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PHYSICAL FITNESS AND EXERCISE TO MOTIVATE THE GOLDEN AGERS USING BODY AREA NETWORK

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ABSTRACT

Maintaining an active lifestyle can help older adults maintain their mobility and independence by improving their physical and mental health. Despite the well-publicized health advantages of regular physical activity, the vast majority of elderly Britons fall short of the recommended daily amounts. Age-related decline in health, sickness, and weakness can be prevented by adopting an active lifestyle. Elderly people are obligated by local governments to participate in physical activity, but it is difficult to know how to get the populace to do so. Regular exercise has a number of health benefits for both elderly people who are physically fit, but also for those who have a history of health problems, such as diabetes or high blood pressure. Elderly people, especially those in poorer areas, aren't getting enough exercise. It is possible for patients to obtain more exercise for a lower cost while still having fun. As a result, they are more likely to spend time with friends and develop a greater sense of self-assurance when it comes to exercising. A doctor, a friend of the patient's family, or a close friend can do the procedure.

KEYWORDS: Physical exercise, Body area network, Golden Agers

1. INTRODUCTION

It's a cause for celebration that people are living longer, but there are also significant social, economic, and health concerns that come with an increase in life span that outpaces the number of years that people may spend in good health. Women in the UK were born in 2008 with an life span of 81.8 years, while males were born with an life span of 78 years. By 2018, this had risen to an life span of 85 years for women as well as 80 years for men. For women in 2008, the average healthy life span was 65 years and for males it was 68 years; by 2020, the average healthy life span was dropped to 65 years for women and 66 years for men. 15 percent of persons over the age of 66 suffer from chronic, debilitating musculoskeletal diseases. Heart and circulatory disease affects 13%, respiratory disease affects 5%, endocrine or metabolic disease affects 6%, and mental health issues impact 3% of persons over the age of 66. In the 12 years following retirement, the prevalence of such chronic diseases far beyond doubles. Ones over the age of 76 are more likely to have chronic musculoskeletal conditions (29 percent), cardiovascular conditions (30 percent), and endocrine or metabolic conditions (14 percent) than younger people. Population over the age of 85 is expected to rise from 1.3 million to about 3.5 million in the next decade. Deterioration in the functioning of the body's systems can be seen at roughly the age of 40 years, with accompanying morphological and ultra-structural alterations. Skeletal muscle shrinks and weakens with age (a condition known as sarcopenia), Osteopenia and osteoporosis are the results of decreased bone mineral density as a result of ageing. Age is a straightforward and frequently accurate indicator of health, illness burden, and physical capacity. Some older people are in excellent health, while others begin to exhibit signs of weakness, impairment, and frailty far sooner.

2. FRAILITY VS HEALTHY AGING

People who do things to improve their health and well-being are more likely to live a healthy, sustainable life in the city as they age. In the MYOAGE study, people in their 70s were found to have worse physiological function than young people, even though they didn't seem to have any trouble doing daily tasks. Older people had a higher BMI than younger people because they had more fat, smaller, weaker muscles, less bone mineral density, less cardiorespiratory and metabolic function, and worse cognitive performance. Studies have shown that healthy old people have 30–50% fewer motor neurons in their leg muscles than young people. This suggests that reorganization of motor units is a normal part of getting older.

Even though muscle fibres and motor neurons are lost with age, exercise training can help improve the structure and function of the cardiorespiratory, metabolic, and musculoskeletal systems. This is why it is important to study the ageing bodies of people who are very active. Master Athletes are athletes who compete often and have great physical skills for their age group. They tend to have better bone, muscle, cardiorespiratory, metabolic, and neurological health than non-athletic people of the same age, though it is clear that all physiological systems get worse with age, even in very active people.

Physical changes over time are linked to slower walking speeds, trouble getting out of a chair, and trouble keeping your balance on your feet. The 6-minute walk has been made a standard way to measure how well older people can move. A score of less than 8 on this short physical performance battery can be used to diagnose sarcopenia and frailty. This test measures walking speed over 4 metres, balance in different foot positions, and the time it takes to get up from five different chair positions. To put it another way, a sarcopenia (low muscle mass) and "pre-frailty" score of 8 to 11 suggests that the person has a lot of physical problems. After walking around a cone for 3 metres, a person has to stand up and do the Timed Up and Go (TUG) test.

Clinicians are becoming more aware that frailty is a geriatric syndrome caused by a number of systemic problems in older people. Physical and mental problems make it hard for fragile people to do everyday things like bathing, getting dressed, and eating. Fragility diagnoses are often put into two groups: mild and moderate. The Rockwood scale defines frailty as a buildup of "deficits," such as the number of medicines taken, the number of illnesses, and the number of medical interventions. Fried Frailty Phenotypes include losing weight without trying to, not being very active, walking slowly, feeling tired, and being weak. Frailty affects about 10% of people aged 65–75 and 50% of people aged 80 and older. It is made worse by a number of things, such as a low income, having more than one disease, taking medications, and having a weak immune system. Frail people have a wide range of physical activity and social interactions, but they usually have a number of long-term illnesses that need medical care. Even a small amount of stress and illness could make it harder for them to get better. People with a lot of dependencies or disabilities can get their independence back, but they are still more likely to have trouble moving around in the future than people who were never fragile. Obesity, high blood pressure, diabetes type 2, heart disease, and some types of cancer can all be helped by not smoking, even if the person doesn't have a visible health problem. 5–6: 49–51 Even when illnesses and physical and mental problems in an older population were taken into account, those who worked out more than 2 hours per week had a lower death rate than those who didn't. 52 These groups of older people should be encouraged to get enough exercise to meet most WHO criteria.

People with disabilities or who are old and weak have a bad reputation because of the stigma they face. About 38% of Americans over the age of 65 have a disability, and this number jumps to 74% of Americans over the age of 80. 53 But there are only a few suggestions for older people with disabilities when it comes to exercise and physical activity. A new meta-analysis shows that more physical activity not only delays the start of functional restriction, but also slows the rate of functional decline in older people with and without disabilities. They have a harder time getting enough exercise on a regular basis to improve their health. Recent meta-analyses and reviews found that moderate to vigorous exercise has a bigger effect on physical function in older people who are frail and have trouble moving around than low intensity exercise. 54–56. Even though the meta-analysis did not give clear information on the best type of exercise56–58, there was strong evidence that strength training interventions were important for functional improvement. – 57 There isn't a lot of evidence that aerobic or strength training is helpful after a stroke. 40 It's still not clear what kind of exercise and how hard it needs to be for people with disabilities and frail older adults to keep or improve their level of function.

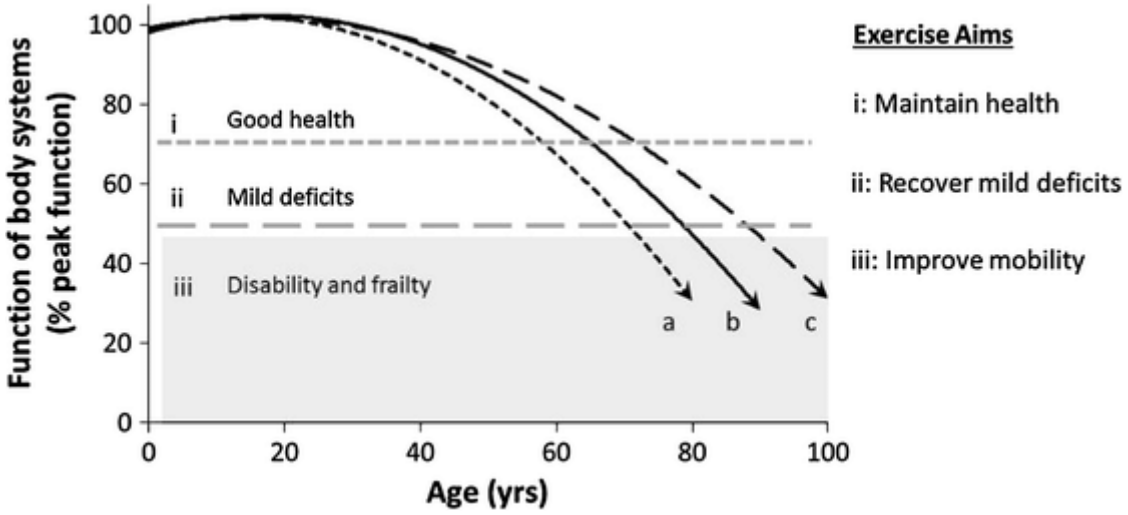

Fig 1 : schematic representation of healthy needs of an individual

3. REGULAR EXERCISE FOR HEALTHY GOLDEN AGE

As we become older, we tend to become less active and more sedentary. If you have health challenges, weight or discomfort issues, or concerns about falling, you may be unable to get out of bed. You may believe that exercise isn't for you since you don't enjoy it. Being physically active, especially as you age, becomes increasingly critical to your health.

Even if you wait until you're in your senior years to start working out, a recent Swedish study indicated that physical activity is the most important factor in extending your life span. To gain more years out of your life, you don't just need to get more active.

In addition to boosting your mood, vitality, and decreasing your risk of cardiovascular disease, regular physical activity can also help you cope with the signs and symptoms of a variety of ailments. Maintaining a healthy weight is also possible with this method. In addition to improving your physical and mental health, regular physical activity also improves your mood and memory. In order to get the physical and mental health benefits of exercise, you can always discover simple, pleasurable methods to get more active. The size and number of muscle fibres diminish as we age. Every decade beyond middle age, the average person loses about 3 kilograms of lean muscle, according to some research. Muscle fibres of the "quick twitch" (phasic) sort, which are responsible for strength and rapid contraction, appear to be the most affected. Sedentary habits, rather than advancing years, may be to blame for these alterations. After only a few weeks of consistent exercise, an older person's muscle mass can rise.

Bone – bone mass begins to decline after the age of 40, but this loss accelerates around the age of 50 years. Older persons have a higher risk of fractures as a result of bone loss. It's possible that regular physical activity can help prevent bone loss and the onset of osteoporosis. Specifically, weight-bearing activity helps to keep bones healthy and robust. Moderate intensity exercise is best for the heart and lungs, such as exercising at 70% of one's maximal heart rate (220 beats per minute minus your age). In older people, it takes longer to attain cardiorespiratory fitness than in younger people, but the physical benefits are the same. Regardless of one's age, consistent exercise can help one's cardiorespiratory health.

For optimal health, it is important to maintain regular movement in your joints. In particular aerobic and strengthening exercises can aid arthritis sufferers. Many ailments, including diabetes and heart disease, have been linked to high levels of body fat, which is why it is important to maintain a healthy weight. Increased muscular mass and a boosted metabolic rate can be achieved through regular exercise. Older people are able to maintain a healthy weight due to a combination of physiological changes.

Activities that older persons can partake in are limited by chronic diseases such as severe arthritis, osteoporosis, or advanced heart disease. To ensure the safety and appropriateness of your fitness programme in these situations, you should get advice from a medical professional.

The purpose of pre-exercise screening is to identify patients with medical conditions that may raise their risk of harm during physical activity. With it, you'll be able to weigh the benefits of working out against the dangers. Create a backup of the pre-exercise diagnostic instrument and discuss it with your doctor or a fitness professional.

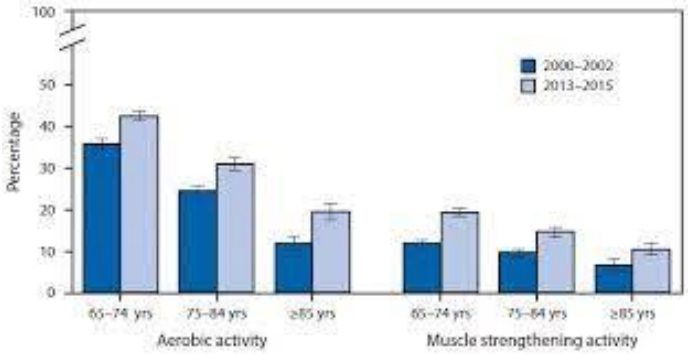

FIG 2: Importance of exercise in golden agers

4. BODY AREA NETWORKS FOR GOLDEN AGERS

4.1 Wearable devices

The patient's body will be attached to sensors on a wearable gadget and a smartphone to gather physiological data. A wide range of healthcare devices are now available for assessing vital signs such blood oxygen level, skin temperature, and heart rate. Monitoring these signs in a patient's body is critical since incorrect data could lead to an illness. Humans can die from sleep apnea, which occurs when the body's oxygen level drops too low. Diabetes and renal disease are both exacerbated by high blood pressure. The patient's smart phone app receives the sensory data through Bluetooth and then uploads it to a cloud database. Users' quality of experience is enhanced and their comfort is improved by sensors that monitor and deliver data regularly without requiring patient attention, making everything more automated.

4.2 Cloud/ data layer

Cloud computing refers to a system's data storage and processing location. Data from patients' smartphones is sent to the cloud, where it is sorted before being made available to doctors for examination.. Patients' data will also be analysed and categorized depending on their health condition and diseases, so that any odd changes in the patient's data can be flagged as aberrant. The patient's and/or doctor's platform, or the emergency unit, or both, will be notified of all results. Because of this, cloud computing makes it possible for healthcare providers to save and share patient data, analytics, and diagnostics with others in the field who share an interest in the same areas of expertise. Faster prescription as well as real-time data upgrades for patients are the results of this.

4.3 Monitoring platforms

Patient records as well as sensory data are monitored on this tier by doctors. Using the cloud, physicians are able to review the information generated by the system and take action. Real-time data synchronization by extracting all cloud data as soon as it is available to use in order to keep doctors and paramedics up to date on the patient's status and prevent hospitalization in the event of an emergency.

4.4 Mobile monitoring

Watches and smartphones with the Android OS are used in this project. Patients with illnesses including chronic obstructive pulmonary disease (COPD), seasonal affective disorder (SAD), and bipolar affective disorder (BPD) have sensors implanted, and the goal is to gather and interpret data from that data (BAD). Every day, the smartphone asks users to answer a health-related question. Breathing into a microphone at the end of the questionnaire measures patients' maximum expiratory flow. During the course of the day, data is collected and delivered to a distant server where it is processed. Preliminary results show that patients are open to using this wearable gadget.

4.5 Vita- data

In order to monitor vital signs and transmit alarms to the patient's carers of children, seniors, and persons with disabilities, Vita-Data is an invention that integrates hardware with software. When it detects an abnormality in a patient's temperature, heart rate, or blood oxygenation, it alerts a caregiver by sending an alarm to a bracelet that the caregiver wears, based on the parameters established by the doctor.

Wearable technologies such as smart watches, wristbands, and belts have been used in the three studies under consideration to monitor vital signs, but the sensors used are fairly similar. Each of the wearable devices was designed to be customized for a certain patient type and activity level.

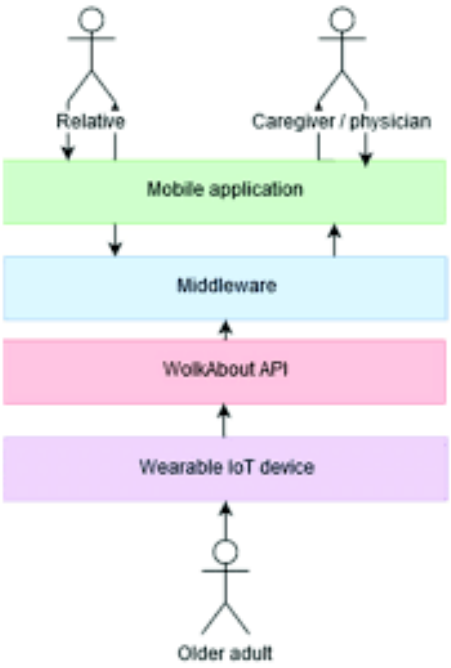

Fig 3: Vita data frame work

5. RISKS IN PHYSICAL PROGRAMMES

Exercise is essential for older folks, but they must keep their present health and physical state in mind while deciding which workouts they should participate in. Elderly people should avoid these activities. Even though crunches are a typical kind of exercise, they're not recommended for those in their senior years. As we become older, our backs become more vulnerable, and doing crunches can be dangerous, especially if done incorrectly. They can injure your back muscles and joints, resulting in excruciating discomfort. Even if you execute your crunches correctly, they can nonetheless damage your spine because of their repetitive nature. Leg lifts as well as planks are better choices. Squats, when performed by the elderly, carry a number of dangers. Knee joints are under a lot of stress, which can lead to injury. While standing from a squat, you may lose your equilibrium and tumble over. Squats can be dangerous, so avoid them at all costs. Going for long runs in your senior years is not the best time to start. A runner's foot & knee joints bear the majority of the weight of their entire body throughout each step. Serious leg injuries, including paralysis, are possible as a result. The elliptical machine or even a swim will always provide higher cardiovascular advantages. Elderly people should avoid using leg press machines, as they can be quite harmful. You must sit on a level bench and press the pounds with your feet in order to use the machine correctly. By applying stress on the back and flattening its natural arch, this might result in serious injury to the lumbar spinal discs. In the world of bodybuilding, deadlifts are a staple. They include hefty weight-lifting feats, to say the least. Not suited for the elderly, this workout is quite demanding on the back and can also inflict harm to the arms and shoulders. Despite the fact that some seniors with years of weightlifting experience are capable of doing them, the vast majority of them should avoid them. The use of a gym machine or a flight of steps to march back and forth is not recommended for elders. It can put a lot of strain on your legs and knees, as well as your overall stability. Finding an alternative to stair climbs is always preferable when it comes to strengthening your legs.

6. CONCLUSION

Evidence shows that regular physical activity is safe for healthy and frail older people, and the risk of developing major cardiovascular and metabolic diseases as well as obesity as well as cognitive impairments as well as osteoporosis and muscular weakness is reduced by regularly completing activities ranging from low-intensity walking through to more vigorous sports. However, physical activity involvement among older persons, particularly those in less affluent areas, is very low.... If clinicians, family, or friends are able to influence older people to increase their activity level, they can do so at a lower cost while still having a positive experience, which makes it easier for them to participate in group activities and increases their confidence in their own ability to exercise. The SW-SHMS has a wide range of potential future developments and improvements, such as the application of artificial intelligence and/or machine learning ideas to aid in the early detection of life-threatening disorders. As an added bonus, the system is equipped with a substantial amount of medical data that may be used to create a system of recommendations for healthier diets and ways of life. It's also possible to add Fog computing nodes to the network topology so that data can be processed at the network's edges instead of having to travel far to the cloud for processing. Fog computing reduces data traffic on the cloud and improves healthcare decisions because of its location within the local network. As a result, the network architecture will be upgraded to allow the distribution of many Fog nodes at the network's edge, which will be used to reduce packet losses. This will aid the system in acquiring and manipulating data more quickly via a Fog-Cloud collaboration model before it is lost.

REFERENCES

1. Adlam T, Faulkner R, Orpwood R, Jones K, Macijauskiene J, Budraitiene A (2004) The installation and support of internationally distributed equipment for people with dementia. IEEE Transactions on Information Technology in Biomedicine
2. Ali A, Ming Y, Chakraborty S, Iram S (2017) A comprehensive survey on real-time applications of WSN. Fut Internet 9(4):77
3. Zhou Y, Vongsa D, Zhou Y, Cheng Z, Jing L (2015) A Healthcare System for Detection and Analysis of Daily Activity Based on Wearable Sensor and Smartphone. In: 2015 IEEE 12th international conference on ubiquitous intelligence and Computing and 2015 IEEE 12th international conference on autonomic and trusted computing and 2015 IEEE 15th international conference on scalable computing and communications and its associated workshops (UIC-ATC-ScalCom). IEEE, pp 1109–1114.
4. . Avancha S., Baxi A., Kotz D. Privacy in mobile technology for personal healthcare. ACM Comput. Surv. 2012;45:1–54. doi: 10.1145/2379776.2379779. [CrossRef] [Google Scholar]
5. 28. Brooke J. SUS-A quick and dirty usability scale. In: Jordan P.W., editor. Usability Evaluation in Industry. Taylor & Francis; London, UK: 1996. [Google Scholar]
6. 29. Nielsen J. Why You Only Need to Test with 5 Users. Nielsen Norman Group; Fremont, CA, USA: 2000. [Google Scholar]
7. 30. Sauro J. Measuring Usability with the System Usability Scale (SUS) MeasuringU; Denver, CO, USA: 2011. [Google Scholar]
8. WolkAbout IoT Platform API 2018. [(accessed on 6 May 2019)]; Available online: https://restapi.wolkabout.com/
9. 21. Papazoglou M.P. Service-oriented computing: Concepts, characteristics and directions; Proceedings of the Fourth International Conference on Web Information Systems Engineering; Rome, Italy. 12 December 2003; pp. 3–12. [Google Scholar]
10. 22. Chaniotis I.K., Kyriakou K.-I.D., Tselikas N.D. Is Node.js a viable option for building modern web applications? A performance evaluation study. Computing. 2015;97:1023–1044. doi: 10.1007/s00607-014-0394-9. [CrossRef] [Google Scholar]