

THE MAGIC POWER OF EXERCISE

THE TEN PILLAR MODEL

Guide How to Promote Physical Activity and Motivate
Behavioral Change

„Never more important than now“

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THE SAD REALITY

More than a quarter of adults in the world (1.4 billion) follow a sedentary and inactive lifestyle (2). Worldwide, about one in three women and one in four men do not perform enough physical activity to maintain or restore health. Levels of inactivity are twice as high in high income countries compared to low income countries. Inactivity increased from 31.6% to 36.8% in high income countries between 2001 and 2016 (1, 2, 5, 6).

Therefore, corrective action is urgently required at the individual and society level.

The promising message

Numerous prospective studies of the last 50 years from Paffenbarger to Del Pozo (14) have proven the high evidence of PA. have shown that regular physical activity has an evidence-based, positive and beneficial effect on enhancement, maintenance (prevention) and restoration of health (e.g. therapy, rehabilitation) and in the improvement of physical fitness.

The physiological effects of physical activity on organs, functions and metabolisms are many fold and are all encompassing (Fig. 6). With this pleiotropic effect, physical activity acts like a „poly-pill“ and as a very effective additional therapy.

As such, regular physical activity can prevent a large number of diseases or mitigate their occurrence. Nowadays, extensive facts and a reliable database for a favorable health effect of physical activity are available and accepted worldwide.

Nevertheless, it is surprising that so many people remain inactive and have a sedentary or inactive lifestyle. Therefore, they have an „Exercise Deficiency Syndrome“ for many years, although worldwide efforts getting people to be physically active are increasing. As a consequence, all new and innovative approaches are important to support a healthy lifestyle (11, 12, 13).

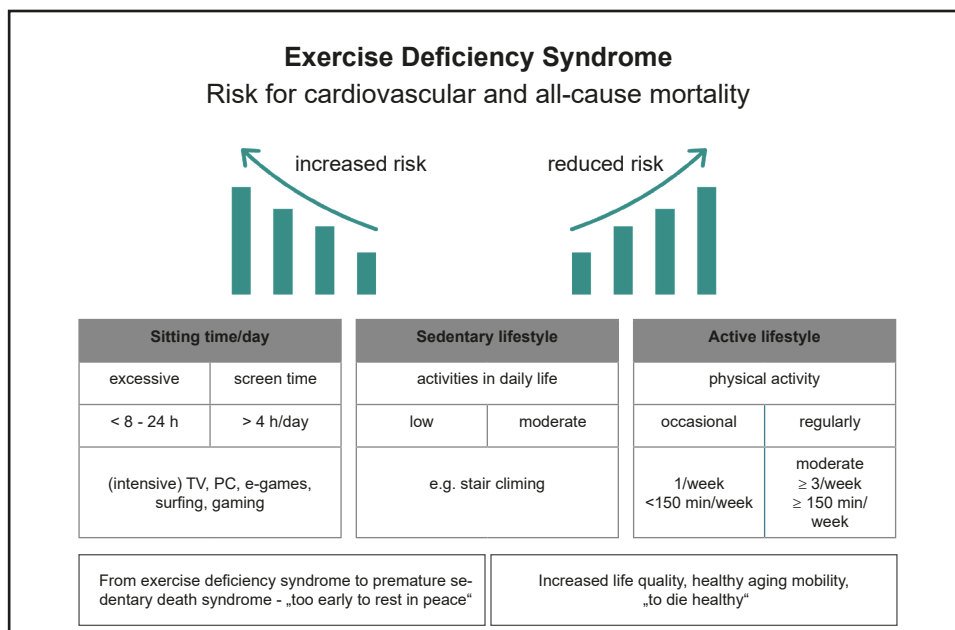


Fig. 1: Increasing risks with sedentary lifestyle for premature death vs. risk reduction with increased regular physical activity or an active lifestyle (13).

GLOBAL GOALS NEED GLOBAL REQUIREMENTS

Physical activity as health enhancing measure

Health is mainly based on three components:

- Genetics
- Environment in the broadest sense including „medical environment“, and
- Personal responsibility through health-enhancing behaviours (Fig. 3) (6, 7, 10, 12).

All health providers must implement three components:

- Creation of an active population based on health literacy
- Creation of active societies through governmental support
- Creation of an environment that facilitates and promotes physical activity in all age-groups and all community settings.

Promotion and Motivation

As such, promotion of increased physical activity using a variety of different approaches is a major priority of all health providers. Motivating people to be physically active is to a large extent the vested interest of the physicians of any specialty. This approach is shown in Fig. 7 with a possible „step pyramid“ of motivation from step 1 (bottom) to step 5 (top).

Deficits in the pre- and post gradual education for sports and exercise medicine

- **Medical school/university:**
The subject of sports medicine does not feature in the training curriculum for students in Germany and in most countries in the world. Medical students become doctors but are not taught about the beneficial effects of movement, exercise and sports, especially of exercise and sports for health.
- **Specialisation:**
The situation continues in the further training of medical specialists, where the subject of exercise, physical activity, or sports medicine, if at all, is a marginal topic.
- **Hospital discharge:**
The recommendation for physical activity after hospital discharge is not mentioned at all. Physical activity and exercise in the hospital is an extremely rare part of treatment. After discharge, patients usually receive a large number of drugs, but the real "polypill" exercise is not prescribed. For many years, a paradigm shift has been sought by sports physicians and sports cardiologists worldwide (1, 2, 5, 17, 23).

TAKE HOME MESSAGE

The consequence:

The way out of sedentarism and inactivity is the „**Exercise Prescription for Health**“ (See Fig. 9). For realizing this approach, the „**Motivation Pyramid**“ (Fig. 7) is strongly recommended for promoting physical activity, considering the steps of the pyramid.

These steps are a manual and a motivation scale with increasing convincing and feasible instructions, guiding from step 1 (bottom) to step 5 (top).

GUIDE HOW TO MOTIVATE PEOPLE TO BE PHYSICALLY ACTIVE

„The Magic Power of Exercise“ and how to overcome the deficits: **The Ten Pillars Model**.

Pillar 1: The consequence of change by exercising

- Gain healthy life years
- Stay active, prevent disabilities
- Prevent worsening of chronic diseases
- Be mobile and autonomous
- Join social events
- Feel better, think positive
- Enjoy a high quality life

Physical activity is the real "polypill" and home remedy.

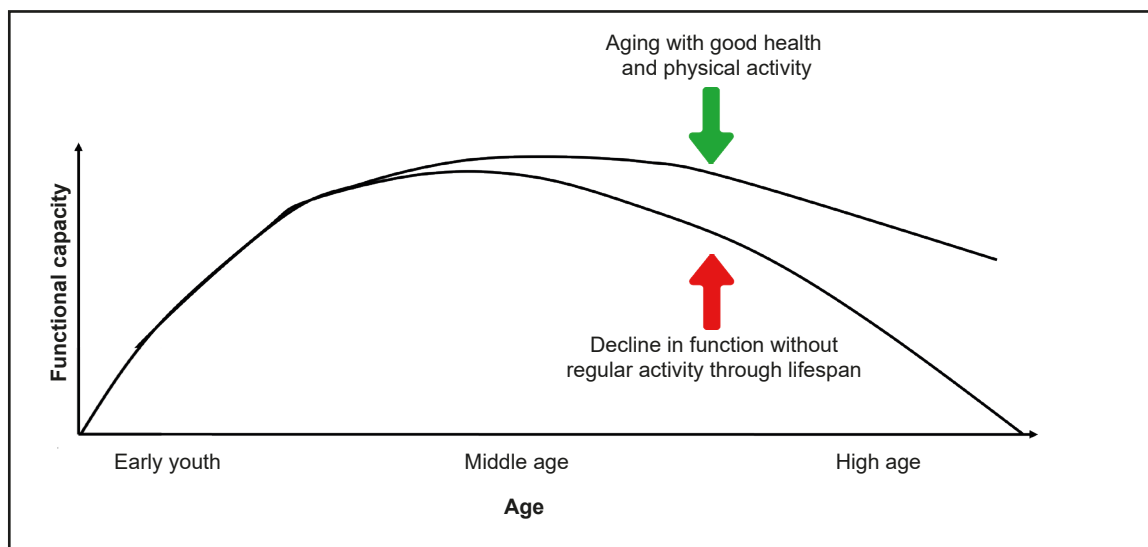


Fig. 2 Typical curve shape of physiological response of physical activity vs. inactivity across the lifespan (Löllgen, unpublished).

TAKE HOME MESSAGE

Explain to your patient: Physical activity is the best investment in your future life.

The recommendation from the current situation means health and fitness for a long time: start with physical activities, at least at the age of 50, stay active and you will be healthy and fit at the age of 80 or longer.

It's never too early and never too late to start with physical activity.

Pillar 2: Facts about the interplay between genetics and epigenetics

Health depends on genetics and epigenetics (7, 10, 13, 27). This leads to the operational definition of health that can be modulated by numerous factors, some of which are illustrated in Fig. 3.

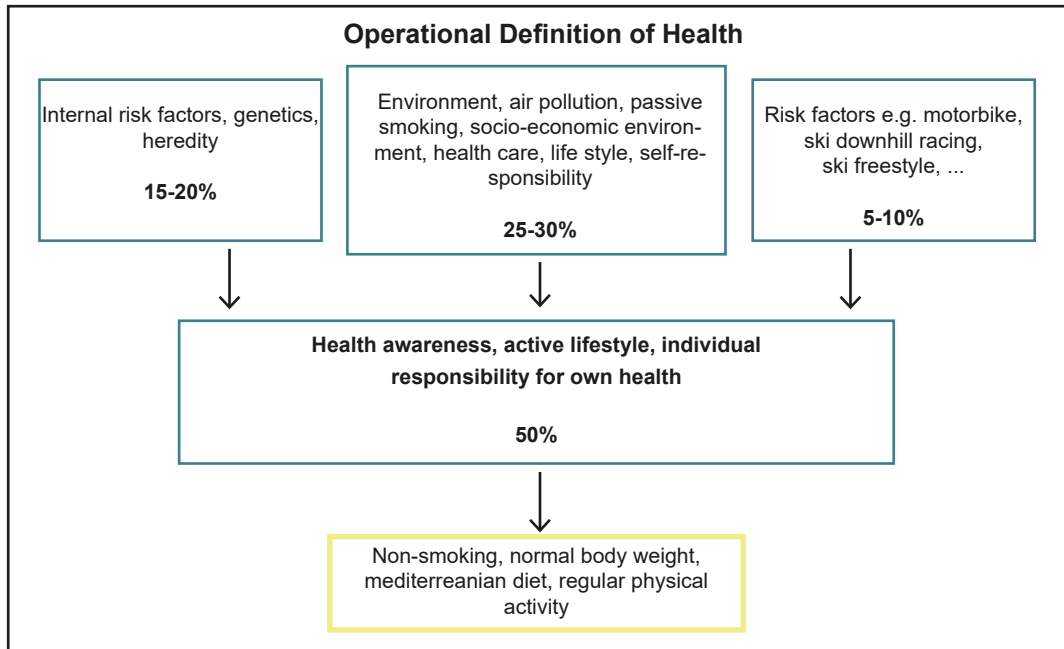


Fig. 3 Operational definition and relative components for health in percent.

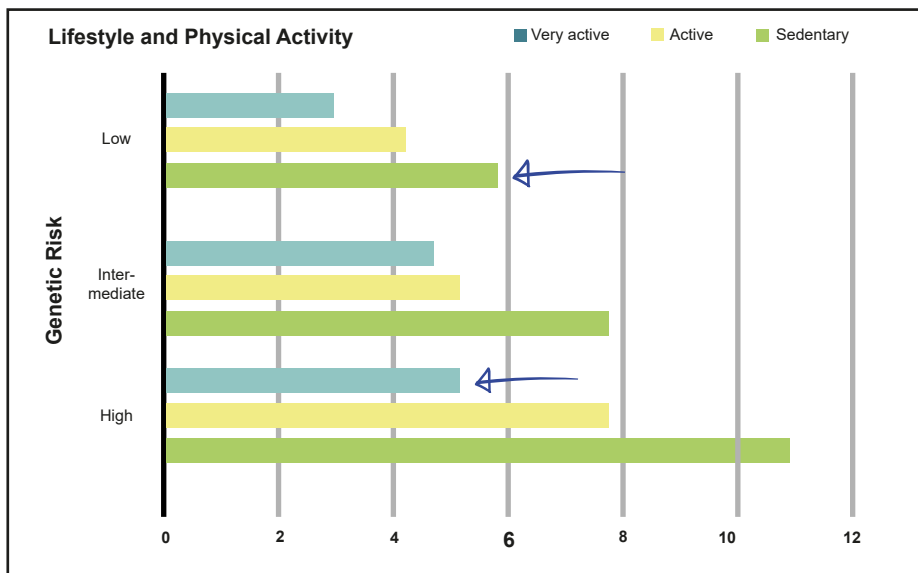


Fig. 4 Genetic aspects for risk of arteriosclerosis (Hazard Ratio (HR)) for 10 ys. Coronary events or cumulative incidence function. Arrows indicate the combination of lifestyle and physical activity combined to extend of genetic risk. (6, 8)

TAKE HOME MESSAGE

People with high genetic risks, but being active regularly, have a lower risk for coronary event rate than inactive people.

Pillar 3: The health impact of sedentary lifestyle

Sedentary lifestyle is almost an independent disease or cause of disease. It is the sum of lack of movement during work and sitting while working on the computer and watching TV, i.e. screen time.

Accordingly, prolonged sitting per day is a part of physical inactivity. How inactivity impacts health and likely pathological pathways is shown in Fig. 5.

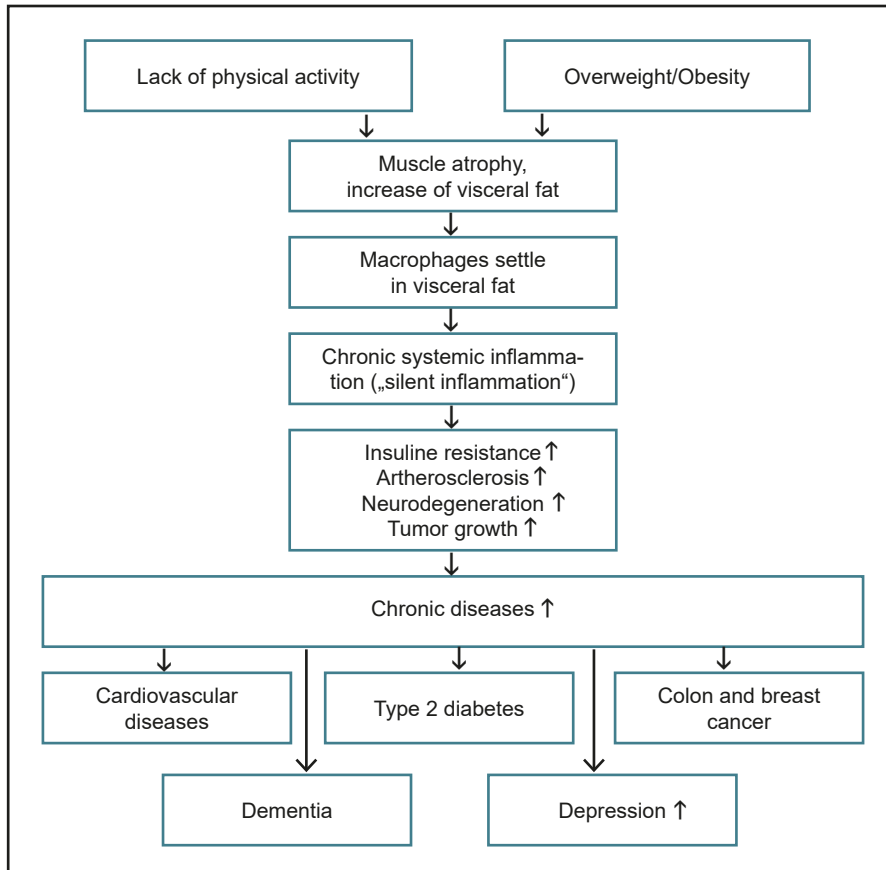


Fig. 5 The graph shows the diseasome, that means all disorders and diseases of an organism viewed as a whole, with special reference to physical inactivity.

TAKE HOME MESSAGE

Sedentary lifestyle and overweight/obesity are health threatening because chronic inflammation can be responsible for many diseases.

Pillar 4: The way out of inactivity or „why should I become physically active?“

Benefits of regular physical activity are shown below (Fig. 6).

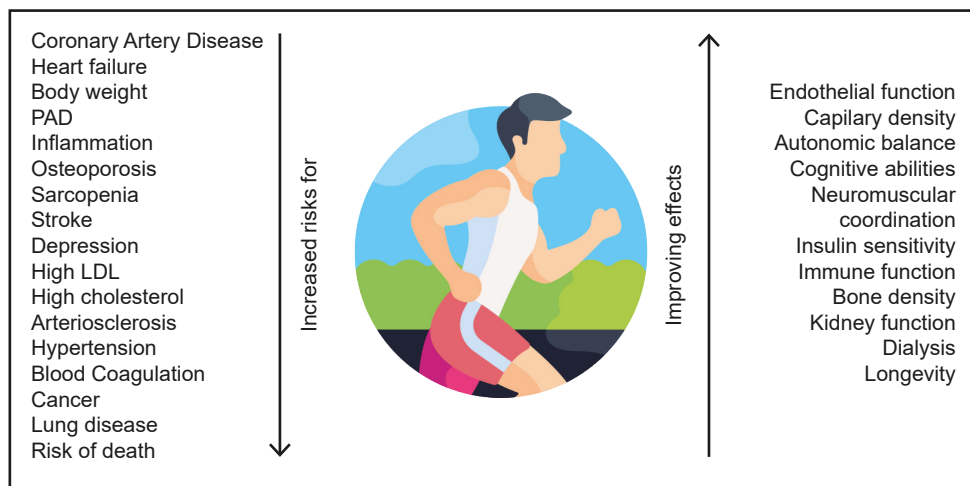


Fig. 6 Numerous benefits of regular physical activity on many organs and organ systems (or pleiotropic effects) comparable to a powerful „polypill“ (1, 5, 9, 12, 16).

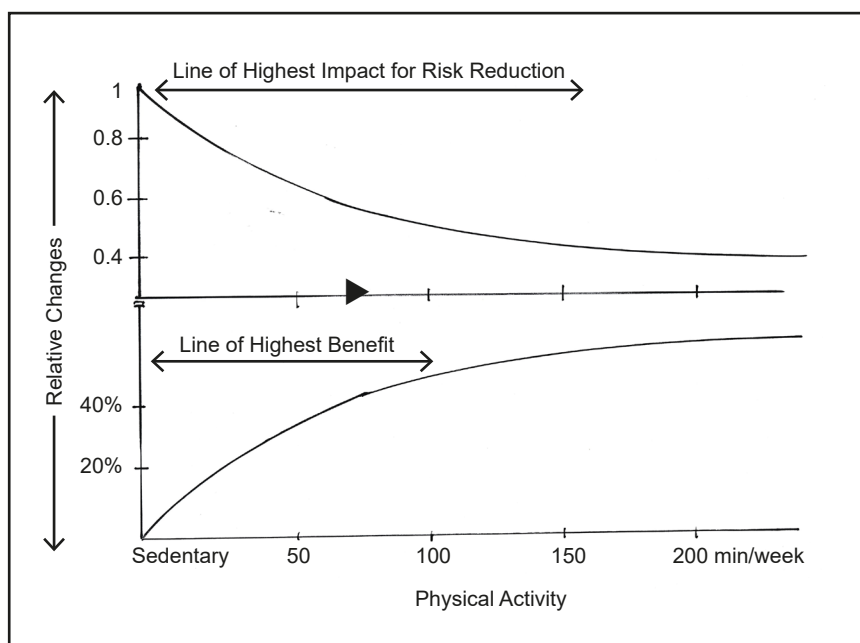


Fig. 7 Dose-response curve of physical activity: the highest increase of benefits occurs when starting with training, that means going from inactive to becoming active

Evidence for physical activity promoting health.

The evidence for regular physical activity promoting health is shown below, demonstrating the worldwide accepted highly evidence-based benefits of activity (13, 16, 17, 22).

Table 1 Evidence based indications for prescribing physical activity in prevention, therapy and rehabilitation (class - for recommendation - and level of evidence). Numbers I - III denote the class of recommendation (CoR) , letters from A - C indicate the level of evidence (LoE) following the usual indications of the international guidelines.

Coronary artery disease	IA
Arterial Hypertension	IA
Chronic obstructive lung disease	IIb
Heart Failure (HfrEF, HfmrEF, HfnEF)	IA
Cancer (colon, breast, etc.)	IA
Osteoporosis	IA
Metabolic Syndrome	IA
Diabetes mellitus (T1M; T2M)	IA
Chronic kidney disease	IA
Peripheral artery disease	IA
Depression	IB
Cognitive function, Dementia	
Neurological Diseases, e.g. Stroke	IA
Fibromyalgia, Parkinson's disease	IA
Chronic bowel disease	IIb
Bipolar disease	IIb

TAKE HOME MESSAGE

What really counts: physical activity, exercise training and sports are effective and health enhancing. Therefore, regular physical activity is the real „polypill“ and home remedy kit.

Pillar 5: Promoting physical activity through personal motivation.

The pyramid rising in steps increasing or escalating with intensification of the motivational strategy.

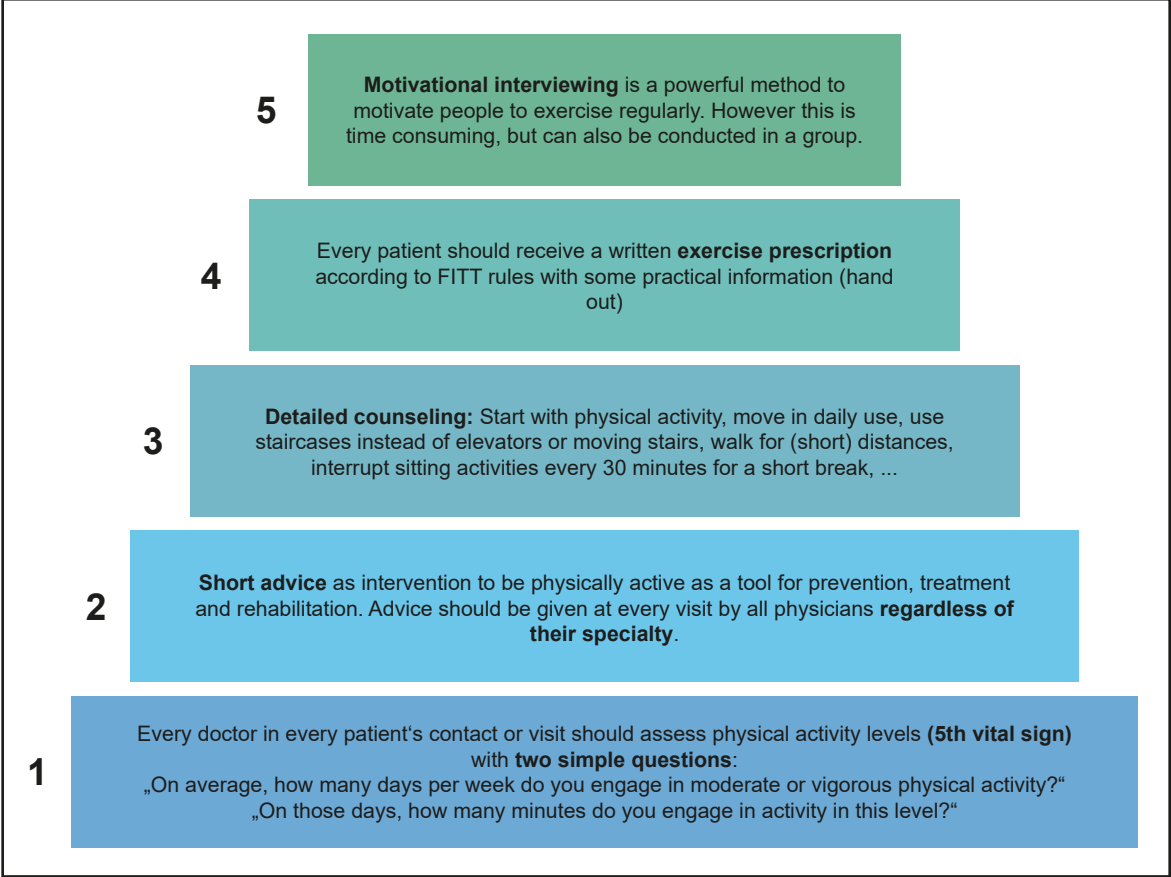


Fig. 8 The Motivation Pyramid

Pillar 6: Using the Motivation Pyramid to promote physical activity

Roadmap to success

Step 1: Every patient-doctor consultation should ask for physical activity level (5th vital sign) utilizing two simple questions:

1. On average, how many days per week do you engage in moderate or vigorous physical activity?
2. On those days, how many minutes do you engage in activity at this level? (12, 13, 22, 24, 28).

Record the responses the patient's medical record. The simple questions can be completed while the patient waits in the reception to be seen.

Consider: Life condition, job situation, time budget.

What you should discuss with your patients before prescribing exercise:

- Register any significant **previous diseases** (medical file, medical history including exercise and sports history, Self-Assessment Questionnaire or a national proved questionnaire for sports and exercise),
- If necessary, order an additional examination by a sports physician specialist,
- Check the patients' level of motivation for modifying his/her behavior.
- Especially persons older than 35 and sport beginners should have a medical check, including a stress test with ECG.

Step 2: Short advice as intervention to be physically active as a tool for prevention, treatment and rehabilitation. Advice should be given at every visit by all physicians regardless of their specialty.

Consider: PPE, health related clinical exam and physical fitness testing (exercise testing).

- Your recommendation to integrate more physical activity and exercise into one's daily life is meaningful and effective, and should be implemented in all patients' activities (such as physical exercise 5 times per week for 30 minutes each or 45 minutes of targeted exercise 3 times a week).
- The counseling may be extended to individual activity recommendations.
- The conversation may be used to a greater extent for recommending physical activity and regular exercise.

The recommendation should always be aligned and adjusted to the patient's motivation and available options.

Step 3: Detailed counseling starts with encouraging movement during activities of daily living. For example use staircase instead of elevator or moving stairs, walk for (short) distances, interrupt sitting activities every 30 minutes for a short break and more (1, 2, 13, 23, 28).

Consider: Motives, personal goals and barriers for regular physical activities

- Draw your patients' attention to the potential risks of excessive loading of the body without a suitable medical check-up beforehand.
- The National Societies of Sports Medicine has issued a valuable flyer for patients, known as „10 Golden Rules for Healthy Sports“ (DSGP)
- The counseling and patient information should be documented in the patient's medical file.

Step 4: Every patient should undergo an exercise consultation and receive an prescription according to the FITT rules with practical information.

Consider: Physical activities in daily life and exercise prescription for health

The FITT rule: Prescribing Exercise and Physical Activity

Frequency: 3-4 times/week
Intensity: Borg Scale 11-13, heart rate 100-130/min
Time (of bout): 30-50 min/session
Type of sports: walking, fast walking, cycling, swimming, dancing, running, home based ergometer, cross-trainer

Strength training: at least 2 times/week according to instructions

Prescription for Exercise

ENDURANCE TRAINING
x/wk, each Min
 Training Heart rate:/min
 Borg Value:
 Warming up: 5 min, cooling down: 5 min
 Recommended training:
 Slow Walk Fast Walk Nordic Walk Running
 Swimming Cycling Others

Ergometer Training:
Watt/.....min for warming upWatt/min..... minutes

STRENGTH TRAINING
% 1RM.....REPsSETS
muscle groups

Gymnastics/ Balance/Coordinationwk each.....min
 Ball Gameswk each.....min
 Others (Golf, Dance,..)wk each.....min

Sport Physician Date:
 In case of dyspnoe, irregular heart beats, chest pain or dizziness,
 stop activity and counsel your doctor.

Fig. 9 Exercise Prescription for Health: The Recipe. (Download version see appendix).

Step 5: Motivational interviewing (transtheoretical modal) for promoting physical activity is a powerful method to motivate people to exercise regularly (6, 11, 17) (Fig. 7).

Consider: This approach is time-consuming, consider conducting session in groups to save time and resources.

Alternative: The 5 A Model (6)

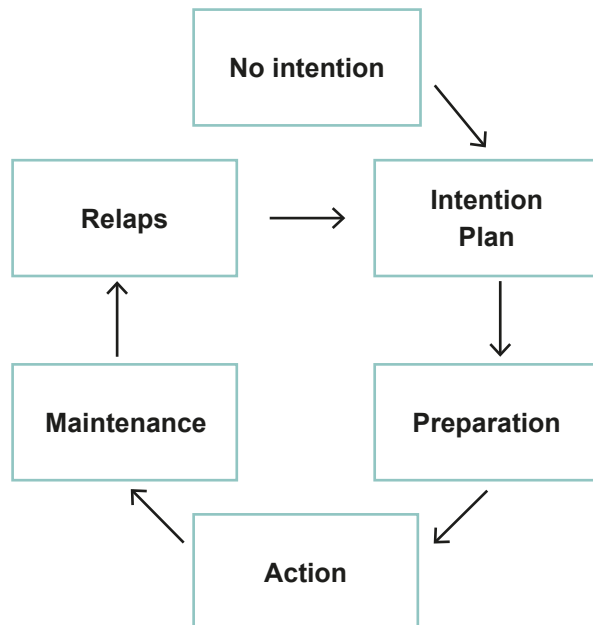
Magic Exercise: The 5 A Model for Physical Activity (PA) (9, modified)

- Assess** patient's lifestyle behavior, belief and motivation for change
- Advise** health risks, benefits of PA, individualized recommendations
- Agree** on goals for behavior change, shared decision making
- Assists** with solutions, steps, overcoming barriers and problems solving
- Arrange** follow up monitoring, feedback, teach back approach, use wearables

Transtheoretical Model

Based on the start with intention to plan, preparation, action and maintenance (10). Schematic diagram is shown below (18, 19).

Both, inactivity as well as activity habits consist of three elements: *trigger, behavior and result*. By mapping the habits, everybody can provide his or her brain with new information about how an activity habit really causes a good feeling. All facts about the „good feeling“-reward of regular physical activity are listed in this information. It is the job of every physician to convince the patient of the huge advantage of an „activity habit change“ (9, 20, 21).



TAKE HOME MESSAGE

Convince the patient, that physical activity must be part of the daily life. Push the patient to change his „habit loop“.

Pillar 7: General advice to create an effective intervention strategy

7.1. Every counseling must be

- Personalised
- Predictive
- Participatory
- Practicable
- With shared decision making

to ensure sustainable success

7.2. Realisation and implementation

- Define a reliable outcome
- Carefully plan your intervention
- Use Exercise prescription for Health
- Start low go slow
- Scale up your intervention (FITT)
- Share the best practice including motivational strategies
- Ensure monitoring of progress (use wearables)

7.3. Desirable outcome

- Increased activities during daily life, and well-being,
- Enjoyment of PA, sport, and training in different settings
- Triggering social participation
- Benefit: a fulfilled life, happiness, and satisfaction

7.4. Longer adherence

- Prevention of disabilities, or worsening of diseases,
- Enhancing independency self-caring or autonomy,
- Reduced frailty risk and falls,
- Improved quality of life,
- Better resilience

TAKE HOME MESSAGE

Be physically active and...

feel better (psychological well-being)

perform better (physical capacity)

look better (self-confidence)

Pillar 8: Barriers to exercise and ways to overcome them

For many recreational athletes, older individuals and particularly the very elderly, there are many barriers to exercise and being physically active (12, 25).

Strategies to overcome the barriers are shown in Table 2. Here, an explanatory conversation is necessary.

Table 2 Barriers to physical exercise and recommodations to overcome them

Barriers and excuses	Way out
Already feeling healthy	<ul style="list-style-type: none"> • Counseling on health in future: PA stabilizes the health by prevention • Autonomy in older age, high quality of life and higher life expectancy
No need for sports	<ul style="list-style-type: none"> • Motivate and advise for the future, fitness with aging
Too much time exposure with sports	<ul style="list-style-type: none"> • Discuss priorities, strictly plan daily schedule with regard to physical activity, discuss FITT schedule
Major interests and obligations in other fields	<ul style="list-style-type: none"> • Consider fitness in the future to follow personal interests
Social fear	<ul style="list-style-type: none"> • Discuss attitudes and outcome expectation, fitness prevents disease and injuries
Longtime spent without physical activity	<ul style="list-style-type: none"> • Discuss to start low and go slow • Reccomend PA just for fun • Motivate for activity and future fitness
Lack of information about sports	<ul style="list-style-type: none"> • Recommend sports club, personal training
Being no athlete or being too old	<ul style="list-style-type: none"> • Physical activity is for leisure time: should be fun and recreational • Moderate activity is sufficient, e.g. start with walking

Pillar 9: Novel Approach to Motivation: Wearables

Many wearables and related virtual methods are emerging and may enhance the motivation to start or continue regular physical activities (Fig. 11):

Hardware

- Smart watch, wrist band, smart phone, accelerometer,
- Smart clothes, including smart shirt and smart swimsuits
- Biosensors

Software

- Physical activity apps, fitness trackers,
- Websites virtual programs, remote patients monitoring via TV-screen or smart phone screen

What physicians and consumers should consider:

- Technology
- Scientific proved outcome (e.g. validity, reliability, etc.)
- Acceptance, adoption, abandonment
- Trust in the device (patient, healthcare providers)
- Validity for diagnosis, treatment, sport setting, monitoring
- Behavior change (during progress), self-monitoring, data protection

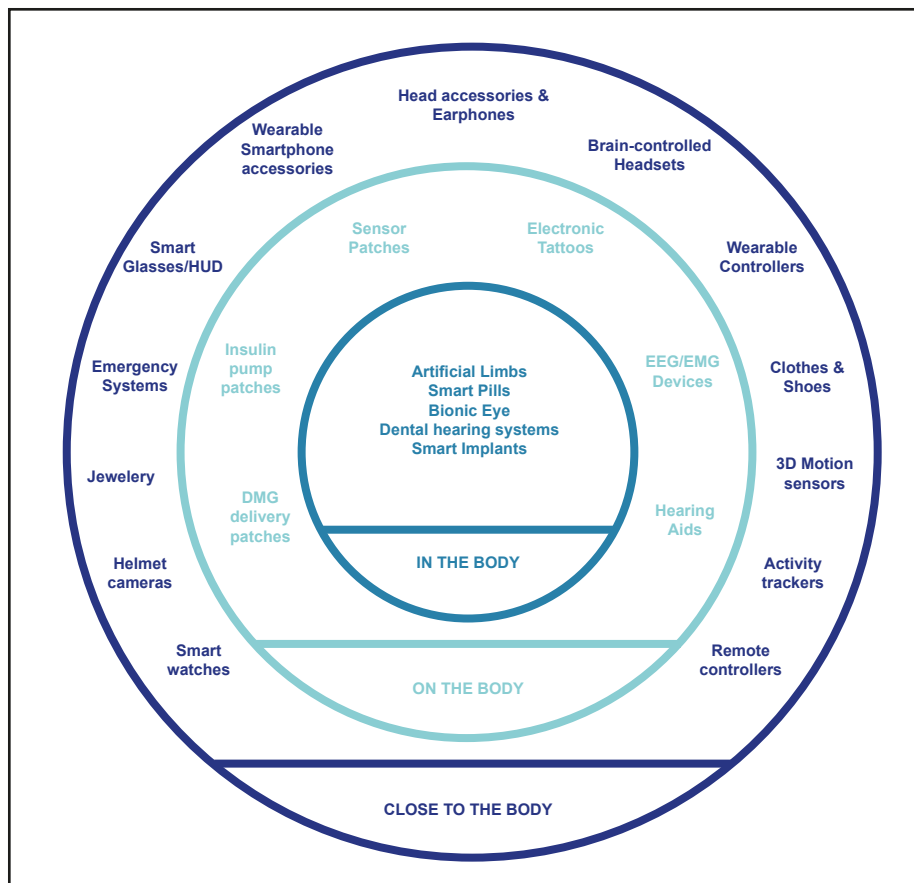


Fig 10 Current status of wearables in medicine and sportsmedicine (courtesy navispace).

Pillar 10: Benefits for the physician and his office

- **Image and competence** gain as a health consultant. Increasingly, patients expect their doctors to be able to provide competent consultation on questions concerning lifestyle and health risks. With your consultation about more exercise you prove your holistic competence concerning the patients expectations and strengthen your patient's loyalty to your medical office.
- The **time taken for an exercise consultation** is the same as that for other medical consultation. Consultations on physical activity and the issuance of a prescription take time - but usually not more time that the time you would need for other therapy or drug consultations. Group consultation and the inclusion of your qualified personnel can additionally enhance the efficiency of your consultation.
- **Enhancement of exercise reduces** the load on your drug budget. Drugs or the dose of prescribed drugs are frequently reduced by performing active and regular exercise. This alleviates the burden on your drug budget. Besides, accompanying exercise can enhance the efficiency of medication.
- **Cost transfer for an examination** by a sports medicine specialist. Suitable patients may also undergo an examination by a sports medicine specialist. For many insured persons, the cost of an examination performed by a sports medicine specialist is now covered by their health insurance.

GENERAL CONCLUSION

The Magic Power of Exercise

1. The new innovative way out of sedentarism and inactivity: "The Ten Pillar Model" based on the „**Exercise Prescription for Health**“ using the „**Motivation Pyramid**“. This approach is strongly recommended because the steps of the Motivation Pyramid are instructive and motivational.

2. Explain to the patient: **Physical activity is the best investment in your future life.** Start with physical activity at least at the age of 50 or less, stay active and you have a much better chance to be healthy and fit at the age of 80 or longer.

It's never too early and never too late to start with activity.

3. Individuals with a greater predisposition, but being and staying physically active, have a **lower risk for arteriosclerosis** than inactive people with low genetic risks.

4. **Sedentary lifestyle and overweight** are health impacting because chronic inflammation can cause many diseases.

5. **Evidence:** There are vast and exceeding studies showing **high grade evidence** for physical activity for prevention, treatment, and rehabilitation of a large number of diseases.

6. **Use the escalating steps of the pyramid** for recommendation of movement and physical activity to all healthy and diseased people.

Ask for physical activity with every patient contact.

7. Every patient should receive an „**Exercise Prescription for Health**“ with detailed recommendations (use the FITT principle) for activity. This is an effective approach to longer **adherence** based on the Motivation Pyramid.

8. An additional support to motivate patients is the **5 A Model**. Experienced doctors may also use the **Transtheoretical Model** or the **Motivational Interviewing**.

During motivation sessions there are four aspects to consider: Expressing empathy, pointing out discrepancies, picking up resistance and demanding self-efficacy.

9. In the meantime, there are new approaches emerging such as **wearables** with various possibilities for increasing motivation in individuals for regular physical activity.

10. **Exercise prescription** compiles the practical means of the **Magic Power of Exercise**, such as:

Physical activity is the best investment for the future for everyone.

With physical activity, you feel better, stay fitter, live better and longer.

References see appendix

APPENDIX

EXERCISE PRESCRIPTION FOR HEALTH

Endurance training:

___ x/week, for ___ min

Training heart rate : ___ to ___ /min

Borg-Scale: ___ to ___

Warming up 10 min, cooling down 5 min

Recommended types of sports:

Walking, nordic walking, running, cycling, swimming

Ergometer: ___ watts for ___ min

Strength training:

%1 RM, ___ reps, ___ sets

Balance training:

Gymnastics, balance exercise, coordination ball games (1h), golf, dancing, yoga

Physician: _____

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