



Fitness Programs Impact on Physiological Variables, Health Related Fitness & Quality of Life: A Meta-Analysis

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ABSTRACT

The objective of this meta-analysis was to observe the trends in the research with reference to the impact of fitness programs on selected health related, physiological variables and quality of life among rural senior citizens. Research articles from the year 1992 to 2015 were reviewed and presented in three sections. The findings of the meta-analysis concluded that yoga exercises increased cardio-respiratory efficiency, spinal mobility and flexibility of the hamstring muscles regardless of age, respiratory muscle strength and endurance. Yoga practices show significant changes in the selected dependent variables namely breath holding time, resting pulse rate, respiratory rate, high density lipoproteins cholesterol (HDL), low density lipoproteins cholesterol (LDL) and very low density lipoproteins cholesterol (VLDL). Aerobic exercise specifically designed for elderly women may improve selected components of balance and locomotion/ agility, thereby attenuating risks of falling. Moderate exercise in the form of walking has definite exercise benefits on obese individuals as it influences the VO₂max. The yogic exercises have significant influence in the development of human health; its effect can be maximized when combined with aerobic exercises.

KEYWORDS : aerobic exercise, yoga exercise, quality of life, fitness program, senior citizens.

INTRODUCTION

Man's life is a continuous flow of activity. Every moment he is doing something; his activity is a result of joint efforts of his body and mind. More integrated efforts yield more success to individual. Environmental interactions come via the body (sense organs) into our mind and things in our mind reach the world outside through the body. Physical fitness is more than 'not being sick' or merely 'being well'. It is different from resistance to or immunity from disease. It is opposite to being fatigued from ordinary efforts to lacking the energy to enter zestfully into life's activities, and to becoming exhausted from unexpected, demanding physical exertion.

Physical fitness is one of the objectives of every individual in the society. It is established that a training of adequate intensity and volume leads to noticeable change in the physical and physiological systems of the body. These changes are affected by a number of factors including age, sex, environment and fitness level.

METHODS AND MATERIALS:

A comprehensive literature search of research articles (21) from the year 1992 to 2015 (24 years period) were reviewed for the present meta-analysis. Differences were observed, discussed and are reported for impact of yoga and aerobic exercises on the fitness of senior citizens.

IMPACT OF YOGA EXERCISE

Impact on Physiological Variables:

The study of Ananth(2014) shows yoga practice is a better tool to reduce the percentage of body fat, body mass index (BMI), systolic and diastolic blood pressure, resting pulse rate and breath holding time, total cholesterol, triglycerides, high density lipoprotein, and fasting blood glucose. The results of a study done by Dhanalakshmi (2015), indicate that both the experimental groups namely the yoga practices three days per week and the yoga practices five days per week had shown significant change in the selected dependent variables namely Breath holding time, Resting pulse rate, Respiratory rate, High density lipoproteins cholesterol (HDL), Low density lipoproteins cholesterol (LDL) and Very low density lipoproteins cholesterol (VLDL). It is also found that the significant change achieved by the yoga practices five days per week group is greater when compared to that of yoga practices three days per week and Control group. It was found that statistically significant improvement in cardio-respiratory parameters, anxiety score, visual reaction time and finger dexterity score ($P < 0.05$) after yogic training; thus, a combined practice of asana, breathing exercises, and meditation & relaxation technique in a sequence is the best available resource (Kurwale&Gadkari 2014). Savitripranayam

produced a significant increase in respiratory pressures and respiratory endurance (Madanmohan, *et al.* 2005). A study of Raju, *et al.* (1997) shows Maximal work output (W_{max}) for the group increased by 21%, with a significantly reduced level of oxygen consumption per unit work but without a concomitant significant change in heart rate. After intensive yoga training, at 154 W_{min}(-1) (corresponding to W_{max} of the pre-yoga maximal exercise test) participants could exercise more comfortably, with a significantly lower heart rate ($p < 0.05$), reduced minute ventilation ($p < 0.05$), reduced oxygen consumption per unit work ($p < 0.05$), and a significantly lower respiratory quotient ($p < 0.05$). The implications for the effect of intensive yoga on cardio-respiratory efficiency are discussed, with the suggestion that yoga has some transparently different quantifiable physiological effects to other exercises. Yogic Exercises done for one hour daily including asanas, breathing exercises and pranayamas seems to improve VO₂ max. In spite of Yogic Exercises being not very vigorous, VO₂ max was found to increase. Yogic Exercises can be of value in conditions of low cardio respiratory reserves, especially in patients in whom heavy exercises are contraindicated. Yogic Exercises may be incorporated as a part of 'Physical Fitness Program' to improve cardio-respiratory efficiency in sport persons (Vinayak, *et al.* 2013).

Impact on Health Related Variables:

Research shows various positive impact on health related variables. The practice of yoga for 12 weeks shows significant reduction in visual and auditory RTs and significant increase in respiratory pressures, breath holding times and HGS (Madanmohan, *et al.* 1992), another study shows that yoga training for 6 months improves lung function, strength of inspiratory and expiratory muscles as well as skeletal muscle strength and endurance (Madanmohan, *et al.* 2003). Yoga training produced a marked increase in respiratory pressures and endurance in 40 mm Hg test in both male and female subjects ($P < 0.05$ for all comparisons); yoga training for a short period of six weeks can produce significant improvements in respiratory muscle strength and endurance (Madanmohan, *et al.* 2008). The study of Grabara&Szopa(2015) shows Yoga exercises increased spinal mobility and flexibility of the hamstring muscles regardless of age. Yoga exercises should be recommended to the elderly to make their muscles more flexible and to increase the range of motion in the joints, which is particularly important for improving their life quality.

Impact on Quality of life:

Yagli&Ulger (2015) conducted a study on 20 patients (10 were in yoga program, 10 were in exercise group) and result was found that all patients' quality of life scores after the yoga and exercise program were better than scores obtained before the yoga and exercise program (p

< 0.05). When the post treatment data of the groups were compared in terms of NHP and subcategories, ER, SI, S, PA and the total scores of NHP were found significantly different in favour of Group I ($p < 0.05$). However EL and P scores of the NHP were not different between the groups ($p > 0.05$). When the groups were compared in terms of depression, pain, fatigue, and sleep quality, statistically significant differences were found in all parameters between pre and post treatment values for both groups ($p < 0.05$). When the post-treatment values of the groups were compared, fatigue and sleep quality were found statistically different between the groups in favour of Group I ($p < 0.05$).

IMPACT OF AEROBIC EXERCISE

Impact on Physiological Variables:

Glad & Sundaramurthy (2015) done a research on 64 young adults and observation shows moderate exercise in the form of walking has definite exercise benefits on obese individuals as it influences the VO₂max. Kaukab & Varghese (2015) concluded that the groups Aerobic Training Group (ATG) and step Aerobics Training Group (ACTG) had shows significant improvement in all the selected coronary heart diseases variables selected bio-motor variables.

Impact on Health Related Variables:

Singh, et. al. (2012) studies on 8 weeks aerobic exercise training with control group, cricket group and softball group; and observed that there were no significant differences found between the control group, cricket group and softball group on the pre test scores of cardio-respiratory endurance. But as far as the effect of 8 weeks aerobic exercise training (Experimental treatment) is concern there were significant differences found between control group, cricket group and softball group on the post test of cardio-respiratory endurance.

Keizo, et. al. (2014) conducted a new type of videogames, "exergames", involving physical motion of the players on 8 men and 16 women (Aged 71.46 ± 4.8 years old), all participants completed 24 sessions of the exergame program. There were significant improvements in maximal isometric muscular strength of hip joint flexion, and knee joint extension and flexion, of ankle joint dorsiflexion. Also MFC, a significant difference was noted between Pre and Post values. However, there was no statistically significant improvement in the functional balance test. Exergame developed in this study was found to be effective in improving muscular strength of lower extremities. Dance based aerobic exercise specifically designed for older women may improve selected components of balance and locomotion/agility, thereby attenuating risks of falling (Ryosuke, et. al. 2002).

Impact on Quality of life:

Patients with type 2 Patients with type 2 diabetes improved in fasting blood sugar, low-density lipoprotein, high-density lipoprotein, and quality of life following 8 weeks of aerobic exercise training. These perceived improvements were not reflected by statistically significant differences in between-group comparison for any parameters (Ajediran, et. al. 2011). A 10-week moderate-intensity of aerobic exercise showed increased QOL and physical functioning in breast cancer survivors (Murtezani, et. al. 2014).

IMPACT OF BOTH YOGA & AEROBIC EXERCISE

Impact on Physiological Variables:

The study of Shivakumar (2010) on both yoga and aerobic exercise on 60 male teachers aged 35-40 years, shows following conclusions; Two experimental group's namely aerobic exercises group and yogic practices group have achieved significant improvement as compared to control group towards improving the selected criterion variables such as systolic blood pressure, diastolic blood pressure, breath holding time, and resting heart rate, improving the selected criterion variables such as haemoglobin and packed cell volume, total cholesterol, Low density lipoprotein cholesterol, High density lipoprotein cholesterol and triglycerides as compared to control group. It is concluded that yogic practices group found to be better than aerobic exercises group in improving breath holding time, resting heart rate, systolic blood pressure, diastolic blood pressure. It is concluded that aerobic exercises group found to be better than yogic practices group in developing the selected haematological and bio-chemical parameters.

Impact on Health Related Variables:

The yogic exercises have significant influence in the development of human health, its effect can be maximized when combined with aer-

obic and resistance training. It was concluded that as far as development of variables related to cardio and respiratory functions are concerned the CYEAT is as good as to CYEART (Ramesh 2008).

Impact on Quality of life:

Practice of physical exercise and yoga may produce significant changes in physical, physiological and biochemical variables of hypertensive patients (Kumar 2012).

RESULTS

Table 1: Effect of Yoga exercises on fitness

S.N.	Authors of Study	Subject Length	Duration	Outputs
1	Madanmohan, et al., (1992)	27	12 Weeks	Increase in respiratory pressures, breath holding times and HGS.
2	Raju, et, al., (1997)	6	4 Weeks	Reduced oxygen consumption, low respiratory quotient.
3	Madanmohan, et al., (2003)	20	6 Months	Improves lung function, strength of inspiratory and expiratory muscles as well as skeletal muscle strength and endurance.
4	Madanmohan, et al., (2005)	30	-	Different types of pranayams produce different physiological responses.
5	Madanmohan, et al., (2008)	23	6 Weeks	Improvements in respiratory muscle strength and endurance.
6	Vinayak, et al., (2013)	60	12 Weeks	Improve VO ₂ max and cardio-respiratory efficiency in sport persons.
7	Ananth, (2014)	45	-	Reduce the percentage of body fat, body mass index (BMI), systolic and diastolic blood pressure, resting pulse rate and breathe holding time, total cholesterol, triglycerides, high density lipoprotein, and fasting blood glucose.
8	Kurwale&Gadkari, (2014)	-	-	Improvement in cardio-respiratory parameters, anxiety score, visual reaction time and finger dexterity score.
9	Dhanalakshmi, (2015)	45	-	Significant change in Breath holding time, Resting pulse rate, Respiratory rate, & high density lipoproteins cholesterol.
10	Grabara&Szo-pa,(2015)	56	20 Weeks	Increased spinal mobility and flexibility of the hamstring muscles regardless of age.
11	Yagli&Ulger, (2015)	20	-	Improvement in quality of life.

Table 2: Effect of Aerobic exercises on fitness

S.N.	Authors of study	Subject Length	Duration	Outputs
1	Ryosuke, et. al., (2002)	38	12 Weeks	Improve selected components of balance and locomotion/agility, thereby attenuating risks of falling.
2	Ajediran, et. al., (2011)	18	8 Weeks	Improved in fasting blood sugar, low-density lipoprotein, high-density lipoprotein and quality of life.
3	Singh, et. al., (2012)	150	8 Weeks	Significant differences found at post test of cardio-respiratory endurance.
4	Keizo, et. al., (2014)	24	24 Session	Improvements in maximal isometric muscular strength of hip joint flexion, knee joint extension and flexion, of ankle joint dorsiflexion.

5	Murtezani, et. al., (2014)	62	10 Week	Increased QOL and physical functioning in breast cancer survivors.
6	Glad & Sundaramurthy, (2015)	64	-	Benefits on obese individuals as it influence the VO2max.
7	Kaukab & Varghese, (2015)	60	-	Improvement in coronary heart diseases and bio-motor variables.

Table 3: Effect of both Yoga and Aerobic exercises on fitness

S.N.	Authors of study	Subject Length	Duration	Outputs
1	Ramesh, (2008)	1300	-	Significant influence in the development of human health, Improvement in cardio-respiratory function.
2	Shivakumar, (2010)	60	-	Improving breath holding time, resting heart rate, systolic blood pressure, & diastolic blood pressure.
3	Kumar, (2012)	90	-	Significant changes in physical, physiological and biochemical variables of hypertensive patients.

DISCUSSION

Yoga is an ancient Indian practice that involves physical postures, breath work and meditation. So many ways to practice yoga asanas, or physical postures, exist. These range from quiet seated poses that focus on stretching and breathing to rigorous flowing practices that involve standing, balancing on the hands and legs and complex twists. The emphasis of yoga is for breath and motion to work together in a type of moving meditation. Aerobic exercise is any physical activity that makes you sweat, causes you to breathe harder, and gets your heart beating faster than at rest. It strengthens your heart and lungs and trains your cardiovascular system to manage and deliver oxygen more quickly and efficiently throughout your body (Kaukab & Varghese, 2015). Aerobic exercise uses your large muscle groups, is rhythmic in nature, and can be maintained continuously for at least 10 minutes. Physical activity such as walking, jogging, indoor cycling, aerobic dancing are aerobic exercise that strengthen the heart and lungs, therefore improving your body's utilization of oxygen. For general health, aim for a 30-minute workout (or three 10-minute workouts per day) three to five days a week at moderate intensity. Moderate intensity refers to an activity that will increase your breathing and get your heart beating fast. You should be able to talk with ease during moderate intensity workouts; though trying to sing would be more challenging.

Overall, the studies comparing the effects of yoga and aerobic exercise seem to indicate that, in both healthy and diseased populations, yoga may be as effective as or better than exercise at improving a variety of health-related outcome measures including HRV, blood glucose, blood lipids, salivary cortisol and oxidative stress (Madanmohan, et al., 1992, 2003, 2005, 2008). Furthermore, yoga appears to improve subjective measures of fatigue, pain, and sleep in healthy and ill populations (Raju, et. al. 1997).

From the analysis of the data for aerobic exercises group and yogic practices group have achieved significant improvement as compared to control group towards improving the selected criterion variables such as systolic blood pressure, diastolic blood pressure, breath holding time, and resting heart rate. Significant improvement were found in aerobic exercises and yogic practices groups as compared to control group towards improving the selected criterion variables such as haemoglobin and packed cell volume. It is concluded that yogic practices group found to be better than aerobic exercises group in improving breath holding time, resting heart rate, systolic blood pressure, diastolic blood pressure. It is concluded that aerobic exercises group found to be better than yogic practices group in developing the selected haematological and bio-chemical parameters. Aerobic exercises and yogic practices groups have achieved significant improvement on total cholesterol, Low density lipoprotein cholesterol,

High density lipoprotein cholesterol and triglycerides as compared to control group (Shivakumar, 2010).

All of these studies need to use rigorous study methodologies, including the use of sample sizes, randomized samples, and blinding of researchers. These studies need to be replicated in a variety of populations, both sick and well, as the effects may vary depending upon the health status of the population.

CONCLUSION

Yoga is a combination of stretching, breathing, meditation, relaxation and visualization. Aerobic exercises such as bicycling and running long distances continually supply oxygen to your body. They're different than stop-and-start anaerobic exercises such as weight training and sprinting short distances that leave you breathless because they require so much short-term energy that your body develops an oxygen deficit. Yoga isn't either an aerobic or anaerobic exercise. It's a physically and mentally relaxing activity that stretches muscles. Aerobic exercises improve physical fitness more than yoga, raise heart rates more and burn far more calories. Aerobic exercises improve your physical fitness. Yoga's benefits include reducing blood pressure and blood cholesterol levels, he writes. Aerobic exercise and yoga can both reduce stress and improve moods. Both yoga and aerobic exercise offer significant health benefits including improved muscle tone, decreased body fat and improved mental outlook.

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