



TO SCREEN THE EXERCISE ADHERENCE BEHAVIOUR AND PHYSICAL ACTIVITY LEVELS IN TYPE 2 DIABETIC INDIVIDUALS: AN OBSERVATIONAL STUDY

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- ABSTRACT

Background/ purpose : Diabetes is group of metabolic disorder characterized by a chronic hyperglycaemic caused by impaired secretion of insulin .Exercise adherence refers to the ability to maintain an exercise program for an extended period. Physical activity is defined as “any bodily movement produced by the contraction of skeletal muscles which results in energy expenditure that is greater than that at rest”. Physical activity is not limited to sports but also includes the physical activity of daily life associated with work, home, transportation and non-competitive leisure

Objectives :

To screen the exercise adherence behaviour and reasons for non –adherence exercise behaviour in type 2 diabetic individuals using EARS questionnaire .

To screen the physical activity levels in type 2 diabetic individuals using IPA questionnaire

Methodology: Individuals who were willing and met the inclusion criteria were taken up for the study and informed consent was obtained. EARS questionnaire and IPAQ was given to the individuals for 30 minutes and collected manually. Subjects diagnosed as type -2 diabetes mellitus at endocrinology OPD, SVIMS tirupathi. The exercise adherence behaviour [EARS]

questionnaire and physical activity levels [IPAQ] were given to subjects to fill the data. 30-50 minutes times were given to fill the data and same was collected and analysed.

Outcome measures : Exercise Adherence Rating Scale (EARS) and IPA questionnaire

CONCLUSION: The study shows that individuals with type -2 diabetes were non – adherence to exercise behaviour and majority of individuals were physically inactive .

KEY WORDS: Type -2 diabetes mellitus, physical activity, Exercise Adherence Rating Scale , and International physical activity questionnaire metabolic equivalents , health belief model ,

Introduction

Diabetes mellitus is a metabolic disorder characterized by a chronic hyperglycaemic condition resulting from insufficient action of insulin ¹

Classification

The beta - cell destruction which leads to absolute insulin deficiency .

- This form was previously referred to as "insulin-dependent diabetes mellitus" or "juvenile diabetes". The loss of beta cells is caused by an autoimmune response .
- The cause of this autoimmune response is unknown.
- Although Type 1 diabetes usually appears during childhood or adolescence, it can also develop in adults. A condition in which cells fail to respond to insulin properly. obesity among children has led to more cases of type 2 diabetes in younger people
- When without a previous history of diabetes develop high blood sugar levels. In women with gestational diabetes, blood sugar usually returns to normal soon after delivery. However, women who had gestational diabetes during pregnancy have a higher risk of developing type -2 diabetes later in life.

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PATHOGENESIS AND PATHOPHYSIOLOGY OF DIABETES MELLITUS

- In type 2 diabetes, the body either produces inadequate amounts of insulin to meet the demands of the body or insulin resistance has developed. Insulin resistance refers to when cells of the body such as the muscle, liver and fat cells fail to respond to insulin, even when levels are high.

- In fat cells, glycogen stores , triglycerides are broken down to produce free fatty acids for energy; muscle cells are deprived of an energy source , liver cells fail to build glycogen stores.
- This also leads to an overall rise in the level of glucose in the blood. Glycogen stores become markedly reduced and there is less glucose available for release when it may be needed
- Impaired insulin secretion and insulin resistance contribute more / jointly to the development of patho-physiological conditions.

Impaired insulin secretion:

Impaired insulin secretion decrease in glucose responsiveness,

More specifically, impaired glucose tolerance (IGT) is induced by a decrease in glucose responsive early-phase insulin secretion, and a decrease in additional insulin secretion after meals causes postprandial hyperglycaemia.

. The decrease in early-phase secretion is an essential part of this disease and is extremely important as a basic patho physiological change during the onset of disease à. impaired insulin secretion is generally progressive.

The progression of the impairment of pancreatic cell function affects the long-term control of blood glucose.

While patients in early stages after disease onset, chiefly show an increase in postprandial blood glucose as a result of increased insulin resistance and decreased early-phase secretion, the progression of the deterioration of pancreatic cell function subsequently causes permanent elevation of blood glucose.

EXERCISE ADHERENCE:

Exercise adherence refers to the ability to maintain an exercise program for an extended period ^[4]

Intrinsic or Personal Factors and the many factors influence exercise adherence

Knowledgeable about their exercise regimen and its potential effectiveness, are more likely to engage in regular exercise than those with limited knowledge and understanding.

Exercise

A subset of physical activity planned, structured and repetitive bodily movement performed to improve or maintain one or more components of physical fitness ^[5] Other related exercise adherence predictors include: The individual's overall health beliefs and health

attitudes & mental health status The self-regulation ability and their level of self-motivation and their ability to tolerate exercise-induced discomfort.

Exercise adherence determinants

- Include the availability of health care, and well-informed motivated health care providers, monetary and/or lifestyle related issues,
- The extent to which patients are compensated for their disease is also a determinant of exercise adherence.

Exercise parameters

- Intensity
- Duration
- Frequency
- Mode

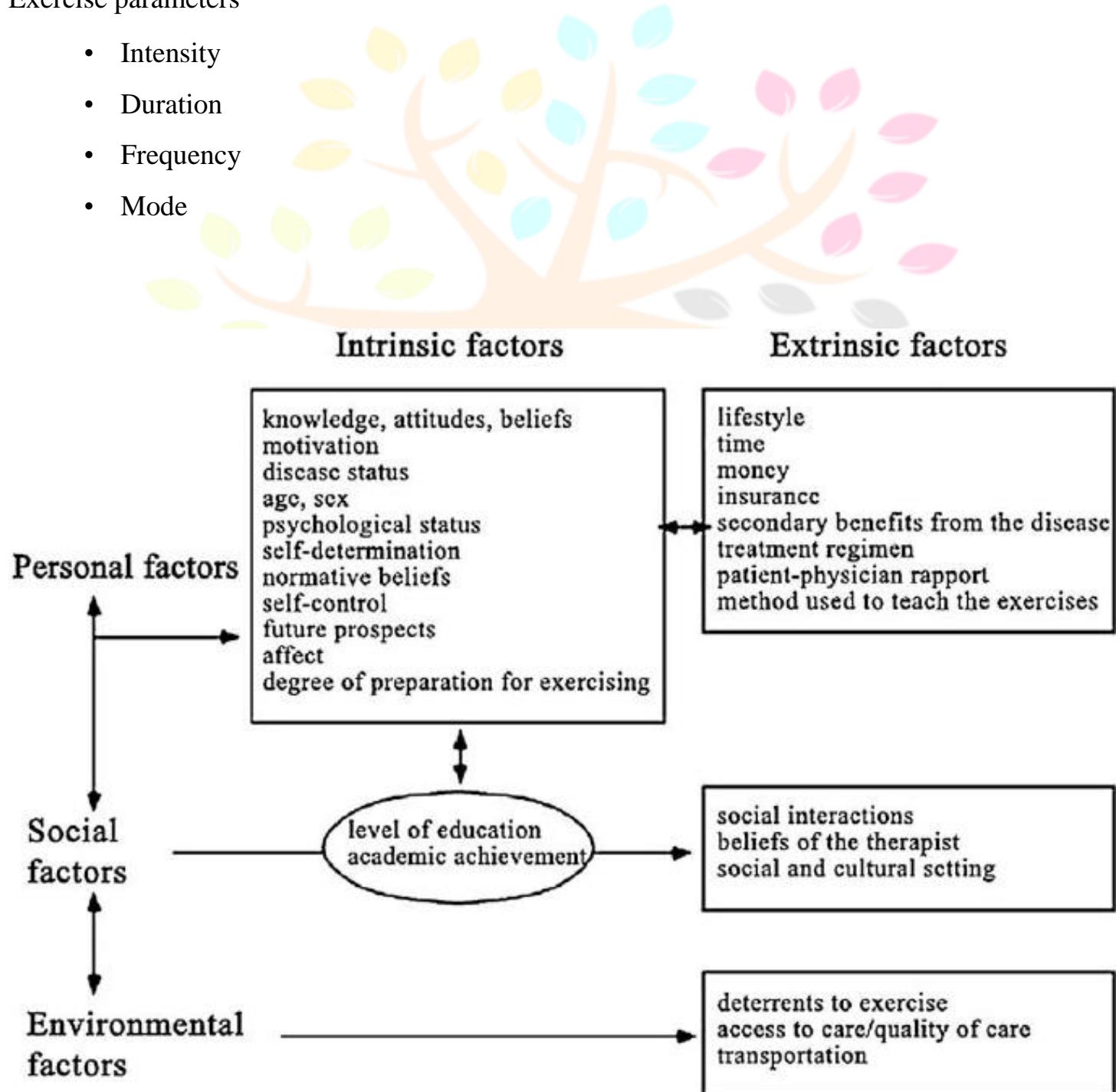


Figure :1

Physical activity

It is defined as “any bodily movement produced by the contraction of skeletal muscles, which results in energy expenditure that is greater than that at rest”. Physical activity is not limited to sports but also includes the physical activity of daily life associated with work, home, transportation and non-competitive leisure

- It is quantified in terms of metabolic equivalents (METs), with one METs equal to the energy expenditure of a subject seated at rest.
- This is equivalent to an oxygen consumption of 3.5 ml per kilogram of body weight per minute (1 kilocalorie/kg of body weight/hour).

Physical inactivity

Physical inactivity / sedentary behaviour over the last several years, a distinction has been made between physical inactivity and sedentary behaviour [12].

Sedentary behaviour refers to all behaviours in which the dominant position is seated or lying, and energy expenditure is very low or even non-existent.

Activities such as watching television or videos, working at the computer, reading, driving, activities

Energy expenditure is around 1 to 1.5 METs [14].

Beneficial effects of regular physical activity

- Regulation of type 2 diabetes
- Improve the physical fitness
- Quality of life
- Glucose regulation

NEED OF THE STUDY

- Diabetes mellitus is a chronic complex metabolic health problem. For decades, exercise has been considered as a cornerstone of diabetes management along with diet and medication.
- There is a paucity of high quality evidence about the importance of exercise and fitness in diabetes, knowledge about exercise adherence and levels of physical activity to be adopted. Reasons for non-adherence to exercises remains unclear.
- Hence, the aim of the study is to screen type -2 diabetic individuals about the adaption of exercise adherence, reasons for non- adherence behaviour and levels of physical activity .

AIM OF THE STUDY

To screen the exercise adherence behaviour, reasons for non –adherence exercise behaviour and physical activity levels in type -2 diabetic individuals.

OBJECTIVES OF THE STUDY

- To screen the exercise adherence behaviour and reasons for non –adherence exercise behaviour in type 2 diabetic individuals using EARS questionnaire .
- To screen the physical activity levels in type 2 diabetic individuals using IPA questionnaire.

MATERIALS AND METHODOLOGY:

- **Study set up** : SVIMS
- **Study method** : An Observational study
- **Study duration** : 6 months (Jan 2022 to June 2022)
- **Sample size** : 60
- **Sampling method** : convenience sampling

MATERIALS:

- Paper
- pen
- Laptop

INCLUSION CRITERIA

- Both males and females with type 2 diabetes were included.
- Age from 50 years to 65 years with history of type 2 diabetes mellitus for past 15 years on regular medication .
- Subjects who can read and understand questions in English

EXCLUSION CRITERIA

- Individuals with type 1 diabetes.
- Neurological disorders .
- Individuals who are not willing to participate .
- Individuals who are not on regular medication.

METHODOLOGY:

100 subjects with type -2 diabetes mellitus were obtained , out of 100 subjects , 60 subjects who met the inclusion criteria were taken for the study an informed consent was obtained and 40 subjects were dropped (not interested to go through the questionnaire). All the subjects were explained about EARS and IPAQ questionnaires before filling the forms.

60 subjects were screened on weekly basis filled the EARS and IPAQ questionnaires were collected. The same were analysed for exercise adherence behaviour, non-adherence behaviour and physical levels in type -2 diabetic individuals.

STATISTICAL ANALYSIS AND RESULTS

Statistical analysis has been carryout to analyse the significant impact of the groups by using IBM SPSS Microsoft excels spreadsheet.Inc.29.0 version for this tabulated and subjected to statistical analysis of the 60 individuals to the study.

Descriptive measures like mean, standard deviation have been reported along with usage of 5 point - Likert -scale EARS questionnaire is calculated

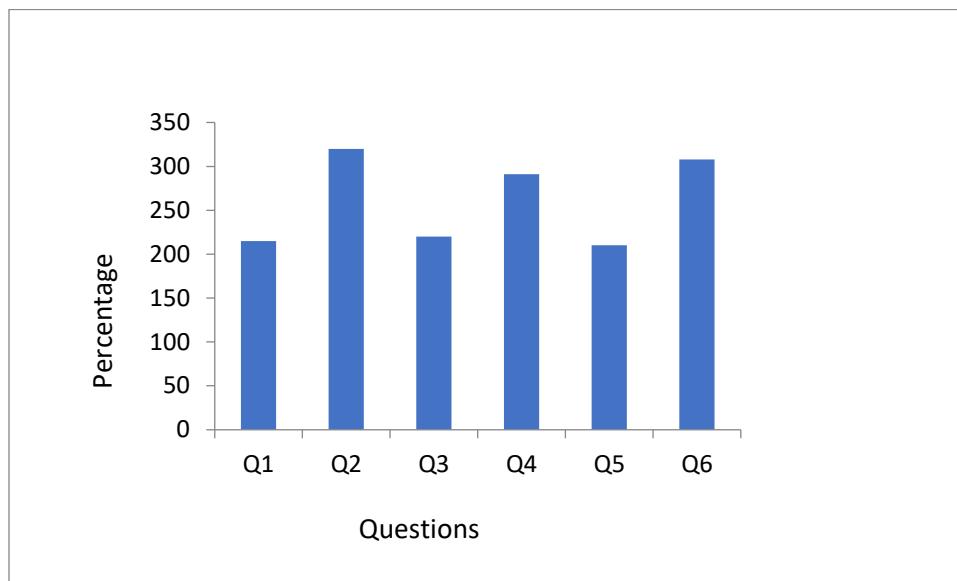
To assess the exercise adherence behaviour

S.NO	EARS	Score	Percentage
1	I do my exercises as often as recommended	129	215
2	I don't get around to doing my exercises	192	320
3	I do some, but not all, of my exercises	132	220
4	I do less exercise than recommended by my healthcare professional	175	291
5	I fit my exercises into my regular routine	126	210
6	I forget to do my exercise	185	308

Table :1

In table 1, according to the study 215 percentage of individuals that they will stating that they are not getting around the exercise, 291percentage of , individuals were doing less exercise than recommended by their healthcare professional, only 210 percentage of individuals they fit into regular routine exercises,308 percentage of individuals were forgot to do their exercise.

Figure : 2



To assess reasons for adherence and non adherence exercise behaviour

S.NO	EARS	Score	Percentage
1	I adjust the way I do my exercise to suit myself	145	241
2	Other commitments prevent me doing my exercise	245	408.3
3	I feel confident about doing my exercise	180	300
4	I don't have time to do my exercise	200	333.3
5	I'm not sure how to do my exercise	220	366
6	I don't do my exercise when I am tired	253	421
7	I do my exercise because I enjoy them	160	266.6
8	My family & friends encourage me do my exercise	130	216.6
9	I stop doing my exercise when my pain is worse	260	433.3
10	I do my exercise to reduce my health problem	140	233
11	I continue doing my exercise when my pain is better	180	300

Table : 2

In table 2, according to the study 408 .3 percentage of individuals were stated that other commitments prevent me doing exercise , 333.3 percentage of individuals were stated that they don't have time doing their exercise because of their personal activities. 366 percentage of individuals were stated that they not sure about how to do their exercise because of their not recommended by their health care professionals . 421 percentage of individuals were stated that they don't do their exercise when they tired , 433.3 percentage of individuals were stop do their exercises when pain is worse.

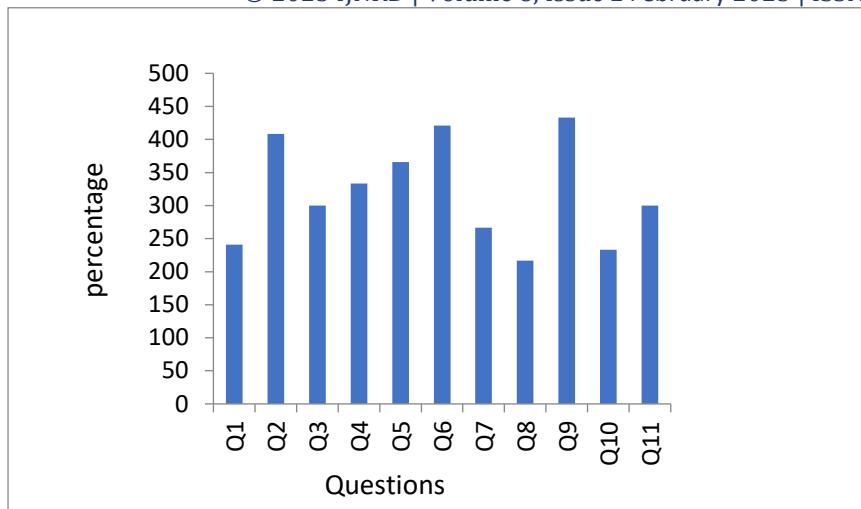


Figure -3

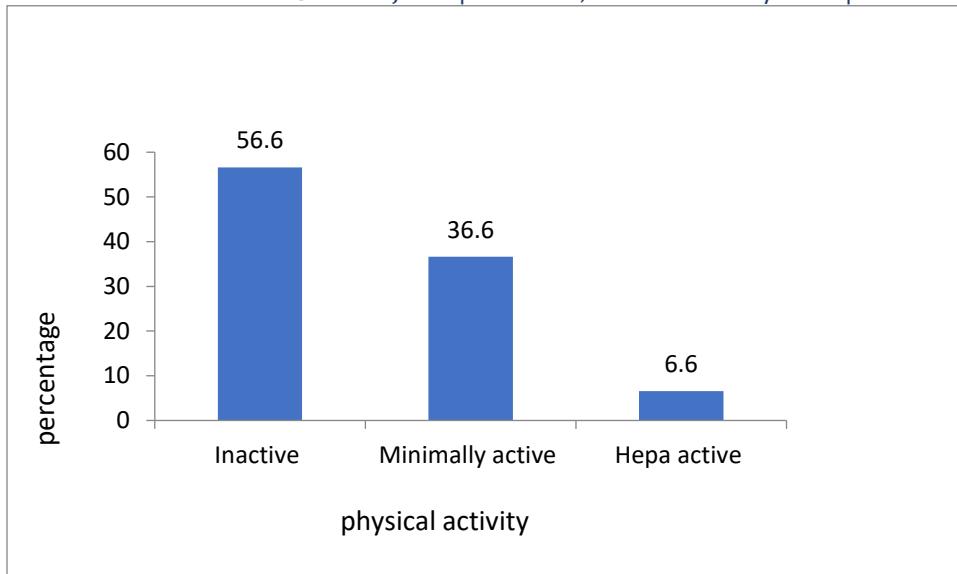
To assess the physical activity

PHYSICAL ACTIVITY	Frequency	Percent
Inactive	34	56.6%
Minimally active	22	36.6%
Hepa active	4	6.6%

Table: 3 physical activity

Among 60 individuals 56.6 % individuals were inactive and 36.6 % individuals were minimally active and 6.6 % individuals were hepa active

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**Figure-5**

DISSCUSION:

The increasing of incidence of diabetes mellitus and obesity is a consequence of increasing urbanization, sedentary life style and lack of physical exercise, junk food habit in the population, most commonly the earning young and middle age group, which ultimately lead to a big financial and social burden over the country.

Exercise adherence in individuals with diabetes lowers blood sugar levels quickly ,improves the body's ability to use insulin in regulation of diabetes , improves the physical fitness and quality of life .

Han- seung et.al concluded that unhealthy life style activities like smoking , heavy alcohol consumption ,lack of regular exercise may impact on diabetes for non adherence behaviour .

Elizabeth A Beverly et.al concluded that spousal support is one of the factor in improving exercise adherence in type 2 diabetes individuals.

Naomi a beinart et.al used EARS questionnaire for measuring exercise adherence behaviour and concluded that people with chronic illness are non adherent to exercise.

Gregory L stonerock et. al found that remberence of exercises can be difficult in non adherence behaviour in individuals with type 2 diabetes.

Jill a kanaley et.al concluded that various physical activities greatly enhance their health and glycemic management of individuals with type 2 diabetes

The present study screened the exercise adherence behaviour, reasons for non -adherence exercise behaviour and physical activity levels in type 2 diabetes individuals on weekly basis using EARS and IPAQ questionnaires. The reasons for non adherence behaviour are lack of time , lack of interest and lack of awareness about the importance of regular physical activity in controlling type 2 diabetes.

Different types of questionnaires used for measuring the physical activity :

- Rapid assessment of physical activity [RAPA]
- Baecke habitual physical activity questionnaire [BPAQ]
- International physical activity questionnaire [IPAQ]

In the present study IPAQ was used to measure the physical activity .

It contains moderate –and vigorous intensity activity like walking and sitting number of days hours and minutes spent in active response of format METs in minutes per week.

Based on the IPAQ individuals were categorized into inactive , minimally active, hepa active with the use of METs values.

The result of the present study shows questions 2,4,5,6,7and 9 was observed as greater reasons for non - adherence exercise behaviour. Majority of individuals were physically inactive based on their METs values.

Conclusion

The present study was done to screen the exercise adherence behaviour and reasons for non adherence exercise behaviour and physical activity levels in type 2 diabetic Individuals

This study accepted null hypothesis as the exercise adherence behaviour and reasons for non adherence exercise behaviour and physical activity levels less in type 2 diabetic Individuals. Who were included in this study.

LIMITATIONS

- Small sample size
- Gender specificity is not mentioned in this study
- Study duration is less
- The results cannot be generalized to individual

RECOMMENDATIONS

- The future study is recommended to get large sample size
- The future study is recommended to study the other outcomes also
- The future study is recommended to different individual

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EARS

- A total of 17 items generated through the direct method

It is two types

Of the 17- questions 6-questions assessed adherence behaviour directly, while a further 11- questions were related to reasons for adherence/ nonadherence

- It assess with the usage of 5- point likert scale questions were developed to extract further information about type, intensity, duration of prescribed exercise.

S.NO	TO ASSESS THE ADHERENCE BEHAVIOUR
1	I do my exercises as often as recommended
2	I don't get around to doing my exercises
3	I do some, but not all, of my exercises
4	I do less exercise than recommended by my healthcare professional
5	I fit my exercises into my regular routine
6	I forget to do my exercise

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S.No	TO ASSESS THE REASONS FOR ADHERENCE/NONADHERENCE
1	I adjust the way I do my exercise to suit myself
2	Other commitments prevent me doing my exercise
3	I feel confident about doing my exercise
4	I don't have time to do my exercise
5	I'm not sure how to do my exercise
6	I don't do my exercise when I am tired
7	I do my exercise because I enjoy them

8	My family &friends encourage me do my exercise	
9	I stop doing my exercise when my pain is worse	
10	I do my exercise to reduce my health problem	
11	I continue doing my exercise when my pain is better	

The exercise adherence rating scale (EARS) consists of 17 questions, that is composed of 6-item that directly assess the exercise adherence behaviour (section A) and 11-items related to assess the “reasons for adherence and non adherence”(Section B).

Scoring : The six item are summed and item positive phrases are reversely scored ; i.e item 1 , 4, 6 . The six items are scored using an ordinal scale answer scale (1= completely agree to 5 =completely disagree) with higher scores indicating greater adherence (0 to 24). Other items (section B) which allow open answers were developed to obtain the reasons for the exercise adherence and non adherence

IPAQ (INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE— SHORT FORM)

IPAQ is an instrument designed primarily for population surveillance of adults. It has been developed and tested for use in adults (age range of 15-69 years) and until further development and testing is undertaken the use of IPAQ with older and younger age groups is not recommended.

Characteristics of the IPAQ short-form instrument: comprehensive set of domains including leisure time, domestic and gardening (yard) activities, work-related and transport-related

IPAQ short form asks about three specific types of activity undertaken in the three domains introduced above and sitting. The specific types of activity that are assessed are walking, moderate intensity activities and vigorous intensity activities; frequency (measured in days per week) and duration (time per day) are collected separately for each specific type of activity.

The items were structured to provide separate scores on walking; moderate-intensity; and vigorous-intensity activity as well as a combined total score to describe overall level of activity. Computation of the total score requires summation of the duration (in minutes) and frequency (days) of walking, moderate-intensity and vigorous-intensity activity.

Another measure of volume of activity can be computed by weighting each type of activity by its energy requirements defined in METS. A MET-minute is computed by multiplying the MET score by the minutes performed.

MET-minute scores are equivalent to kilocalories for a 60-kilogram person.

Kilocalories may be computed from MET-minutes using the following equation: MET-min x (weight in kilograms/60 kilograms).

The selected MET values were derived from work undertaken during the IPAQ Reliability Study undertaken in 2000-2001.

Using the Ainsworth et al. Compendium (Med Sci Sports Med 2000) an average MET score was derived for each type of activity. For example, all types of walking were included and an average MET value for walking was created.

The same procedure was undertaken for moderate-intensity activities and vigorous-intensity activities.

values continue to be used for the analysis of IPAQ data:

Walking = 3.3 METs

Moderate PA = 4.0 METs

Vigorous PA = 8.0 METs

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the vigorous activities that you did in the last 7 days.

Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

- During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ days per week

No vigorous physical activities → Skip to question 3

- How much time did you usually spend doing vigorous physical activities on one of those days?

_____ hours per day

_____ minutes per day

Don't know/Not sure

- During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ days per week No moderate physical activities → Skip to question 5

- How much time did you usually spend doing moderate physical activities on one of those days?

_____ hours per day

_____ minutes per day Don't know/Not sure

Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

- During the last 7 days, on how many days did you walk for at least 10 minutes at a time?

_____ days per week

- How much time did you usually spend walking on one of those days?

_____ hours per day

_____ minutes per day

Don't know/Not sure

To improve the exercise adherence behaviour with various theories and strategies

THEORIES OF EXERCISE ADHERENCE

Overview of social cognitive theory: Social Cognitive Theory incorporates a triadic causation reciprocal model to represent its perspective of human as a dynamic interplay of personal, behavioural, and environmental influences.

Example, how people interpret the consequences of their own behaviour informs and alters their environment and their personal factors (cognitive, affective, and biological events), which, in turn, inform and alter subsequent behaviour.

Self-efficacy: a major construct of SCT,

- Confidence, Lack of ability to perform a particular behaviour to accomplish a specific. Self-efficacy beliefs are theory
- To affect behaviour initiation and cessation, effort and persistence, motivation, thought patterns, and emotional reactions.

SELF DETERMINATION THEORY:

- According to self-determination theory (SDT), motivational behaviour is mediated by two factors:
- (a) satisfaction of basic psychological needs, such as autonomy, competence, and the development of social relationships,
- (b) An increase in self-determined motivation [^{18]}.
- The ability to maintain and enjoy physical activity depends on whether a person's decision-making mechanisms lead to adopt a favourable attitude towards regular exercise [^{18]}. An increased awareness of its benefits will favour more self-determined regulation, and hence higher levels of physical activity and satisfaction in everyday life [^{18]}

Whereas increase in intrinsic motivation, the presence of an instructor who encourages autonomy

HEALTH BELIEF MODEL:

- The likelihood of exercising depends on the person perception of the severity of health risks and appraisal of the cost and benefits of acting
- Inconsistent support for predictions of exercise behaviour with the health belief model
Discuss the importance of developing successful strategies to improve health behaviour.
- Describe the scope and evolution of health education.
- Provide key definitions of health education, health behaviour, and health promotion.
Discuss the diverse settings and audiences for health education. [^{19]}

TRANS THEORETICAL MODEL

- **PRECONTEMPTATION:** Provide information from various sources (e.g., news, posters, pamphlets, general health-promotion material). Information is more effective from multimedia sources than from family and friends.
- **CONTEMPLATION:** Provide information about different types of activity options, fitness facilities.
- Programs , and classes. Invitations to tours, or information sessions.
- **ACTION:** Provide continued support and feedback. and provide continuous opportunities to be active and a plan to maintain activity in the changing seasons, during vacations, and through schedule changes

- **MAINTEANCE** : Keep the exercise environment enjoyable and Create reward systems for continued adherence.
- **TERMINATION:** Once exercisers have exercised for many years

ECOLOGICAL MODEL:

- An individual's health behaviour is influenced by surroundings personal, family, social, social cultural, organizational, community, policy, physical environmental factors can positively or negatively impact a person's engagement in physical activity
- An individual may exhibit fitness knowledge, skills, and abilities and exercise history, life health behaviours and goals.
- Neighbourhood walking ability and outdoor recreation spaces, social support in the form of emotional and instrumental support and set up sessions, continue to query the client regarding barriers exercise adherence.

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Strategies for Enhancing Adherence to Exercise

- **Behaviour modification approaches**
- **Reinforcement approaches**
- **Cognitive-behavioural approaches**
- **Decision-making approaches**
- **Social-support approaches**

Intrinsic approaches

Behaviour modification approaches:

Prompts: Verbal, physical, or symbolic cues initiate behaviour's (e.g., posters encouraging people to take the stairs, placing running shoes by bed).

Contracting: Participants enter a contract with their exercise practitioners.

Reinforcement Approaches

Charting attendance and participation Rewards for attendance and participation: Rewards improve attendance but must be provided throughout the length of the program.

Feedback: Providing feedback to participants on their progress has positive motivational effects.

Self-monitoring: Participants keep written records of their physical activity.

Cognitive-Behavioural Approaches

Goal setting should be used to motivate individuals.

Exercise-related goals should be self-set rather than instructor-set, flexible rather than fixed and time-based rather than distance-based.

Cognitive techniques:

Dissociative strategies emphasize external distractions and the environment and produce significantly higher levels of exercise adherence than associative strategies focusing on internal body feedback.

Social Support Approaches

- Social support

- A person (e.g., spouse, family member, friend) has a favourable attitude toward another person's involvement in an exercise program.
- Social support can be enhanced by participation in a small group, the use of personalized feedback, and the use of a buddy system. Intrinsic Approaches

- Focus on the experience itself. Take a process orientation.

Engage in purposeful and meaningful physical activity.

Motivational Interviewing

- An intervention to increase the likelihood of a client's considering, initiating, and maintaining specific strategies to reduce harmful behaviour via an interview.
- Motivation to change is elicited from the counsellor

- Client-counsellor relationship is more of a partnership. Strategies focused on changing people:
- Physical activity classes, technical instruction, reward systems
- Strategies focused on networking people: Services to link up clients to help them engage in physical activity
- Strategies focused on changing the interpersonal environment: Activity classes for families, couples, or small groups of friends

Strategies focused on networking interpersonal environments: Services to link up couples, families, or small groups to participate in activities .

