ADAPTED PHYSICAL ACTIVITY

Physical activity (PA)

KEY POINTS

- To improve physical capabilities and mood, stimulate memory, promote sleep and reduce behavioural disorders.
- This intervention involves physical, cognitive, psychological and social processes.
- Observed effects are an improvement in mobility, physical condition, cognitive functions, autonomy, and a decrease in anxiety and depression.
- In group, individually or with a family caregiver.
- For all people with dementia, regardless of the stage of the disease.

PRESENTATION

A. Definition

The World Health Organization defines physical activity (PA) as "any body movement produced by the contraction of skeletal muscles resulting in an increase in energy expenditure over resting expenditure". For a person weakened by illness, age or disability, the concept of «adapted» physical activity (APA) seems more relevant than simple PA.

In fact, APA is a physical activity adjusted to physical condition and functional abilities. According to the French Ministry of Health decree of 31 December 2016, APA is "the practice, in a context of daily activity, leisure, sport or programmed exercises, of body movements produced by skeletal muscles, based on the aptitudes and motivations of people with specific needs that prevent them from practicing in ordinary conditions". It is provided for prevention, functional or vocational rehabilitation, education and/or social participation. According to the objectives of the APA, but also to possible disabilities and pathologies, some exercises are specific and train a particular physical domain such as cardio-respiratory capacity, endurance, flexibility, strength or balance, while other exercises are said to be multimodal, i.e., train multiple domains.

Unlike sport, which is often associated with performance and/or competition, APA also pursues strictly preventive and therapeutic objectives in a positive approach to the individual; supporting, maintaining, or developing his or her health and abilities[1].

B. Fundamentals

According to the collective expertise of the French National Institute for Health and Medical Research (INSERM), which has analysed nearly 2,000 scientific studies on chronic diseases, physical activity, adapted to a patient's state of health, has benefits on metabolic, joint, muscle, cardiac, neurological and immunological functions[2].

In dementia, basic scientific studies provide convincing evidence of physical activity effects on brain according to several intertwined physiological mechanisms, notably vascular and related to neuro-plasticity benefits[3-4]. Indeed, this type of pathology has vascular and/or degenerative origins and is particularly favoured by cerebral blood circulation disorders and neuron metabolism, on which physical activity has an action.

Thus, physical activity has a positive vascular effect improving cerebral blood perfusion even though people with dementia have a decrease in perfusion in certain brain areas. This

effect allows a better nutrients consumption and oxygen use by neurons with a better carbohydrate and neurotransmitter metabolism. This effect protects against neuron function disorders and carbohydrate utilization dysfunctions that promote the formation of amyloid plaques characteristic of Alzheimer's disease. On the other hand, according to animal studies, physical activity would encourage cerebral and vascular plasticity by neural growth factors synthesis, notably BDNF (Brain-Derived Neurotrophic Factor). In addition, human studies have shown an increase or a smaller decrease in size of certain brain areas (including hippocampus, which plays a central role in memory) after the implementation of adapted physical activity programs.

THEORETICAL BACKGROUND

A. Processes involved

- Physical processes: motor and sensory capabilities, cardio-respiratory abilities, muscular strength, endurance, walking and balance.
- Cognitive processes: memory and body schema, attention and task planning, coordination.
- Behavioural processes: cooperation during group sessions, playing enjoyment, stimulation of action and of autonomy in people who are often sidelined because of their disease or the help they receive.
- Social processes: social interactions, social links and integration of people with each other and with family caregivers and/or care staff and contributors participating in the sessions.

B. Neurophysiological correlates

Physical activity involves different cerebral areas in particular motor (voluntary movements) and somatosensory (visual and motor coordination) areas, cerebellum (balance), but also hippocampus (memory). Moderate or intense physical activity triggers the secretion of beta endorphins and serotonin, well-being hormones. It stimulates bones osteocalcin production, which has a positive neurogenic effect on hippocampus memory neurons.

SCIENTIFIC EVALUATION

Several studies have shown that PA is effective for people with dementia on mobility, physical functioning, cognition, anxiety, apathy and depression. It would be even more effective associated with cognitive stimulation and speech groups. Further studies are necessary to determine more precisely effective modalities. Meta-analyses of randomised controlled trials are difficult to conduct because participant characteristics, PA programs, and efficacy criteria are not always comparable. Nevertheless, several meta-analyses have indicated that APA programs can improve physical and functional abilities[5-6], cognitive functions[7], and ability to perform activities of daily living[6; 8], which are critical for quality of life and autonomy. Another randomised controlled trial showed that burden on family caregivers could be reduced when they supervised people's participation in the program[9].

Regarding cost-effectiveness, a research conducted with Siel Bleu by the Health and Ageing Laboratory of the University of Versailles Saint Quentin, the French School of Advanced Studies in Public Health (EHESP) and the French Institute of Public Policy (Paris School of Economics) evaluated a 12-month adapted physical activity programme with around 450 people in 32 nursing homes in four European countries (Belgium, Spain, France, and Ireland). The results showed that the programme prevented approximately one minor fall per person per year and one accidental fall every 18 months and one serious fall every five years. If this programme were applied on a national scale considering the total number of residents in nurisng homes in France, the total net economic benefit per year would be estimated at between 421 million euros and 771 million euros (taking into account the cost of the programme)[10].
An intensive and long-term exercise program administered to people with dementia at home could slow the decline in physical functioning without increasing total health and social service costs[11]. Further, an instructed walking program for people with dementia and their family caregivers is potentially cost-effective compared to usual care, when focusing on the reduction of behavioural and psychological symptoms of dementia as outcome of interest. However, no cost-effectiveness threshold was yet defined. The incremental cost-effectiveness ratio for Quality-Adjusted Life-Years (QALY) was high, thus the intervention seems not to be cost-effective with regard to QALY gains. Therefore, further evaluations are needed[12].

IMPLEMENTATION AND PRACTCAL ADVICE

A. Training and/or knowledge required to provide the intervention

Specialised contributors trained and (if possible, graduate) in APA sciences and techniques. For example, in France, Bachelor of Physical and Sports Activities Sciences and Techniques (STAPS) option APA is recommended.

B. Practical and clinical advice

THERAPEUTIC INTENTION

Participants profile

- People with mild to severe dementia.
- Family caregivers can participate.

Indications

- Apraxia, memory disorders.
- Mood disorders, apathy, anxiety.
- Behavioural disorders: psychomotor agitation, wandering, opposition to care.
- Sleep/wake rhythm disorders.
- Improvement of vital functions and physical performance (cardio-respiratory capacities, reflexes and coordination, balance, muscular power, and weight...).

Contra-indications

- Excessive behavioural problems (non-verbal aggression, hallucinations).
- No intense physical activity in cases of high blood pressure.

Contributors

- The physical activity program must be supervised by certified APA professionals.
- Program suitability must be first evaluated by a physician (general practitioner for example) and/or a psychologist.
- Care staff can contribute to program implementation: psychologist, psychomotor therapist, physiotherapist, speech therapist, occupational therapist, nurse, nursing assistant.

Setting of intervention

- At home, in fitness room or in institution.
- If indoors: aerated and insulated, windows with curtains, good luminosity.
- Equipment: chairs or armchairs, table, music.
- Gym equipment: balls of different sizes and textures, heels, rings, studs, elastics, markings (different shapes, textures, and colours), adapted rackets, etc.

Dosage

- Period: following regular session respecting the same schedule.
- Frequency: once or twice a week (depending on participants physical condition).
- Duration: 30 minutes to maximum one hour.

Stopping physical activity is accompanied by loss of skills and "deconditioning", a disadaptation to the activity with deleterious effects on physical and psychosocial health. However, the reverse, positive spiral is always possible.

Session sequencing

- Individual or groups sessions of 3 to 5 people.
- Warm-up routine to start and stretching to end the session.
- Progression cycle.
- Components that can be included are: strength, flexibility, balance, coordination, endurance. It also helps to work on attention, memory, and relaxation.

Sitting exercises in cases of pathological falls risk to improve physical fitness.

Observance / Attendance

- The APA programme must be adapted to the person, their environment and their lifestyle (home, institution).
- Concentrating and communicating difficulties often reduces motivation, especially since cognitive and psycho-behavioural disorders limit the expression of needs, feelings, suffering or somatic pain.
- Encouragement and good mood are essential to promote self-esteem.

Assessment

Evaluation at least at program beginning and at the end (test must be adapted to disease severity and level of autonomy of people):

1. Physical fitness components assessment (tests) by APA intervention provider:

- Agility, dynamic balance: Get Up and Go test, balance test with unipodal support, double task test.
- Muscular strength of upper limbs: arm flexion, pressure of foam balls.
- Muscular strength of the lower limbs: 30 seconds sitting upright, knee flexion.
- Aerobic endurance: 2 minutes on site.
- Flexibility of lower limbs: flexibility while sitting in a chair.
- Flexibility of the upper limbs: to be evaluated with a back scratcher.

2. Psychosocial behaviour assessment by APA provider and by medical and social professionals:

- Observation grids.
- Individual interview whenever possible.

FOR MORE INFORMATION

- Exercise in the early to middle stage of dementia: https://www.alzheimers.org.uk/get-support/daily-living/exercise/early-middle-dementia

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The author would like to thank Gkolfo Gourna, APA specialist in charge of prevention at Siel Bleu, for his helpful contribution.

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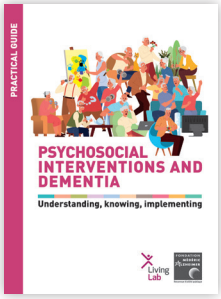

This sheet corresponds to a chapter of the guide ***Psychosocial interventions and dementia: understanding, knowing, implementing*** directed by the Fondation Médéric Alzheimer.

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Communication – June 2021
Design Philippe Lagorce

Living Lab

FONDATION MÉDÉRIC ALZHEIMER
Reconnue d'utilité publique