

Mass Performance of Adapted Physical Activity: A “Population Strategy to Prevent Frailty”: Setting-Up and Running the Service-8 Years of Experience



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Abstract

Lack of physical activity has been postulated to be the cause of a significant loss of healthy life expectancy and in much greater costs, both for the National Health Service and for the individual. On the other side, the beneficial effects of Adapted Physical Activities have been demonstrated in many of the pathologies prevalent among older persons. Our experience, arising from a test performed 8 years ago, has demonstrated both the beneficial effects on the participants and the substantial reduction of costs for the Health Service. Nowadays, more than 2,500 senior citizens from the area covered by our Local Health Service take part in several Physical Activity courses that include both Adapted Physical Activity and fitness programs. The courses are managed by a private, nonprofit entity under the supervision of the Local Health Service and have involved also the local Social Services and the Municipalities. By all accounts the approach is successful and worth applying on a larger scale. The applied criteria and organization are described and guidelines proposed for further development.

Keywords: Frailty prevention, Adapted physical activity, Primary care, Population strategy, Risk of fall prevention

Abbreviations: APA: Adapted Physical Activity; APE: Adapted Physical Education; ASL: Italian Local Health Service; GDS: Geriatric Depression Scale; GP: General Practitioner; HSIC: Health & Social Care Information Centre; NHS: National Health Service; RM: Roland Morris Questionnaire

Introduction

In 2012 the Health & Social Care Information Centre (HSIC) published the initial results of the Health Survey for England on Physical Activities in the UK. The document provides a quick review of the effects of inactivity and on the beneficial effects of Physical Activity [1]. “Lack of physical activity is the fourth most important risk factor worldwide for chronic, no communicable diseases, after tobacco use, raised blood pressure and hyperglycemia (raised blood sugar) [2] In the UK, inactivity has been estimated to cause 3% of disability adjusted years of life lost in 2002; this represents a direct cost to the NHS of £1.06billion, with indirect costs to society bringing this cost to a total of £8.2billion. Inactivity is particularly important in some groups. For example, inactivity was estimated in 2011 to account for at least 20% of the excess heart disease deaths seen in the South Asian community in Britain.

Physical inactivity contributes to: cardiovascular disease, particularly ischaemic heart disease and stroke, cancer of the colon and breast; psychological distress and depression; and dementia as well as being a major cause of obesity and diabetes [3-11]. Regular physical activity reduces all-cause and cardiovascular mortality, even among those with an otherwise high cardiovascular risk profile or with established cardiovascular disease; reduces the incidence of ischaemic heart disease and stroke; reduces long-term blood pressure in both those with raised and with normal blood pressure; improves cognitive function in older people with and without existing impairment; reduces anxiety; and improves mental well being [12-22].

At the core of the diffusion of Physical Activity lies the approach to a “Population Strategy” as defined by Rose in 1985 [23]. In layman’s words, significant improvements in population

health indicators should be achieved by the adoption of a healthier lifestyle.

However, a healthier lifestyle cannot be limited to increasing the quantity or quality of physical activities:

- To reduce the prevalence of adult obesity [24], a major concern for preventive medicine, and to tackle the increase of osteoporosis [25], the control of food intake, in both quality quantity is of the utmost importance or
- To reduce the Risk-Of-Fall [26], besides some specific Physical Activity aimed to balance, the adaptation of living space is generally required.

Furthermore, the complex interactions between mood and health suggest that a specific attention should be given to the social aspects of the daily life of an elderly person [27-29].

APA: A medical intervention?

Given the broader scope involved in the concept of “healthy lifestyle” the question that arises immediately is whether Physical Activity, at least that proposed to senior citizens, should be considered as a medical intervention or not [30,31]. The fact of the matter is that the link between Physical Activity and Health was born in Medicine as an adjunct to the rehabilitation process [32,33] and/or as a tool for preventive medicine [34-37]. The proposal of a healthier lifestyle within a true “population strategy” should include Physical Activity as well as Social Inclusion Initiatives and instructions on how to upgrade daily living activities (improvements in living spaces/facilities, nutritional education, recreational activities, etc.) The program begins to shift towards a Social approach, under Medical advice. Life expectancy is now rapidly increased to the point that, in the Liguria Region of Italy, the life expectancy for a 65 year old person is about 19 (Males) and 23 (Females) years!.

Although the most effective way to extend the healthy life span would be to adopt a healthier lifestyle early in life, there is still time to intervene in the case of senior citizens aged over 65. At this age, however, there is a high prevalence of “frail” or “pre-frail” individuals, [38] according to the prevailing definition of these terms [39-42]. Very often, these persons carry on a “normal” life with some compensation of slight pathological conditions (mild atherosclerosis, compensated hypertension.... etc). These persons can however perform also Physical Activities-some even specifically recommended-although with some limitations [43].

Based on these concepts, Adapted Physical Activity was developed such that it could also be proposed to pre-frail individuals. The main concept is the execution of simple exercises linked to a specific task, at a level of intensity level suited to the specific condition of each individual. As stated by Titze & Martin in 1997 “In contrast to the previous assumption that only fairly high-intensity sporting exercise undertaken over a minimum period of 20min produces health-related benefits, recent

studies have shown that even everyday activities (climbing stairs, brisk walking and cycling) can have a beneficial effect on health, particularly in those who take little exercise. So now the recommendation is: exercise of moderate intensity lasting 30min at least 5 times a week, corresponding to an energy consumption of about 150kcal/day or 1000kcal/week” [44].

Since then growing evidence has been produced in support of APA effectiveness with respect to specific themes such as: Osteoporosis, Back Pain, Flexed Posture, Sarcopenia, Eating Disorders, Balance and Motor Control, Diabetes, Parkinson Disease, Multiple Sclerosis, Acute Stroke, Cardiovascular Diseases, Breast Cancer, Fibromyalgia, Chronic Fatigue Syndrome [45-61]. At the same time, a generic effectiveness of APA in healthy aging has been observed [62-66]. In addition to a very comprehensive definition of Adapted Physical Education (APE), [67] there are also bibliographic references to the more specific Adapted Physical Activities as a Health-Oriented practice [68], different from the traditional sickness-oriented practice and more closely related to the social and environmental assistive activities.

The role of the public health service

Given that Physical Activity, as well as favoring healthy aging, has a specific role in the functional recovery and in the prevention of specific diseases, [69] we submit that the main sponsor of the Physical Activities promotion should be the General Practitioner to whom the primary prevention of illness is entrusted. It cannot entail true “Prescription”, otherwise the Physical Activity would become a Medical Tool, but there should be an active, hopefully bi-directional, link between the GP and the Physical Activity Instructor [70]. There is a lively debate on the subject, [71] but in spite of the name- whether it should be a Prescription or Counseling or Advice [72,73] the main actor should be the GP who should be made aware of both benefits and general prescription criteria [74]. Furthermore, in Italy, Government Authorities have recommended that APA should be applied wherever feasible as a tool to promote a healthier lifestyle, [75] although without the involvement of medical professionals and at no additional costs for the National Health Service.

However, we submit that the referenced governmental indication should at least be discussed.

- The simple issue is why, how and on what ground should the GP- under contract to the National Health Service- be involved in prescribing, suggesting or advising APA and shouldering the relative responsibility?
- A more complex issue is the reference to additional cost. Several studies have shown that preventive medicine- and APA can be included in this category- in the medium term, leads to a significant reduction of health related public costs [76]. This is confirmed

by our experience: a preliminary study analyzing NHS services expenditures for individuals following our APA program has demonstrated a substantial abatement of drug prescriptions and accesses to out-patient services (diagnostics, physiotherapy) [77].

A deeper investigation is now underway on a larger population, seeking a possible correlation between this reduction and the frequency of attendance at APA sessions. If the formal requirement is constant cost, the reduction afforded by APA could well be supported by a certain NHS investment, if nothing else, at least to support the involvement of GPs and to set up an internet-based network between GPs, local NHS management and APA management. In any case, to return to the role of the GP, they can at least be asked to recommend if not to prescribe APA.

Discussion-Our Experience

The test phase

In 2008 the ASL 4 Chiavarese started an experimental APA project specific for Low-Back-Pain, Dorsal Kyphosis and Balance Rehabilitation. After nearly 6 months of twice weekly group APA exercising (one hour per session) encouraging results were observed [78]. The beneficial effects were measured in terms of pain reduction (over 85% declared a significant improvement), of reduction of medical assistance needs (drug consumption or Rx Diagnostics or Clinical examinations- 80%) and quality of life enhancement (GDS and RM). The program was successful and the participants passed their satisfaction “down the grapevine”. Based on individual and GPs’ requests, the population accessing APA courses has constantly grown to over 2,500 persons (March 2016) (Figure 1 & 2).

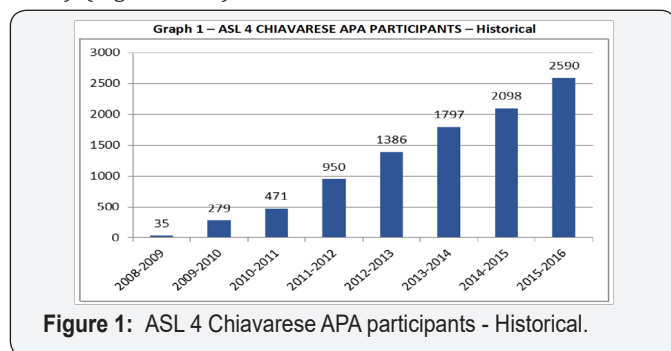


Figure 1: ASL 4 Chiavarese APA participants - Historical.

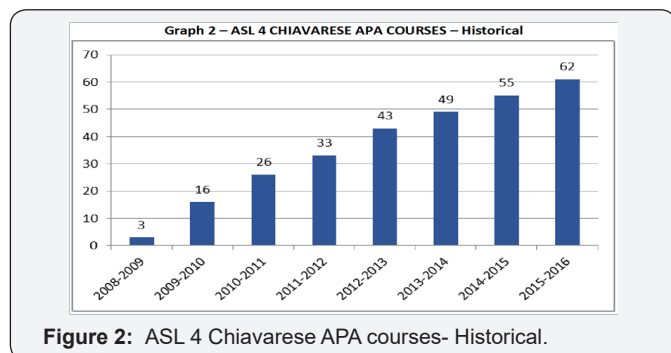


Figure 2: ASL 4 Chiavarese APA courses- Historical.

Logistics and organization

The effort required to find appropriate spaces in the ASL4 territory, which covers the valleys on the East coast of Liguria, was rather hard but successful: there are now 62 courses in 13 Municipalities where rooms capable of accommodating groups of 20 persons performing APA exercises were successfully found and set up for the purpose. The choice of setting up exercise rooms close to the living areas was crucial to the success of the program: the geological characteristics of the ASL4 area with mountains and deep valleys with a rocky seafont make travelling time-consuming and tiring.

An effort was made to set-up regular procedures and appropriate software tools:

- To enroll the participants
- To integrate the instrumental tests, the self-administered questionnaires, the medical information available from different sources
- To standardize the formal procedures.

Thanks to the above it has been possible to monitor course attendance and participants’ health conditions (Figure 3).

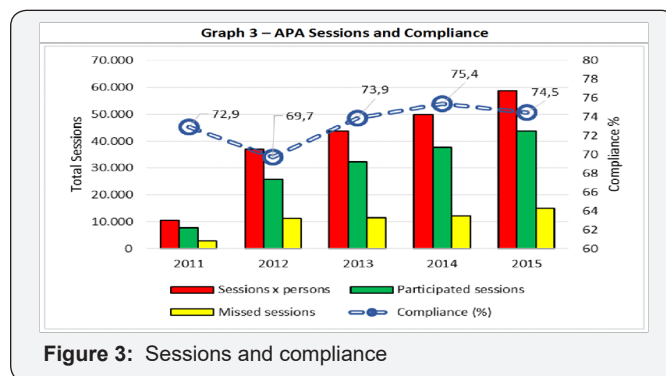


Figure 3: Sessions and compliance

It is worth noting the high level of participation, which may be considered a sort of “customer satisfaction” index but, more importantly, a sign of the participants’ awareness of APA as a new lifestyle.

Furthermore, instructors have reported the growth of “Social Inclusion” indicators within each APA Group: participants started sharing transportation and some social events. This phenomenon is one of the hoped-for side effects of the APA courses and is perhaps only to be expected [79].

Trainers, management and costs

The ASL4 Chiavarese selected and gave specific education to the trainers (motor sciences university graduates and/or physiotherapists with APA specialist qualifications), performed the health assessment according to standard rules and monitored activity performance.

The Instructors are on the payroll of “Ben-Essere” Non Professional Sport Association. The association levies a quarterly

participation fee of 50 Euros. This income pays for the insurance, gym-related expenses, legal obligations and compensation of trainers: in the budget of Ben-Essere some allowances are made for further investments. However, the fee can be reduced according to the person's income upon agreement with the Social Services.

The APA exercises

The exercises were selected from among those defined by Macchi et al. 2012 [67] for twice weekly courses of 1 hour for groups of a maximum of 20 participants. Exercises were especially selected according to the specific Course, and planned according to a standard scheme followed in all courses of the same type by all trainers (Table 1).

Table 1: APA courses Exercises.

Main Theme	Session Program
Back-Pain or kyphosis	<p>2 weekly sessions, 1hr each</p> <p>Objective: posture, mobility, reinforcement, stretching, respiration, balance, relaxation. Each Session is subdivided into three phases:</p> <p>a. Standing (10-15'): cardiovascular activation, shoulder and coxo-femoral joints mobilization, lower limbs reinforcement.</p> <p>b. Sitting (10-15'): neck and shoulders mobilization.</p> <p>c. On the Ground (5-30') spine mobilization, abdominal muscles reinforcement, gluteal and spine extensor muscles reinforcement, spine stretching, ischiocrural and psoas muscle reinforcement, self-stretching and final relaxation.</p>
Balance	<p>1 weekly session (additional to other courses) lasting 90'</p> <p>Objective: proprioception and balance control training Each session is subdivided four phases:</p> <p>a. A warming-up sequence (10-15').</p> <p>b. A specific Qi-Gong (ZhiNeng Qi Gong, basic) sequence (20-30').</p> <p>c. A specific Tai-Chi (primary Taijiquan Wu style 18 figures) sequence (30-40').</p> <p>d. A respiration and relaxation sequence (10-15').</p>
Muscle Mass Reinforcement	<p>2 weekly sessions, 1hr each</p> <p>Objective: increase of muscular strength and tone to improve posture and motor control for sarcopenia and Risk-Of-Fall increase of muscular strength and tone to improve posture and motor control for sarcopenia and Risk-Of-Fall</p> <p>Each session is subdivided into three phases:</p> <p>a. Standing (15') warming up and motor coordination exercises.</p> <p>b. Standing/On-the-Ground (30') muscle tonification at low/medium intensity for different muscular districts (primarily abdominal and both lower and upper limbs) with low weight loads (0.5, 1.0 or 1.5 Kg).</p> <p>c. Defatigation (15') and relaxation/stretching of the muscle systems with specific exercises (respiration and stretching) (The exercises are specifically selected among a list of 70: 15 for warming-up, 35 for muscle tonification, 20 for stretching, respiration and relaxation).</p>
Nordic walking	<p>2 weekly sessions, 1hr each</p> <p>Objective: group motor activity, mostly aerobic, targeting primarily cardiovascular, dis-metabolic or respiratory pathologies. The standard session includes a mostly aerobic walk with the specific style (sticks) followed by exercises to improve strength, balance, motor coordination/control.</p>
APA-Sea	<p>2 weekly sessions, 1hr each (summertime, either in the morning or in late afternoon)</p> <p>Objective: Chronic pain, muscle tone, muscle mass, proprioception. This special course exploits the well-known positive effects of sea water (chronic pain, microcirculation, lymphatic drainage by the wave induced pulsating massage), passive load of water on the limb movement which is beneficial for muscle mass increase, wave induced unbalance to train proprioception and motor control. The exposition to sunshine (in appropriate periods of the day) is beneficial to osteoporosis. The standard session includes a first phase on the beach with warming-up exercises, followed by a second phase in sea water with exercises to be performed in pairs to train joint mobility, muscle tone, body proprioception. Floating aids are used.</p>
APA "Circuit"	<p>2 weekly sessions, 1hr each</p> <p>Objective: Muscle reinforcement recommended for subjects willing to perform at medium intensity and/or for subjects to prevent sarcopenia. 16 working stations are used, 4 of which with Technogym Easyline machines. Each session is subdivided into four phases:</p> <p>a. Warming up (12') Floor exercises mimicking the exercises that will be performed on the stations.</p> <p>b. Core (32') two full turns are taken in all 16 stations for 30" each followed by 30" rest time and switching to the following station.</p> <p>c. Group training (10') for lower limbs work out.</p> <p>d. Final (5') stretching of the muscle district 42 exercises are currently selectively applied. 90 further exercises are presently being validated</p>

Peer-Reviewed course quality

In accordance with general Quality Assurance criteria, the courses are monitored on the basis of specific checklists and through periodic "peer-review" inspections. Courses have to be performed in the same approved pattern and with the same sequences and timing for each specific course type.

The capability of providing Quality Assurance is of the utmost importance for the attendants, for the Health Service that is sponsoring the program and for the GPs that "prescribe" APA to their patients. For this purpose, a "peer review" approach has been established: trainers take turns in acting as inspectors of their peers, according to a specific checklist that covers all the aspects, ranging from quality of exercise and performances to

the logistics of the training space and to the behaviour of the trainer under scrutiny. It is aimed to ensure the quality and homogeneity of APA activities for all the courses.

During the review

- 20 items are checked with regard to the logistics of the course with a max total score of 50.
- 20 items are checked with regard to the session performance with a max total score of 50. As an example of the process, in Graph 4 the results of the peer-review process, are reported for 14 trainers/facility in 2015 (Figure 4).

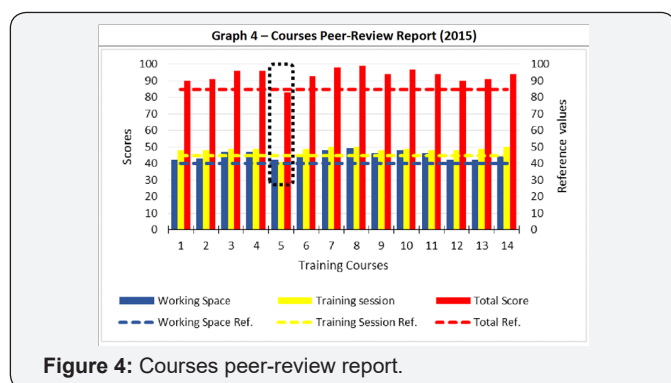


Figure 4: Courses peer-review report.

As can be seen, course #5 was below acceptance limits and actions were undertaken to upgrade its overall quality. In the initial period the “peer review” approach has served also the purpose of ameliorating and standardizing the exercise programs. Data are recorded and monitored using the APA management Software tool. Efficiency indicators and attendance are recorded for each session. ASL Health Care Managers can monitor the courses by means of real time access to a specific on-line database.

Effectiveness assessment

Some effectiveness data are monitored by means of digitally scanned self-administered questionnaires derived from the most popular ones used for geriatric assessment: Activities of Daily Living (ADL)/ Instrumental Activities of Daily Living (IADL), Roland Morris, Geriatric Depression Scale (GDS), Falls Efficacy Scale (FES), Fear-Of-Falling, Minnesota Leisure Time Activity and questions related to lifestyle [80-85]. The results (“Checkup” software by MICROLOG SRL- Sassuolo (MO) are available on-line to the ASL Managers and to the Trainers.

Functional performances assessment

A set of instruments was procured thanks to the above budget allowances.

The tests are performed at least once a year on all the participants:

- Static Balance (Romberg Test), on Force Plate [86-87]
- SPO2-Saturimetry [88]

- Arterial Pressure
- Handgrip, (Hydraulic handgrip) [89,90]
- Arterial Stiffness, (Accelerated Photoplethysmography) [91,92]
- Body mass composition, (Multifrequency segmental body impedance).

The set of recorded data generally confirm standard age/sex related values. Deviations from average values are mostly associated with known pathologies. In some cases, however, it seems the observed deviations from average might indicate borderline individuals worth reporting to their GPs.

Conclusion

Different courses

As a natural evolution, besides the Back Pain groups, there are now Balance groups and also experimental Tai-Chi and Qi-Gong groups have been established. During the summer a Sea APA Group was run with wide participation and a Nordic Walking group started to practice along the hill paths of the areas. A group specifically aimed to increase the muscle mass has also been started.

Participation

As can be seen from Graph 3, the frequency of attendance levels out at 75%, confirming the high level of compliance by the participants. The total participation of the over 65s has reached the value of 1585 (March 2016) for a relative impact on the over 65 population related to ASL4 of 3.8%. A significant shift has been observed in the motivation of persons enrolling in APA courses: besides the effect of the passage “down the grapevine” of the satisfaction of attendants, that in the beginning accounted for the vast majority of persons enrolling in APA courses, prescription by the GPs is increasing .

Critical points and guidelines for improvement

The experience should be rated successful, but it has demonstrated a few critical points:

- I. An effort should be made to involve the GPs at a deeper level in enrolling their senior patients in APA courses.
- II. The percentage of enrolled senior citizens is of just 3.8% of the total over 65 citizens referring to ASL4: a specific effort should be made to increase the diffusion of this service.
- III. The participation of male subjects is very scarce: of the 1,585 over 65 subjects only 14, 8% are males compared to 85.2% of females. This data is not satisfactory: it must be understood why the proposal is not appealing to senior males and a different strategy should be found and put in place.
- IV. As stated in the Introduction to the present narrative Review, a healthier lifestyle should not be limited to an

increase of physical activities. In close cooperation with the local Social Services, specific interventions should be made to ameliorate nutrition, social inclusion, and home safety.

V. Screening and functional assessment should be progressively enhanced and form the core of feedback to GPs prescribing APA to their patients.

VI. A correlation to Frailty according to the already mentioned standard and the possible extension of the functional assessment of the totality of the senior population would appear to have realistic growth prospects.

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