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The Pros And Cons Of Morning And Evening Exercise A Review Article

Doiphode Rupali S[1*], Vinchurkar Aruna S[2]
[1]*Physicist, Department of Physiology, Government Medical College, Aurangabad, Maharashtra, INDIA.*
[2]*Associate Professor, Department of Biophysics, Government Institute of Science, Aurangabad, Maharashtra, INDIA.*

Abstract :-
Evidence suggests that exercise may contribute to prevent pathological changes, treating multiple chronic diseases, and reducing mortality and morbidity ratio. Scientific evidence moreover shows that exercise plays a key role in improving health related physical fitness components and hormone functions. Regular exercise is one of the few strategies that have been strictly adapted by healthy individuals for fitness. However, time-dependent exercise has different outcomes, which are also mainly based on the type of exercise, duration and hormone adaption etc. In the present review, we briefly describe the type and duration of exercise performed in morning and evening. In addition to this context, we discuss the pros (advantages) and cons (disadvantages} of the best and suitable time of day for exercise, for getting maximum benefits out of it.

Keywords:- *Morning exercise, Evening exercise, Diurnal variations*

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I. Introduction:-

Regular exercise has an in-numerable proven health benefits from burning of body fat, building muscle mass and strengthening bones to enhancing memory, improving cardiovascular health and beefing up the immune system. It also reduces stress, enhances sleep quality, boosts up confidence and ultimately helps us to live stronger, healthier and longer.

According to the Department of Health and Human Service, a healthy adult needs at least 150 minutes (2 HOURS AND 30 MINUTES) to 300 minutes (5 HOURS) of moderate aerobic activity like brisk walking per week or 75 minutes (1 HOUR 15 MINS) to 150 minutes (2 HOURS AND 30 MINS) of vigorous intensity aerobic activity like running, swimming etc, per week or an equivalent combination of moderate and vigorous intensity aerobic activity.

But now the main question arises—WHICH IS THE BEST TIME OF A DAY TO EXERCISE OR,IS THERE REALLY A BETTER TIME OF DAY TO EXERCISE?

Mr. DAVE SMITH, A professional weight loss coach and also the founder of "MAKE YOUR BODY WORK" and **Mr. Fabio Comana, the Exercise Physiologist and Faculty Instructor at San Diego State University And The National Academy of Sports Medicine,** both Fitness experts have shared the views about the correct timing for exercise.

The best time is that will help you be complaint and consistent with your workouts says Mr. DAVE SMITH. Further he says that, for most people, exercising in the morning is like getting exercise out of the way as early as possible because, putting it off un-till later in the day creates too many opportunities for other " **PRIORTIES**" to replace the time that a person intended for exercise. He says that, moreover exercising in the morning has been linked to greater productivity, lower blood pressure and better sleep pattern. It also speeds up a person's metabolism which can improve calorie-burning through-out the day.

In addition he explains that morning exercise can also set stage for other healthier choices throughout the day. For example, people who exercise in the morning are more likely to make healthy food choices, this is because subconsciously, they want to built upon the healthy way they started their day. Also some of us feel more energetic, later in the day, during evening. For these people, working out in the morning would be a bad idea, as they likely won't enjoy the process and most people don't do what they don't enjoy. He also adds that getting results from exercise is almost entirely about compliance, so people need to do it when they can enjoy it most.

Fabio Comana, says that it depends on a person's circardian rhythms (whether they are lark or night owl) which creates variations in physiological markers like heart rate ,blood pressure and core temperature, each of which impacts the exercise performance. He notes that researchers also suggest that people who exercise early in the day are more likely to adhere to their fitness routine because their will power is stronger and the

pressure of the day hasn't yet accumulated. However, he also points out that mornings are also present with greater joint stiffness and expanded or swollen discs, both of which can compromise movement. (1)

Various psychological and physiological functions have been shown to undergo changes relative to the time of the day (10) .Body responses are varied from time to time in a day due to specific body conditions such as wakefulness, hunger, sleep etc (11). These responses and variations are related to the **circardian rhythm** (i.e **body clock**) and are also known as **Diurnal variations** (11,12).

Diurnal variations or circardian rhythms in response to exercise have been studied in recent years (10,13-16). Results depend on a variety of factors such as the experimental design, that is kind and intensity of exercise and other parameters. It is however clear that there are some differences in responses to exercise that depend on the time of day when the activity is performed (16).

Knowledge of the time course of variables tied to physiological modification induced by exercise is important mainly in sports. This is true both in the professional field, identifying the most favourable physiological moment to obtain the maximum result from performance, and for the non-professionals, allowing one to take full advantage of the benefits that physical activity produces for the body (10,13,17-21).

Increased muscle strength and cardiac fitness reflect regular physical activity(22-24).This reflection is strongly associated with time-dependent exercise(25,26). Recent studies have attempted to elucidate the manner in which different exercise types and duration are involved in the regulation of several physiological responses through morning and evening exercise because this information is important in improving muscle fitness, aerobic capacity, and well being(26-29).

The beneficial effect obtained from exercise is generally determined by multiple systems such as the motor, physiological, and neurobiological systems(30-32). In particular, physiological and neurobiological activities are dependent on biological rhythms in the human body; this is also known as circadian or diurnal rhythms(10,33-35).This phenomenon has been widely described in time-of-day studies. Despite the fact that the data in the literature have shown a significant association between time and aerobic exercise(16,36,37), other studies have not indicated any such circadian variations(38-40). These results indicate that the time-course effects of aerobic exercise on maximal aerobic velocity and exhaustion time remain unclear(32,34). Other reports have described the use of time-of day for resistance exercise(41-43). The results of time variations during resistance exercise (which involve muscle strength, power, and sprint) range from 3% to 21.2%, depending on the individual being tested, the position of the muscles, and the experimental design(44,45). The warm-up duration, sleep deprivation, and training time prior to exercise training can be affected by diurnal variation(46,47). Sedliak et al (48) report that exercise performed in the morning can improve muscle strength. However, another study obtained contradicting results and showed that participants were able to perform more physical activity in the evening, despite the lower physiological variation at this time (49). However, variations in the neuromuscular performance level increased during evening exercise.

Thus, further more information on the differences in the effects of morning and evening exercises is required. In this review, we discuss the exercise effects on Endurance (aerobic) and Resistance (anaerobic) performance, on short and long duration exercises through time-of-day exercise studies.

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II. Differential Effect Of Exercise Type

A) Endurance training

In general, aerobic exercise plays a role in weight loss management(50), and improves peak maximal oxygen consumption (VO2max)(51), and workload(52). Several studies have recently confirmed the presence of time-of-day effects of exercise on these variables(53,54). Therefore, health and disease outcomes in response to exercise may depend on the time of day the exercise is performed(55,56). Hobson et al(57) suggest the existence of a time-of-day effect on aerobic exercise for improving aerobic exercise capacity. The authors observed that the endurance exercise capacity of men during exhaustive cycling exercise at 65% peak VO2 was significantly greater in the morning than in the evening. In addition, Shiotani et al (49) found that a two-month aerobic exercise program, which consisted of ergometer cycling, increased the heart rate in the morning. However, another study found that an evening exercise training group had a greater work capacity after 5 weeks of high-intensity training, compared to the morning exercise training group (58). Faisal et al (59) similarly indicated the presence of a time-of-day specificity on the effects of aerobic exercise training. Therefore, the studies in the literature indicate that different effects may be elicited, depending on the exercise duration, time, and the individual.

B) Resistance training

Resistance exercise elicits improved muscle strength and power, and elicits changes in anabolism/catabolism, depending on the time of the day (60,61). Souissi et al (62) found that, compared to evening exercise, morning exercise yielded more beneficial effects on anaerobic performance after 6 weeks of resistance training. After examining study participants who underwent resistance training for 6 weeks in the

morning, Chtourou et al (46) similarly noted that muscle performance determined by the one-repetition, squat jump, and Wingate tests was significantly higher among this group than among individuals who performed resistance training in the evening. By contrast, certain researchers have reported that evening exercise is more effective than morning exercise, and one study showed a significant improvement in peak muscle power in well-trained cyclists in the evening than in the morning (63). Furthermore, Edwards et al (64) showed that grip strength, isokinetic knee flexion, peak power, and peak torque were higher in the evening than in the morning. However, Sedliak et al (65,66) observed that after 10 weeks of exercise in a diurnal pattern the maximum isometric strength was not altered in the morning and evening. In a similar study, some researchers indicated that no time-of-day changes were observed in muscular anaerobic performance. Chtourou et al (67) measured electromyography (EMG) activity in study participants performing the 30-second Wingate test in the morning and evening; however, the authors did not note any significant differences in EMG activity during the entire 30 seconds between the morning and evening exercise. In another study, Chtourou et al (46) similarly indicated that, after 8 weeks of lower extremity progressive resistance training, the muscle strength was similar between the participants who performed the exercise in the morning and participants who performed the exercise in the evening. Sedliak et al (66) did not show any time-of-day-specific adaptations during unilateral isometric knee extension peak torque training. Zarrouk et al (68) investigated the time-of-day effects on repeated sprint ability, but did not observe any significant time-of-day effects on the EMG activity levels of four thigh muscles during a repeated pedalling sprint exercise. Chtourou et al (69) moreover showed no significant difference in muscular power or strength between the morning and evening tests. To understand better the time-of-day effects on muscle strength responses, future studies should assess the main physiological variations following resistance exercise adaptations.

C) Differential effect of exercise duration

Many scientists have investigated different exercise types, times, durations, and intensities of exercise training. Exercise duration is particularly important. Many studies have shown that short-term performance changes with different exercise times. In addition, short-term exercise training, which enhances anabolic metabolism, can be influenced by several factors such as time-of-day training(66,70). In previous studies, exercise training improved anaerobic performance in the morning and/or evening(48,65) (Table 1). Most investigations have shown that evening exercise is better than morning exercise(46,66,69,71). Souissi et al (62) indicated that 6weeks of resistance training in 10-year-old and 11-year-old boys improved muscle strength and power to a significantly greater extent in the evening than in the morning. Brisswalter et al (72) investigated the effects of moderate exercise and determined that VO2 kinetics were significantly higher in the morning than in the evening. Souissi et al (47) observed the effect of different exercise training times on anaerobic performance, including peak anaerobic power, jump performance, and peak knee extension toque. Their study found that the group that was trained in the evening had greater improvements in anaerobic performance. Lricollais et al (73) moreover showed that, during the 60 second Wingate test, muscle fatigue was lower in the evening than in the morning. Long-term exercise has beneficial effects on aerobic capacity, cardiac function, and rehabilitation. In particular, this type of exercise is important in exercises involving time trials such as cycling, rowing, swimming, running, football, and table tennis.

In a previous study, Deschenes et al (40) observed that during aerobic exercise, the mean arterial blood pressure was higher in the morning than in the evening (Table 2). In agreement with these studies, Edwards et al (74) investigated the effect of sub-maximal cycling at 60% of VO2max, and found that the morning exercise group exhibited greater improvements in lactate levels, compared to the evening exercise group (62).

By contrast, Reilly and Garrett (38) indicated a higher power output during a 60-minute cycle ergometer test in the evening than in the morning. Atkinson and Reilly (10) also indicated that, after a 1.6-km time trail exercise, the heart rate and blood lactate levels exhibited greater improvements in the evening exercise group than in the morning exercise group. However, previous studies did not indicate any difference in the time-of-day effect on exhaustion during maximal (38,40) and sub-maximal cycling (74).

III. Results:-

Studies included in the analysis

Table I :- The effect of time of day on short-term exercises

SOURCE	SAMPLE SIZE	AGE (Years)	PARAMETERS STUDIED	RESULTS
Atkinson et al (75)	Trained (n=7) Untrained (n=7)	19-29 Trained 23.9+ 3.3 Untrained 24.3+ 24	Whole body flexibility, back and neck strength, grip strength, flight time in a vertical jump, self-chosen work rate	Improvements observed in evening group only
Chun-Yip Chin et al (11)	Athletes (n=35)	15.17+ 1.62	Maximal oxygen uptake (Vo2 max), post exercise % of maximal heart rate, post-exercise body temperature, post exercise	Vo2 max significantly higher at noon and other parameters NS

			blood lactic acid level measured at morning (9:00-10:00 am), Noon (12:00-13:00 N), Afternoon (16:00-17:00 pm)	
Reilly T et al (13)	n=10	-	HR,BP were measured pre and post exercise during submaximal and maximal exercise on a cycle ergometer at 3:00,9:00,15:00,21:00hrs	NS
Torii J et al (16)	Sedentary men (n=12)		Aerobic training program assigned to morning (9-9:30), afternoon (15-15:30), evening (20:00-20:30) And 30-minute 60% Vo2 max , cycle ergometer 4days/week for 4 weeks, HR, blood lactate levels were measured	Results suggested that aerobic training is most effective in the afternoon
Wyse et al (76)	9 Collegiate sportsmen	19.6±9.6	Extension peak torque Flexion peak torque	Beneficial effect seen in evening (18.00–19.30 h)
Gauthier et al (71)	13 Physical education participants.	M: 22.0±: 22.0 physical education	Elbow flexor torque	Beneficial effect seen in evening 18:00 h - 4%
Martin et al (77)	13 Healthy participants (12M and 1 F)	22–40	MVC	Beneficial effect seen in evening 18:00 h -8.9%
Callard et al (78)	6 M ultradistance cyclists	33.4±3.4	MVC	Beneficial effect seen in evening 19:30 h- 6%
Souissi et al (79)	13M physical education student	22.4±2.4	Maximal power during the force velocity test	Beneficial effect seen in evening 18:00 h- 8.3%
Castaingts et al (80)	11 M	18–30	MVC	18:00 h 8.6%

F=female; M= male; MVC=maximal voluntary contraction; NS=not significant

TABLE II:- The effect of time of day on long-term exercises.

SOURCE	SAMPLE SIZE	AGE (Years)	PARAMETERS STUDIED	RESULTS
Dalton et al (39)	7M competitive cyclists or tri-athletes	22.3±2.3	Total work during a timed trial cycling performance of 15-min duration Average power output during a time trial cycling performance of 15 min duration	NS
Bessot et al (78,81)	10M competitive endurance cyclists	21.5±1.5	Free pedal rate during 4 × 5 min cycling exercise	NS
Edwards et al (74)	8M recreational cyclists	24.3±4	Work rate during 30-min submaximal cycling at 60% of VO2max	NS

M=male; NS= not significant; VO2max= maximal oxygen consumption.

IV. Discussion

A detailed look at the differences between morning and evening exercises and what we stand to get out of each.

***PROS OF MORNING EXERCISES**

Your body functions are at its lowest when you have just woken up, as sleep puts your body in a rested state. However working out in the mornings not only helps to kick start your body for the day, it also helps you to end up the day better as well, by providing better quality of sleep.

You are more likely to be consistent with your daily morning exercise, when you get started on exercise before clocking in to work or taking care of your daily chores, you give yourself time to focus on your physical wellbeing.

Working out early in the morning can help to increase your energy level in the afternoon. The human body performs at its best in the mid-afternoon, and studies have shown that an exercise routine in the morning could help to elevate this further.

Exercising before breakfast may help the body burn fat more effectively, as compared to an evening workout. Besides that, working outs in morning, resulting in burning calories through-out the day, rather than after an evening workout when you are sleeping that means when body metabolism is lower.

***CONS OF MORNING EXERCISE:-**

Exercising during morning time also has some challenges. It is tough to be motivated to wake up early to exercise, especially if you are not a morning person. Our lungs also function at a lower rate in the mornings, as our airways are constricted after sleeping at night which makes getting out of the sleepy state –harder.

Your joints and muscles are stiffer when you have a just woken up, which make them particularly prone to injuries if you exercise in the morning. Before you jump on the treadmill, be sure to do some light stretches and deep breathing to let the blood flow.

Exercising before having breakfast could put you at risk of an earlier burn out and fatigue. At the time of walking, your body is technically running an empty tank after hours of sleep with no food or water intake.

PROS OF EVENING EXERCISE:-

Studies show that exercising later in the day is much more beneficial than working out in the morning, as our bodily functions are at their best at this time –so one will have more energy and more strength for an optimal exercise. However many find it harder to exercise after a long day at work.

This is what happens when one workouts later in the day.

Your body temperature is highest in the evening. Muscles and joints are up to 20% more flexible this time compared to in the morning, which makes it easier and less of a strain to exercise. Chances of injuries during exercise is also lower than morning exercise. One likely has more energy to exercise in the second half of the day, compared to the first thing in the morning. Not only that, body metabolism and lung functions are also working best in the late afternoon /evening, so one should have more strength and endurance to last through your cardio workout session.

Exercising in the evening gives you an outlet of stress release from the days work. One will also have a cleaner mind to work out as it would be one's final task for the day.

***CONS OF EVENING EXERCISE:-**

It is easier to call off an evening exercise session by using work or tiredness, as an excuse. Occasionally, there are unexpected work demands which take precedence as well, making evening work out routines more difficult to schedule then morning workouts.

Exercising too close to your bedtime could make it harder to full asleep. After a workout, your temperature, metabolism and heart rate are elevated, which may interrupt the body's ability to go into a rested state. Instead, try some light stretches or yoga before sleeping, to overcome this.

Options of exercise at night, may be limited. For example, there are only a few hour's of daylight for you to be able to squeeze in time for running or a jog in the park. Likewise, gyms are also generally more crowded after office hours.

At the end of the day, there are undeniable advantages, for working out in the morning or evening. Which you choose depends on your choice, life style and time management .(2)

V. **Conclusion** :-

From the above discussion it is clear that, it is not necessary to stick to only one time for your exercise, but it does help in building a habit of regular exercise. Be flexible with your workout routine as every effort counts. The importance of exercise for health is well known; however, there are no prescribed guidelines about the relative effects of exercising at different times of day. These may be important for both the safety and efficacy of training programs (21).

At last, but not the least, it all comes down to being consistent and setting up a routine that aligns with your long-term fitness goals as **health is wealth. STAY HEALTHY.**

LIMITATIONS :-

1) No Indian studies were included in the review.
2) In discussion, we did not assess the time of day effect in co-morbid individuals.

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