of the advice/counselling method varied from study to study. One study examined the efficacy of brief oral advice only, whereas the other studies combined oral advice with one or more types of aids or adjunct interventions. Among such aids in the reviewed studies were written information and advice, individualized prescription of physical activity, support during brief phone calls, additional advice by mail, pulse measurement to identify the proper level of exercise, lists of available exercise facilities, exercise diaries, reward systems and discussions of goals.

The advice/counselling methods also varied in terms of intensity, who provided them, the type of physical activity involved, how the patients or subjects were recruited, where the intervention occurred and how long it lasted. Finally, the control group received different interventions from study to study.

Advice and counselling in everyday clinical practice was consistently shown to increase physical activity by 12–50%. No study

reported reduced physical activity level, and it can be established that the advice/counselling clearly increased it at follow-up of six months or longer (Evidence Grade 1).

The scientific evidence is insufficient to conclude whether advice concerning a particular type of physical activity is more effective (for instance if everyday activities are more effective than purposeful exercise, or if self-supervised programs are more effective than organised exercise).

More frequent, intensive advice/counselling by means of repeated sessions for several months additionally boosts physical activity at follow-up of six months or longer (Evidence Grade 3).

Advice/counselling is 15–50% more effective when combined with prescribed physical activity, pedometers, exercise diaries, discussions about goals or the like (Evidence Grade 3). But the scientific evidence is insufficient to conclude whether any of those aids are more effective than the others.

There is insufficient scientific evidence to conclude whether the healthcare system can provide more effective advice/counselling by cooperating with other stakeholders.

Supervised Exercise in Group and Individualized Programs

Exercise groups refer to some type of organised and professionally supervised exercise – usually on an outpatient basis at a hospital or care facility – and/or individualised, professionally supervised home exercise programs.

A broad-based search was initially conducted concerning exercise for treating various conditions. Many studies were excluded because they lacked relevant outcome measures and/or the follow-up period was too short. As a result, the review covered only studies of patients with cardiovascular disease or chronic obstructive pulmonary disease (COPD), as well as healthy, physically inactive people with or without risk factors for cardiovascular disease. A total of 19 studies were reviewed.

Physical exercise in groups leads to greater activity among cardiovascular patients. Such sessions are most effective if they are initially monitored, last for 45–60 minutes 2–3 times a week, have the proper level of intensity for improving general fitness and continue for at least six months (Evidence Grade 3).

Supervised exercise for patients with peripheral arterial disease increases physical activity in terms of walking distance and/or time. Such sessions are most effective if they are initially monitored, last for 30–60 minutes three or more times a week, have a level of intensity near the pain threshold and continue for at least six months (Evidence Grade 3).

Participation in an exercise group as part of a rehabilitation program for patients with chronic obstructive pulmonary disease can increase physical activity. Such exercise appears to generate the best results if it is monitored and lasts for at least three months, followed by a daily walking regimen at home. However, the scientific evidence does not permit any conclusions in this regard.

Exercise programs that strive to boost physical activity among healthy but inactive people seem to be most effective if they are home-based, encourage walking and include regular follow-up. Programs that do not require the use of special exercise facilities may lead to a more lasting increase in total physical activity. However, the scientific evidence does not permit any conclusions in this regard.

Theory-based Behavioural Interventions

A theoretical behaviour change model enables identification and testing of the factors that lead to or mediate such changes. The general description of behaviour change provided by such models is fully consistent with the greater emphasis on the daily component of physical exercise programs since the mid-1990's.

The two main theoretical behaviour change models used by physical activity researchers are the Social Cognitive Theory (SCT) and the Transtheoretical Model (TTM). The SCT

emphasizes the interaction among people, their surroundings and their behaviour, stresses the importance of greater self-efficacy (confidence), and often uses behaviour change techniques such as self-monitoring and discussions about goals. The TTM bases its analysis and behaviour change measures on the particular stage of the change process at which a person finds herself.

People's confidence in their ability to perform is the psychological concept that has been shown to provide the most accurate explanation and prediction of their future physical activity. Self-efficacy is affected by a person's thoughts and cognitions about physical activity.

Of the 21 identified studies that were assigned sufficient quality, 5 used several different behaviour techniques and could not thereby be classified as adhering to a specific theoretical model. Of the other 16 studies, 6 were based primarily on the TTM, 6 on the SCT or self-efficacy concept and 4 on components taken from both.

Interventions based on theoretical behaviour change models increase physical activity 10–15% more than usual care. That is particularly true, as is the case with lifestyle studies, when the intervention is relatively extensive. A case in point is programs for specific cardiovascular and diabetic conditions. Efficacy has been less unequivocal in studies that minimize resource utilization by restricting intervention to only a few sessions (Evidence Grade 2 for women and Evidence Grade 3 for men).

Interventions based on theoretical behaviour change models are as effective as structured exercise programs for increasing physical activity among inactive people. Behaviour change programs for people with specific conditions, such as cardiovascular disease, produce modifications and improvements in physical activity and capacity (Evidence Grade 3).

More extensive behavioural interventions further boost physical activity, though with a diminishing marginal effect. But there is a threshold. If intervention is too limited, behaviour changes only minimally (Evidence Grade 3).

Interventions that include a patient's entire lifestyle, focusing on diet and stress management as well as physical activity, accelerate the increase in activity. That may be due to many different factors, including the magnitude of the intervention (Evidence Grade 3).

Self-efficacy, people's confidence in their ability to change their behaviour, is a significant mediator for increasing physical activity (Evidence Grade 3).

Methods for Children and Adolescents

A total of 24 studies were identified that met the criteria for methods of promoting physical activity in children and adolescents. Only 3 of them were healthcare-based, while 21 were school-based intervention studies covering a number of different methods.

The healthcare-based studies dealt with three different methods – exercise groups, counselling and computer-based behaviour change programs. The scientific evidence is insufficient to draw any conclusions about how these methods affect physical activity among children and adolescents.

All school-based studies reviewed were based on a combination of different methods. To varying degrees and intensities, the interventions included the following types of components: curriculum development, teacher training, extra activity sessions during class periods or recess, support for behaviour changes and improved health education. Seven of the studies also got parents involved.

Interventions that focus on improving the content of the physical education curriculum increase activity by 5–25% during class periods in children between 7 and 14 – even more so for boys than for girls (Evidence Grade 1).

The increase in physical activity was greater for groups run by specially trained teachers and instructors. Activity during physical education classes makes an important contribution to children's total activity level. Given that studies often neglected to report

the number of class periods per week, the scope of the improvement remains unclear. Whether such efforts increase general activity outside physical education classes is also uncertain.

School-based interventions that involve a number of different methods increase the physical activity of children and adolescents during the school day and sometimes during after-school hours and weekends as well. Many studies described the methods unclearly, and no conclusions can be drawn about which of the individual components are effective. However, the opportunity for physical activity during the school day undeniably makes a significant contribution to the total activity level of children and adolescents. Half of the studies showed that interventions that include health education and support for behaviour changes, as well as the chance to try different kinds of activities and to develop skills, also increase physical activity during after-school hours and weekends. The involvement of parents in school-based interventions appears to play a beneficial role. Because the follow-up and intervention periods coincided in many of the studies, the only possible conclusion at this point is that physical activity remains at a higher level as long as the intervention lasts (Evidence Grade 2).

School-based interventions in groups at greater risk of cardiovascular disease boost physical activity by approximately 10% – even more so among boys than girls (Evidence Grade 3).

Health Economic Aspects

The project identified only a handful of health economic studies that both addressed its questions and were of acceptable quality. As a result, the scientific evidence is insufficient to draw any conclusions about the cost-effectiveness of the methods under consideration.

Ethical and Social Aspects

The use of various methods to promote physical activity can encroach upon a patient's personal life, goals, values and opinions. It is important that care professionals be aware of that risk and avoid the often counterproductive approach of violating the patient's right to participate in the process. Even if well intended, the paternalistic attitude of knowing better than patients themselves what is best for them is invasive in that it refuses to recognize their autonomy as human beings.

On the other hand, care professionals may find it awkward and embarrassing to ask patients about their lifestyle. Reluctance to invade the privacy of patients can go so far that caregivers refrain from recommending physical activity even when they know that it will be highly beneficial. Such an approach violates the principle of beneficence ("doing good").

The goal should be to focus on patients in a way that affords them the opportunity to actively participate in decisions about the most suitable method of treatment. Optimal use of various methods of promoting physical activity demands strict attention to their ethical and social aspects.

Clinical Practice

Knowledge about how and to what extent healthcare institutions promote physical activity is limited. The project's survey of clinical practice indicates that healthcare units regard the promotion of physical activity as a vital ingredient of their overall responsibility. A substantial majority of the units that responded said that they were actively involved in that effort. But only within occupational health care the majority of units had procedures and programs concerning how the staff should discuss physical activity issues with their patients. And even when units took the initiative to improve the knowledge and skills of their staff, they used the manual "FYSS"² to only a limited extent.

Virtually all of the healthcare units that had procedures or programs for promoting physical activity reported that they did so by means of oral recommendations to their patients or students. A much smaller percentage promoted physical activity by writing prescriptions or referring patients to other healthcare professionals. One overall conclusion of the clinical practice survey was that the concrete effort to promote physical activity varies greatly among and within various healthcare segments. Generally speaking, however, the field is underdeveloped. The likely causes are lack of time and knowledge, as well as inadequate management.

The prospects for making clinical practice more effective appear to be good. Care professionals have great confidence in the benefits of physical activity and generally regard its promotion as integral to their duties. Thus, the report presents several examples of conceivable changes in areas where the disparities between current and optimal, evidence-based practice may be considerable. Assessing the health, economic, ethical and social consequences of such changes is a difficult challenge. But a reasonable hypothesis is that the changes would generally be profitable – improving the health and quality of life of patients, providing the healthcare system with better treatment results, and rewarding the general community with more efficient resource utilization and greater individual well-being.

² FYSS – Fysisk aktivitet i sjukdomsprevention och sjukdomsbehandling (Physical Activity in the Prevention and Treatment of Disease). Stockholm: Yrkesföreningar för fysisk aktivitet (Professional Federation for Physical Activity) – in cooperation with the Swedish National Institute of Public Health, 2003. (FHI Report no. 2003:44).

Future Areas of Research

There are major gaps in our knowledge about the long-term effectiveness of various methods of promoting physical activity. The gaps emerge not only in the content and design of the methods, but in how and by whom they should be used to achieve the desired short-term and long-term results for various patients and groups of patients. Future research should be designed so as to enable long-term follow-up of both the effectiveness and costs of various methods, while considering ethical and social aspects, including those related to gender and ethnic background. The project identified the following as particularly urgent areas of future research:

- The impact of various types of advice and counselling on the short-term and long-term physical activity of different target groups. For instance, how effective are recommendations of moderate, daily, self-supervised activity as compared to more intensive activity?
- To what extent is the effectiveness of advice/counselling affected by whether it is provided by a doctor or by another healthcare professional, such as a district nurse or physiotherapist? Is it more effective for individuals rather than a team to provide the advice/counselling?
- The long-term impact of group and other supervised exercise programs on physical activity. There is a lack of objective, reliable gauges for measuring changes in the level of activity, long-term follow-ups to examine the permanence of the changes and studies to determine whether who supervises the program is of any significance.
- Comparative studies of various behaviour change theories, as well as long-term intervention studies. Such research can also assess which components of the various theories best promote behaviour change.

- Translating research results into workable clinical practice. Can today's technology, such as Internet-based computer support, help sustain behaviour changes?
- School-based interventions that focus on the most inactive groups, for whom the potential health benefits are greatest. Given that previous research suggests differences in activity levels between girls and boys, there should be a clear gender perspective. Knowledge is also lacking concerning the methods that are most effective for various age groups.
- Long-term intervention studies of the best methods for child health care to promote physical activity.
- Health economic studies concerning the costs and effectiveness of various methods, or combinations of methods, of promoting physical activity.
- An examination of the obstacles that stand in the way of devoting greater resources to the promotion of physical activity and an analysis of how they can be overcome or eliminated.



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- SBU shall evaluate the methods used in health care by systematically and critically reviewing the scientific evidence in the field.
- SBU's assessments shall cover the medical aspects and the ethical, social, and economic consequences of disseminating and applying medical and dental technologies.
- SBU's assessments shall be compiled, presented, and disseminated in such a way that all affected parties have access to the information.
- SBU shall contribute, through informational and educational initiatives, toward ensuring that the knowledge gained is used to rationally utilize available resources in health care.
- SBU shall draw on national and international experience and research findings in the field and shall serve as a focal point for health technology assessment in Sweden. This effort shall be managed in a way that secures success and respect for the organization, both domestically, and internationally.