

MSc Thesis Report

A Qualitative Review of the Views and Experiences of Individuals With or At Risk For Chronic Disease in Physical Activity Programs



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*A Qualitative Review of the Views and Experiences of Individuals With or At Risk
For Chronic Disease in Physical Activity Programs*

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Acknowledgements

For the last six months I have been working on this final report of my master thesis. I was excited to start this journey, learning more about a topic that has always interested me since my Bachelor studies at the University of Guelph, in Human Kinetics. During this time, I have been able to gain so much knowledge in the topic of physical activity interventions for individuals with or at risk for chronic disease. This knowledge came from both my study and from the interactions I had with participants during the physical activity tests that I helped out with. These physical activity tests were a fun addition to my experience providing me with practical experiences, interactions with programs participants and a change to practice my Dutch! Reflecting on this experience, I am certain that I have found a topic that I would like to continue working with in the future.

I would like to express my extreme gratitude to everyone who supported me during my time writing this thesis. First of all, I would like to thank my two supervisors, Dr. Ir. Annemarie Wagemakers and PhD candidate Eva Smit, for their constant support, feedback, motivation and commitment to my project. It was your positive energy and enthusiasm that provided me with the confidence and inspiration needed to complete this thesis. Secondly, I would like to thank my family. I would like to thank my parents for always believing in me and providing me opportunities to grow and learn. To my sister for her constant support, for being there for me during the stressful times and the celebratory times and for always being able to make me laugh! Finally, I would like to thank all of my friends both here in Wageningen and at home in Canada.

As my thesis work comes to a close, so does my time here in Wageningen. I have learned and grown so much during my stay and created so many fond memories. I will keep all of these fond memories and bring them with me as I head into my next adventure, moving to Calgary, Canada for my internship.

Happy reading!

Tineke

Abstract

Introduction - The benefits of regular physical activity among individuals with or at risk for chronic disease are well established. The difficulty is in getting this population to be active and maintain activity levels. Physical activity programs have been created and have had varying success. Understanding the factors that facilitate or hinder a participant to adhere and maintain physical activity is imperative. Little qualitative research has been conducted on factors associated with physical activity adherence and even less so on maintenance of physical activity. This qualitative literature review examined data from the participants' perspective on facilitators and barriers about physical activity programs at two time points. Two sub questions were formulated to match these time points. 1) What are the views and experiences of individuals with or at risk for chronic disease on facilitators and barriers used to enhance PA adherence during a program? 2) What are the views and experiences of individuals with or at risk for chronic disease on facilitators and barriers to maintain PA participation after a program has ended?

Methods – A systematic review was undertaken to answer the two sub questions. An electronic search in Web of Science, PubMed, SPORTDiscus, Psych INFO and Science Direct was conducted to identify publications with relevant qualitative data. Thematic content analysis was used to analyse the qualitative data. The behaviour change taxonomy (v.1) was used as a tool to identify and extract program components. The behaviour change taxonomy was used to as the initial coding framework with emergent themes added. These codes were clustered into themes and for sub question one further mapped into the five levels of the social ecological model. This model was used as the ecological model to examine what factors influence physical activity at various levels of the program.

Results – 40 publications met the inclusion criteria for sub question one and 13 publications met the inclusion criteria for sub question two. The most salient finding for both adherence to a program and maintenance of physical activity was social support. Other program components identified included: general enjoyment, the central role of the instructor as both a credible source and a source of support, the use of monitoring, self-monitoring, goal setting, prompts, action planning, self-talk and social comparison. For maintenance of physical activity, participants struggle after a program has finished. Although participants learn new skills and tools to remain physically active, most participants find that the sudden loss of support (from the program ending) makes continuing physical activity difficult.

Discussion and Conclusion – This comprehensive review identified program components that facilitated or hindered participants' adherence and maintenance of physical activity. The behaviour change taxonomy was a useful tool to comprehensively extract important program components from the publications. Multiple components were extracted and mapped at different levels of the social ecological model, indicating the importance of using multi-levelled physical activity programs. Social support, mapped at the interpersonal level, is a crucial component of a program for this population and has a role in both adherence and maintenance of physical activity. This was extremely connected to another significant finding being the general overall experience of the program (enjoyment). Experiences during the program provide skills and tools for the participant to use. Future programs should aim to foster social connections between program participants. This has been shown to both enhance adherence and maintenance. These social connections might also be one method to decrease the dependency on the program/instructor.

Abbreviations

BCT = Behaviour Change Technique
CSC = Care Sport Connector
CVD = Cardiovascular Diseases
FG = Focus Group
PA = Physical Activity
PAM = Physical Activity Model
MetS = Metabolic Syndrome
MI= Motivational Interviewing
MS = Multiple Sclerosis
RCT = Randomized Controlled Trial
SEM = Social Ecological Model
SQ1 = Sub Question One
SQ2 = Sub Question Two
T2DM = Type Two Diabetes Mellitus
TTM = Transtheoretical Model
UK = United Kingdom
US = United States
WHO = World Health Organization

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1. Introduction

In this thesis, a review of individuals' views and experiences towards physical activity (PA) programs was explored. This review specifically looked at the participants' perspective on the program components that were incorporated in PA programs. This was explored from two different time points; during the PA program and after the PA program has ended.

This research was part of the larger project: "Connecting care, sport and physical activity". Within this project the role of the care sport connector (CSC) will be evaluated. The role of the CSC is to increase the amount of PA in the neighbourhood. This thesis aims to increase the knowledge base of PA program components that can be used to increase adherence and subsequent maintenance of PA. The results of this thesis can be used by the project to help inform CSC of important PA program components.

In the following sections regular physical activity, chronic disease, physical activity interventions and the care sport connector will be further elaborated on in relation to this research. Followed by the problem statement and research question, scientific objectives and the relevance of the research.

1.1 Regular Physical Activity

Regular PA has been linked to many positive health effects including psychological well-being, weight maintenance¹ and decreasing the risk of CVD, T2DM, osteoporosis, depression, obesity, breast cancer, colon cancer and falls in older adults². Despite these benefits, sedentary behaviour remains a significant health problem, as many individuals are sedentary or underactive³⁻⁵.

In the Netherlands, current evaluations by the TNO estimate around 42% of the Dutch population over 18 years of age do not reach the recommended PA level⁶. The current PA guidelines in the Netherlands recommend 30 minutes of moderate intensity activities (e.g. cycling, brisk walking) at least five days a week⁷ and are similar to PA guidelines from the United States (US)³ and the World Health Organization (WHO)⁸. PA is defined as "any force exerted by the skeletal muscles that results in energy expenditure above resting levels"⁸. This definition includes daily routine activities such as household chores, shopping and work. The PA guidelines allows such activities to be incorporated into the recommended 30 minutes, as long as it is for minimum 10 minute duration⁷.

1.2 Chronic Disease

Currently in the Netherlands it is estimated that around 32% of the population is living with a chronic disease⁹. The number of individuals with a chronic disease has been increasing and is estimated to continue the upward trend, reaching an estimated 40% in 2030⁹. An increase in the amount of individuals with chronic disease is partly due to the changing lifestyle of individuals and partly due to the better diagnostics and improved treatment of the disease (increasing prevalence)⁹.

The risk factors for chronic disease include glucose intolerance, insulin resistance, hypertension, dyslipidemia and abdominal obesity¹⁰. The clustering of these risk factors collectively constitutes the metabolic syndrome (MetS), a progressive disorder that tends to worsen over time and collectively contribute to an increased risk for chronic disease^{10, 11}. MetS has been associated with chronic diseases such as cardiovascular disease (CVD), type two diabetes mellitus (T2DM) and cancers¹¹. The growing prevalence of obesity and a sedentary lifestyle has negatively impacted many individuals and led to the prevalence of MetS¹¹. Due to the association between MetS and the subsequent

development of chronic disease, individuals with at least one factor of MetS will be included in this research and referred to as individuals at risk for developing a chronic disease.

In addition to MetS risk factors sedentary individuals and older adults also fall into the at risk category. A sedentary lifestyle is a risk factor for MetS^{10, 11} and chronic disease¹¹. Older adults will also be included as a risk factor for a chronic disease as sedentary lifestyles are associated with older age, risk for developing a chronic disease increases with age and there is a high incidence of chronic disease in older adults^{12, 13}. PA in older adults follows the same guidelines and benefits¹⁴.

1.3 Physical Activity Interventions

Regular PA has an important role in the prevention of chronic diseases (CVD, T2DM, obesity, stroke, some cancers, and osteoporosis)¹⁵ and is a standard protocol for treatment in many countries to delay onset for those at risk for developing chronic disease¹⁶. Due to this positive relationship, many PA interventions have been developed and implemented to increase this behaviour.

Literature shows that interventions attempting to increase PA levels have varying degrees of success. In many, adherence levels are low with around a 50% dropout rate^{17, 18}. In addition, maintenance of PA is low with approximately 50% of the participants discontinuing regular PA three months after the program ended^{4, 5, 14, 19}. These results are troubling as the positive benefits of PA on health status are only obtained through sustained maintenance of PA^{3, 4}.

1.3.1 Determinants of PA

There have been many studies investigating the determinants of PA. It is generally accepted that factors associated with PA behaviour include both environmental and individual determinants. This is in line with an ecological perspective that incorporates an individual's interaction with their physical and socio-cultural environment with the individual shaping their environment as well as being shaped by their environment¹⁹. Studies have shown several factors to be associated with PA. From the physical environment factors include availability of PA equipment, convenience of recreational facilities, accessibility of recreational facilities, availability of trails, availability of sidewalks and environment aesthetics. From the socio-cultural environment factors include: social support, having a companion for PA and seeing other people exercise^{15, 20}. Finally, behavioural factors of PA in adults include health status, self-efficacy, history of PA and intention to exercise¹⁵.

1.3.2 Behaviour Change Techniques (BCTs)

Often publications do not describe in detail the specific components/ elements/ strategies used in interventions²¹. This lack of a clear description makes it difficult to identify effective methods to be used in future interventions. This leads to every intervention varying in delivery (mode of delivery, intensity and duration) and content of interventions or "active ingredient" (elements/ component/ strategy). The content of interventions are the active ingredients that bring about behaviour change (the what of the intervention) and are often described differently in protocols and published reports²². This makes replication, implementation, evidence synthesis and identification of the active elements difficult²². Not only are components referred to differently (active ingredients, components, content, elements, strategies) but they can be labelled differently (e.g. self-monitoring may be labelled as daily diaries)²². A method recently developed to improve specifying and reporting intervention content is the reliable characterization of interventions into behaviour change techniques (BCTs) by use of the BCT taxonomy²².

BCTs represent the content of behaviour change interventions often referred to as elements/ components/ strategies and are the “active ingredients”²². They are observable, replicable and irreducible components of an intervention designed to change behaviour²². Recently, Mitchie et. Al. (2013)²² published a BCT taxonomy (v1) of hierarchically clustered techniques. It was developed to increase accurate replication, facilitate faithful implementation, reliably extract information for systematic reviews, intervention development and investigate possible mechanisms of action. This taxonomy will be used in this research to identify and extract the “active ingredients” from the studies included in this review.

1.3.3 Adherence to a Physical Activity Program and Maintenance of Behaviour Change

Literature indicates that the factors that enable individuals to adopt a new behaviour are different from the factors needed to sustain this behaviour^{19, 23}. Much of the research surrounding PA interventions has been on the short term, investigating factors influencing PA initiation and adherence. Rothman²³ investigated the theory behind long-term health behaviour change and found that interventions that aim to increase PA are often based on theoretical models used to explain adoption of health/unhealthy behaviours such as the health belief model, protection motivation theory, social cognitive theory, theory of planned behaviour, theory of reasoned action, transtheoretical model of behaviour change. Interventions based off of these theoretical models have been successful in the short term, but consistently fail to provide long-term behaviour maintenance²³. Rothman²³ postulates that this is because many of these theories do not distinguish between initiation and maintenance.

The far lesser studied area concerns factors associated with maintenance of PA²⁴. To date, little has been conducted on the long-term effects of PA interventions especially after the intervention has ended^{2, 17, 25}. This information is vital for PA interventions because understanding PA maintenance is essential to achieve sustainable public health effects for individuals with or at risk for chronic disease. In this study, adherence will refer to the time period during the PA program and maintenance will refer to the time period after a PA program has finished.

1.4 Care Sport Connector

Introduced in 2012 by the ministry of Health, Welfare and Sport, the role of the care sport connector (CSC) is to connect sport and PA with other sectors such as healthcare, welfare, childcare, education and to improve PA levels among Dutch citizens²⁶. This was partially in response to the growing levels of chronic disease. The desired outcome of this new role is to increase the amount of physically active residents in their local neighbourhood and in local sports facilities. One of the roles of the CSC is to liaise with community and neighbourhood PA groups and connect primary care patients to a suitable PA program.

1.4.1 Project Connecting Care, Sport and Physical Activity:

The project connecting care, sport and exercise will look at the role of the CSC in connecting health and PA. The project has two tracts. The first tract will examine the impact of a CSC on local organizations and networks as well as the effect on the municipality and the neighbourhood. The second tract will evaluate lifestyle interventions in which the CSC is engaged. This research is part of the second tract of the study, investigating program components from interventions associated with successful participation and maintenance of PA programs. This information can then be translated and used by the CSC when developing future programs.

1.5 Problem Statement:

The benefits of regular PA among individuals with or at risk for chronic disease are well established, including preventing the development of disease and improving general health¹³. Interventions have been shown to lead to short-term exercise adherence, however, long-term exercise adherence has not been shown¹⁴. Consistently, reports show around 50% of participant's dropout within the first six months³. In addition, studies report around 50% of the participants discontinue regular PA after three months^{4, 5, 14, 19}. Maintenance is necessary as the health benefits of regular PA are obtained through sustained participation in PA^{3, 4}. The importance of better understanding the views and experiences that contribute to adherence and maintenance of behaviour change is vital to the future of PA interventions targeting individuals with or at risk for chronic disease. This requires better understanding of the factors that are specific to adherence and maintenance of behaviour change.

1.6 Scientific Objectives and Research Question:

The objective of this research is to use the views and experiences of adults (18+) with or at risk for chronic disease, to determine the program components that are useful to enhance adherence during a program and maintain regular PA after a program has finished. This study will attempt to distinguish between factors associated with participation during a PA program and maintenance of PA after a program has finished. The question that this research will answer is:

What program components need to be included for individuals with and at risk for chronic disease, to enhance adherence during the PA programs and stimulate maintenance of PA after a program has ended?

- 1) What are the views and experiences of individuals with or at risk for chronic disease on facilitators and barriers used to enhance PA adherence during a program?
- 2) What are the views and experiences of individuals with or at risk for chronic disease on facilitators and barriers to maintain PA participation after a program has ended?

1.9 Relevance of the Research:

PA interventions are extremely relevant for individuals with or at risk for chronic disease. Regular PA has been shown to have positive effects on health status of individuals with chronic disease and is often part of the treatment protocol for chronic diseases¹⁵. Understanding the views and experiences of individuals about an intervention's BCTs associated with regular PA can help understand behaviour change and maintenance of behaviour change. This information is best obtained using qualitative reports from program participants. The results from this research can be used to help develop future interventions that stimulate long-term PA.

2. Theoretical Framework

In general, it has been agreed that environmental and individual factors are needed for an effective intervention to maintain behaviour change¹⁹. This includes social factors (supportive partner) and environmental factors (lack of access to PA opportunities)¹⁹. This is in line with an ecological perspective that incorporates an individual's interaction with their physical and socio-cultural environment with the individual shaping their environment as well as being shaped by their environment¹⁹. As stated by Bauman, Reis, Sallis, Wells, Loos, Martin¹⁵, knowledge about all types of influence can inform development of interventions from an ecological perspective to offer the best chance of success. Evidence argues that concurrent interventions at multiple levels offer the best hope for adhering to a PA program and maintaining PA levels and should be encouraged²⁷.

An ecological perspective includes two key concepts. The first is that behaviours are both affected by and affect multiple levels of influence²⁸. The second is reciprocal causation; that an individual shapes their environment as well as being shaped by their environment^{19,28}. An ecological perspective on health emphasizes the interaction between factors within and across different levels and incorporates this relationship into the understanding of behaviours. The use of an ecological approach is useful for long-term behaviour changes. A long-term behaviour change must become included into the individual's habit or lifestyle in order for it to be maintained, therefore models with a time component are important when investigating long-term behaviours¹⁹. The time component tolerates changes in an individual's lifestyle without compromising a behaviour change (social/physical environment).

In this research the social ecological model (SEM) will be used as the ecological model to distinguish between the different levels of influence. To extract and analyse the "active ingredients" of PA programs the BCT taxonomy (v1) will be used. As BCTs are only found in programs, the PA maintenance (PAM) model will serve as a model that describes the components relevant to PA maintenance, after a program has finished. A description of each is found below.

2.1 Social Ecological Model (SEM)

The ecological model that will be used to guide data analysis will be the social ecological model (SEM) by McLeroy, Bibeau, Steckler, Glanz²⁹. This model is based off of Bronfenbrenner's model and includes five levels of influence on behaviours: intrapersonal factors, interpersonal factors, institutional or organizational factors, community factors and public policy factors. Definitions of each level of influence can be found in Table 1 and a pictorial diagram of the model can be found in Figure 1. This model will be used to understand the factors that influence PA behaviour at varying levels surrounding the program. The five levels describe the broadening levels of influence over an individual's behaviour. The intrapersonal and interpersonal levels are where most behaviour change interventions are put into practice, while the next three levels (institutional, community and public policy) incorporate the social and physical environment which have influence on shaping²⁸.

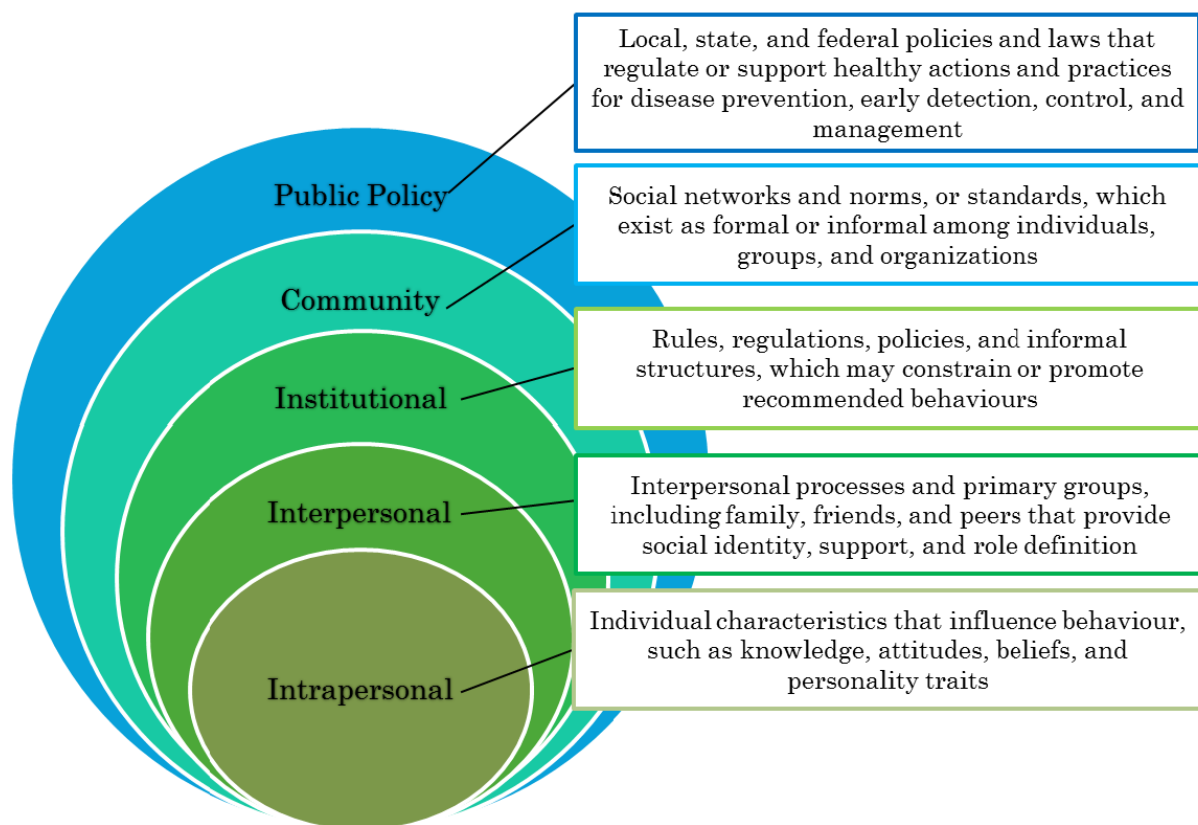


Figure 1: Pictorial diagram of the Social Ecological Model depicting the five levels of influence with definitions of the different levels of influence from the ecological model by Glanz & Rimer (2005) p.11

2.2 Behaviour Change Technique (BCTs) Taxonomy v.1

The BCT taxonomy (v1) is a hierarchically structured taxonomy composed of 93 reliable and distinct BCTs within 16 clusters ²². BCTs represent the content of behaviour change interventions often referred to as elements or “active ingredients” ²². This taxonomy was developed to increase accurate replication, facilitate faithful implementation, reliably extract information for systematic reviews, enhance intervention development and investigate possible mechanisms of action ²². The taxonomy was structured hierarchically to allow for improved processing of large quantities of data. The BCT taxonomy is suitable to use for a wide range of behaviours, including PA ²². Appendix III contains an overview of the 93 BCTs and their associated 16 clusters in addition to a table referencing the definitions and example of each labelled BCT.

In this thesis, the BCT taxonomy will be used to identify and extract BCTs from the included studies that have been described as “active ingredients” in the program. BCTs can be considered at different levels according to the social ecological model (SEM). Most BCTs are delivered at the intrapersonal and interpersonal level, but BCTs can be encouraged by organizations, community and public policy ³⁰. The extracted BCTs will be classified to their respective levels from the SEM. The SEM will guide the analysis of relevant BCTs.

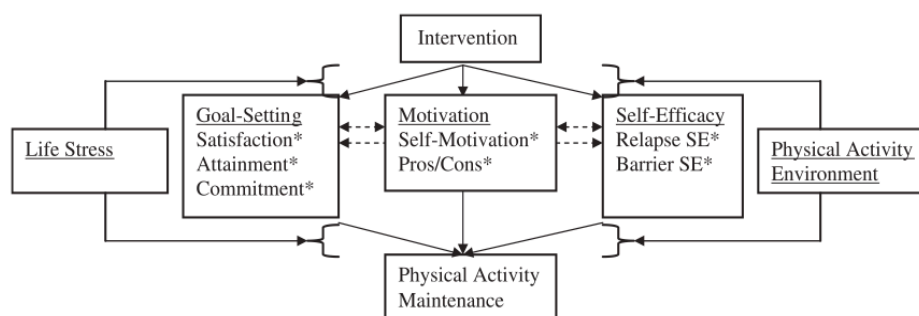
2.3 Physical Activity Maintenance (PAM) Theory

The final component of this theoretical framework is the PA maintenance theory (PAM) by Nigg, Borrelli, Maddock, Dishman ¹⁹, a model that incorporates an ecological perspective. An important

aspect of this model is that it assumes that the predictors of initiation are different from the predictors of maintenance. The model includes individual and environmental variables important for maintenance, triggers for PA relapse and conceptualizes PA maintenance as an active process³¹. It is a multilevel model looking at the interpersonal factors, social environment and community structures. The model proposes a reciprocal relationship between the person and the environment, which is in line with the social-ecological model³¹.

The model describes three mediators of PA maintenance being goal setting, self-efficacy and motivation. These represent individual psychosocial variables. Goal setting operates through commitment and achievement and influences the direction, regulation and persistence of effort. Goal setting serves as a method to build mastery experiences through attainment and influences self-efficacy. In this model barrier and relapse self-efficacy are most relevant, having direct and indirect (through goal setting and motivation) on behaviour. Motivation is considered here from an intrinsic perspective (self-motivation). Motivation is considered as a disposition to persist independently of context specific beliefs and extrinsic expectations of the pros and cons of maintaining regular PA. This model proposes that the three psychosocial variables are interrelated and have reciprocal influences³¹.

PAM describes two contextual factors, PA environment and life stress (triggers for relapse), for PA maintenance on PAM mediators. These contextual factors can be opportunities that are filtered by perceptions, cognitions and motivation and moderated by existing conditions. An important addition in this model is the inclusion of life stress as a contextual element. This incorporates a time component as life stresses come and go at various time points in an individual's life. Life stress can affect behaviour maintenance because stress decreases and redirects personal resources away from PA, distracts from goal-setting, increases negative affect, depression and anxiety, thus decreasing motivation for PA³¹. In addition, chronic stress can compromise the immune system, leading to increased fatigue and physical weakness³¹.



* constructs specific to maintenance of PA which may be correlated to each other.

Figure 2: The Physical Activity Maintenance Model (PAM) by Nigg, Borrelli, Maddock & Dishman (2008)¹⁹

3. Methods

A systematic literature review was conducted to answer the two sub questions. This included an initial search, appraisal of the included articles, data extraction and data analysis.

3.1 Search Strategy

The PRISMA method is a well-known method for conducting systematic reviews and was used as a guideline for this review. The PRISMA method contains four steps: identification of publications, screening of publications, eligibility and inclusion³². Two searches were conducted using all of the search terms, except for the first search key terms associated with adherence were used and in the second search key terms associated with maintenance were used.

Table 1: Overview of categories and associated search terms used for both searches in PSYCHinfo, Science Direct, Web of Science, SPORTDiscus and PubMed

Category	Search Terms
PA program*	“physical activity program” OR “exerc* program*” OR “physical activity intervention” OR “exerc* intervention” OR “training program*” OR “training intervention” OR “walking intervention” OR “walking program*”
Chronic Disease	“chronic disease*” OR “metabolic syndrome” OR “chronic illness*” OR obesity OR overweight OR “cardiovascular disease*” OR “type two diabetes” OR “type 2 diabetes” OR diabetes OR “syndrome x” OR “heart disease”
Qualitative Methodology	Qualitative OR interview* OR focus group OR “mixed methods” OR “mixed-methods” OR “Participants’ perspectives”
Population	Adult* OR “young adult” OR elderly OR “older adult”
Adherence (used for 1st search only)	Adherence or participat* OR compliance OR “behavio* change*”
Maintenance (used for 2nd search only)	Maintenance OR maintain OR evaluation OR follow-up OR “follow up”
Pub Med (1st search)	((((((((((“Metabolic Syndrome X”[Mesh] OR “Diabetes Mellitus, Type 2”[Mesh]) OR “Cardiovascular Diseases”[Mesh]) OR “Obesity, Abdominal”[Mesh]) AND “Exercise”[Mesh]) OR “Motor Activity”[Mesh]) AND “Qualitative Research”[Mesh]) AND “Patient Compliance”[Mesh])
Pub Med (2nd search)	((((((((((“Metabolic Syndrome X”[Mesh] OR “Diabetes Mellitus, Type 2”[Mesh]) OR “Cardiovascular Diseases”[Mesh]) OR “Obesity, Abdominal”[Mesh]) AND “Exercise”[Mesh]) OR “Motor Activity”[Mesh]) AND “Qualitative Research”[Mesh]) AND “Follow-Up Studies”[Mesh]) (((((((((((“Metabolic Syndrome X”[Mesh] OR “Diabetes Mellitus, Type 2”[Mesh]) OR “Cardiovascular Diseases”[Mesh]) OR “Obesity, Abdominal”[Mesh]) AND “Exercise”[Mesh]) OR “Motor Activity”[Mesh]) AND “Qualitative Research”[Mesh]) AND “Program Evaluation”[Mesh])
For the first search in Web of Science the category “PA program” was split into “PA” (searched by: “physical activity” OR “exerc”) and “program” (searched by: program or intervention). This was later combined into one category to improve search results.	
<u>Note:</u> Some adjustments were made to the search terms in order to meet the different database requirements	

The search strategy included a systematic review of published, peer-reviewed articles from January 1st, 2000 to November 7th, 2014 using online databases. Databases searched included Web of Science, PubMed, SPORTDiscus, Psych INFO and Science Direct. The key words used for the two searches are found in Table 1. Forward and backward searching of all included articles and forward searching of all relevant study protocols were also explored and relevant citations were selected for review. Mixed method studies were also accepted, with only the qualitative section included in the review. Endnote X7 was used to organize all of the references and duplicates were removed using the “find duplicate” function.

The first researcher manually screened each publication against the inclusion and exclusion criteria (see Table 2) by reading the abstract. A second researcher assessed a random 10% of the initial search. Subsequently, all full text articles were read and deemed eligible by two researchers. The two researchers discussed any discrepancy on decisions regarding inclusion/exclusion of a publication until consensus was reached. This resulted in a total of 40 publications included in the review.

Table 2: Inclusion and exclusion criteria for sub question one and two

Eligibility Criteria for Sub Question One and Two	
Inclusion Criteria	
✓	Published English articles from developed countries
✓	January 1 st , 2000 to November 7 th , 2014
✓	Empirical data
✓	Community dwelling adults aged 18+ with a chronic disease or with one element of metabolic syndrome present ¹ or older adults
✓	Qualitative data obtained during a program on views and experiences of program participants*
✓	Qualitative data obtained after the end of the program on views and experiences of program participants [§]
Exclusion Criteria	
x	Studies on trained athletes or sport students and rehabilitation patients
x	Interventions in clinical and hospital settings
Note: * was used for sub question one [§] was used for sub question two	

3.2 Critical Appraisal

A tool by Boulton, Fitzpatrick and Swinburn (1996)³³ was used to critically appraise the articles (Appendix I). This tool is composed of a checklist to score qualitative publications. Publications are scored against 18 criteria in 5 categories (introduction, sample and generalizability, methods of data collection, data analysis, discussion). A total score of 18 can be achieved for an article. Critical appraisal scores were not used as eligibility criteria but for descriptive purposes. No pre-set quality scores were set; rather the critical appraisal scores were reported as given and left to the reader's discretion. To optimize objectivity, two researchers independently scored each publication using the critical appraisal tool. The results of both researchers were compared. If a score differed by two points, consensus was reached between the two researchers. When a score differed by more than two points a third researcher was consulted and scored the articles to help determine the most appropriate score, to reach consensus with the first two researchers. Critical appraisal scores were reported in table 9 in Appendix III.

¹ Glucose intolerance, insulin resistance, hypertension, dyslipidemia and abdominal obesity

3.3 Data Extraction and Analysis

Data was extracted by the first researcher and included the aim of study, type of program, country of study, setting, sampling technique, sample characteristics, study population, type of study, methodology, data collection method, qualitative data analysis, program components and results/conclusion per sub question.

To facilitate data analysis, six steps outlined by Creswell (2009)³⁴ were used. The first step includes organizing and preparing the data for analysis and was completed by importing all included publications into Atlas.ti. Secondly, all articles were thoroughly read and re-read to enable the researcher to become immersed in the data, thereby having an overview of all the data and to facilitate identification of recurrent themes. Subsequently, all articles were analysed using inductive and deductive methods. The first researcher read, coded, checked and organised the data during data analysis. The first researcher met regularly with two other researchers to discuss and check codes, discuss key concepts and the development of the larger themes.

For SQ1, the BCT taxonomy was used to guide the deductive analysis and was applied to the publications. Additional emergent codes were added in an inductive way. In this way, all relevant topics will be coded. BCTs were coded as both facilitators and barriers instances. A facilitator was when a participant felt a certain program component (BCT) helped them during the intervention or they enjoyed a certain program component. A negative instance was when a participant felt something could be improved or when they did not like it or did not find a program component helpful.

After initial coding, codes were then further interpreted to find additional concepts, associations, patterns and explanations. BCTs were consolidated into larger themes and organized into corresponding levels of the SEM. Clustering codes into larger themes allows for interrelation and interpretation of the data³⁴. The results were analysed as a whole and separately on commonly used program components (e.g. individual vs. group based, type of monitoring etc.). A summary table of the codes and how they were placed in the SEM can be found in Appendix V).

For SQ2, the BCT taxonomy and the PAM were used to guide the deductive analysis. A combination of the two was used because the BCTs are not as prevalent in the maintenance of PA as the program has finished. Therefore the PAM was included as a theory specific to maintenance of PA. Similar to SQ1 emergent themes were added in an inductive way. Facilitators and barriers were specified during the coding. An overview of the codes and how they were placed within larger themes can be found in Appendix VI.

As an additional step, the methodology sections of all publications² were coded using the BCT taxonomy. This was to check the level of detail in documentation of interventions as well as to act as a form of "validation" and comparison of the result section coding. When a BCT was not described in the methodology section and was described by the participants in the results section, the BCT was coded in the result section and included in the analysis.

² All publications including the publications referred to in a method section (for further description).

4. Results

The electronic search strategy identified 655 records for sub question one and 319 records for sub question two. In total there were 974 records and 159 duplicates were removed. Forward searching of study protocols identified in the initial search produced two additional full-text articles. Following title and abstract screening of 817 articles, 45 full-text articles were obtained and accessed for eligibility. Of these, 14 were rejected because they were a rehabilitation program (n=2), not from developed countries (n=2), did not include (relevant) qualitative data (n=7), did not include a physical activity program (n=1) or the population consisted of healthy participants (n=1). Forward and backward searching of the 31 included studies resulted in an additional 9 articles included in the qualitative synthesis. 40 publications were included in the review. All 40 articles met the inclusion criteria for sub question one; 13 articles met the inclusion criteria for sub question two. An overview of the inclusion process is presented in Figure 1.

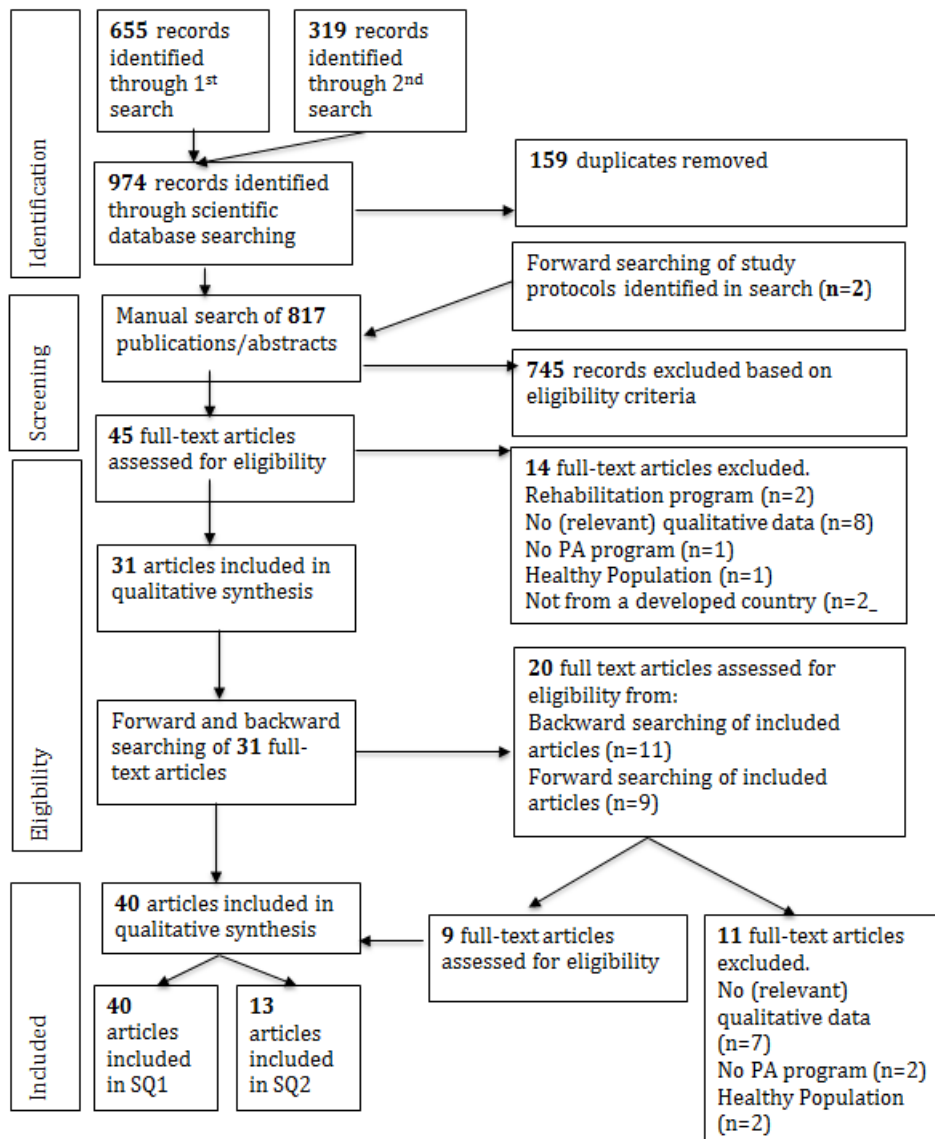


Figure 3: Schematic overview of inclusion process

4.1 Facilitators and Barriers of Physical Activity Adherence

4.1.1 Summary of the studies

A total of 40 publications describing 47 types of PA within the PA programs were identified and analysed. Appendix 1 contains a summary of included publications country, setting, sampling technique, sample characteristics, study population, type of study, methodology, data collection method and qualitative data analysis. The majority of the publications were conducted in the UK (n=11) and the US (n=11) followed by Australia (n=6), Denmark (n=5), Canada (n=4), New Zealand (n=2) and France (n=1). Most participants belonged to the majority ethnic group of their country, with nine publications incorporating an ethnic minority. Publications collected data through individual interviews (n=21) (age range 22-82; 7-51 participants), focus groups (n=15) (age range 22-93; 9-84 participants), a combination of both (n=2) (age range 10-39; 35-93 participants) and written responses (n=1) (age range and number of participants not specified). The target group under investigation were older people (65+) (n=8), type two diabetes (n=9), overweight/obese (n=9), sedentary (n=7), at risk populations (n=6), multiple sclerosis (n=3), mental illness (n=1) and chronic lower back pain (n=1). An overview of the selected publications is provided in Appendix 2, which includes the aim of study, type of program, BCTs and results/conclusion per sub question. Most programs were group based (n=26), individual programs (n=11), or a combination (n=9); examples of the types of PA in each program can be found in table 1. The majority of programs were physical activity only (n= 31) or a combination intervention (n=16). Combined interventions included an education component (n=9), a diet component (n=5), a group reflection (n=1) or socialization time (n=1)

The results have been presented according to the levels of the social ecological model (SEM). Results will be discussed from the intrapersonal level to the community level.

Table 1: Overview of Program Type and Associated Type of Physical Activity from the Publications

Program Type	Type of Physical Activity
Group Training (supervised) (n=26)	Unspecified Group Training (n=7) ³⁵⁻⁴¹
	Resistance/ Strength Training (n=4) ⁴²⁻⁴⁵
	Endurance/Aerobic exercise (n=3) ^{44, 46, 47}
	Combined Resistance and Endurance (n=3) ^{44, 48, 49}
	Circuit Class (n=1) ⁵⁰
	Cross fit + HIIT (spinning) (n=1) ⁵¹
	Dragon Boating (n=1) ⁵²
	Spinal Exercise Program (n=1) ⁵³
	Falls Prevention Program (n=2) ^{54, 55}
	Walking Program (n=2) ^{56, 57}
	Football Program (n=1) ⁵¹
Individual Training (n=11)	Walking program (n=8) ^{56, 58-64}
	PA at the Gym (n=1) ⁴⁸
	Fall prevention home program (n=1) ⁵⁴
	PA in the community (n=1) ⁶⁵
Group or Individual Training (n=9)	Choice between community group programs (n=9) ⁶⁵⁻⁷³ (e.g. tai chi, dance, strength training) or using the community facilities individually (e.g. swimming pool, gym, walking)

4.1.2 Interpersonal Level

The first level of the SEM is the intrapersonal level; here results included the individuals' physiological changes, knowledge acquisition and other personal improvements.

4.1.2.1 Physiological Changes

Participants often discussed body changes as a positive motivator for adherence to the program. Participants found a large range of body changes as motivating as shown in table 2. Participants attributed these positive body changes as results of increased PA from the program, which in part increased their adherence. *"I continue my exercise because I have to lose a lot of weight, and I see a lot of results."*⁴⁶ AND *"I used to stagger, trip... and since I've been doing strengthening I've noticed it a lot less."*⁴² AND *"Less rolls of fat ... I feel more confident. I have made myself more comfortable in my skin ... A healthier body weight leads to a healthier body image"*⁶⁷.

Positive body changes were not present in everyone and it was mentioned in two publications that participants felt no body changes. *"I don't feel any changes. I walk to the grocery about once a week and still feel tired afterward"*³⁶. These participants struggled to see the value of the program if there were not positive body changes and could lead to non-adherence and viewing the program as a waste of time.

Reducing medication was another personal motivating factor mentioned in five publications. Participants were enthusiastic that if they continued to exercise they could reduce the amount of medication needed, *"I can cut down more on medication if I do more exercises"*⁶⁶. This was mostly limited to individuals with diabetes, however a few participants described similar decreases in medication for blood pressure.

4.1.2.2. Knowledge Acquisition

Many participants felt motivated to increase PA after learning the reasoning behind PA to help prevent onset of disease. *"I think the health talks were the most relevant for me because I'm in a high-risk group for high blood pressure and diabetes. There is a long line of this in my family. So I found it really good to hear what the conditions are, what the best prevention and treatment is, and how to manage the conditions..."*⁷³ AND *"It was a wake-up call right there, knowing that... we are so high at risk...And so the 'pre' I want to maintain that...That was enough in itself to make me say, 'OK now, I've gotta really pay attention, and do what I need to do to not cross over and cross that line of pre-diabetic to diabetes'"*⁷⁴. This knowledge although not mentioned often, plays a role in motivation and understanding.

Knowledge acquisition was important for many of the participants. Although not always brought up, it might have underlying effects as demonstrated by this note, *"Although workshops were not noted in the focus groups as being among the most useful aspects of the program, they were widely discussed and seemed to be valued for their educational content"*⁶⁵. In addition, when one program

Table 2: Overview of Body Changes and Number of Time Mentioned in the Publications

Times mentioned	Body Changes
23	Feel better completing daily tasks
14	Feeling more "fit"/stronger
9	Increase mood, decrease depression
5	Feel Healthier
4	Weight loss
4	Increased body image/confidence
4	Increased energy
2	Less pain
2	Negative feelings
1	Helps with illness
?	Medicinal Changes

switched guest speaker information sessions from weekly to monthly, some participants felt this was a negative change to the program and would lose important information. *"The new people who are coming don't get to regularly listen to all these talks, like heart disease, sugar/diabetes, and what causes it. They get the information only in doses, when they remember to attend, and then they have to wait for a whole month before listening to another talk"*⁷³.

When participants were asked what improvements could be made, responses included tips for staying active against common barriers (e.g. bad weather) and ideas for places to maintain activity. These ideas can be seen as antecedents for PA. Having a back-up plan or strategy to predict when you will feel like avoiding physical activity could be beneficial to help participants adhere and maintain PA.

4.1.2.3. Attitudinal Changes

Participants described changes in their self, an attitudinal change. Participants described how the PA program helped them recognize and affirm their positive self. *"Physical activity has enabled me to be better accepted, to have a positive image of myself"*⁶⁷. This increased confidence developed from their the program led to an enhanced positive self and commitment to the program, *"a sense of 'competence' that encouraged them to continue with healthy changes"*⁴¹. Participants described situations of self-talk that helped motivate them. *"I have to leave everything and come and walk. It is a proposition that I made to myself"*⁶³. *"I say to myself: it IS really necessary to modify the food, to pursue a physical activity and maintain weight loss, to prevent the illness becoming worse and avoid complications"*⁶⁷. This evidence of self-talk demonstrates individuals taking personal responsibility for their PA. A limited amount of participants described anticipated regret. This included participants that were *"worried [they] would lose what [they] had gained"*³⁶. Although this specific example did not include the BCT in the intervention (to induce expectations of anticipated regret), evidence from the participants show that this might have some positive effect on motivation to continue. Some participants even identified themselves by the new behaviour and identified themselves "as walkers"⁵⁶ or as an exerciser, *"I am now. I think I've been an exerciser but got away from it"*³⁶.

4.1.2.4. Summary

At the individual level important components include achieving physiological changes, especially feeling better or more fit, was a major motivational component. Knowledge and skill acquisition such as knowing health risks, learning different types of PA and tips for staying active are also important to understand the process of behaviour change and to learn strategies to support behaviour change. Finally, attitudinal changes such as increasing self-pride, self-talk and a new identity as an exerciser also had an effect on adherence. Physiological benefits seem to be more salient in the mind of the participants and therefore improvements (or lack thereof) are more noticeable and therefore more significant.

4.1.3 Interpersonal Level

The second level is the interpersonal level and includes the influence of family, friends and peers. Results from the interpersonal level were mainly derived from social support. This was the most prominent finding from the data on the participant's experience in a PA program. All but one publication (⁶⁴) discussed the impact of social support on the participant's experience. For some, support was the reason participants kept coming back. *"The support more than the exercise is*

important to me"⁴¹. Three main means of social support emerged from the data; group support, instructor support and external (friends/family) support.

4.1.3.1. Group Support

Being part of a group developed many opportunities for participants to receive additional support. When groups were formed of similar individuals, group effects were intensified and led to advantages such as feeling more accepted, comfort among similar individuals, social comparison, finding an exercise buddy, friendly atmosphere, provision of an escape (from life) and additional knowledge gains.

Similarly composed groups enabled participants to feel more easily connected to one another. This fostered an atmosphere where participants felt accepted. They no longer felt alone in their thoughts and fears associated with their disease/age and gained comfort from being among similar peers. *"I like listening to the people to get information for living"*⁴¹. This similarity created a common bond among peers and enhanced cohesion. Many participants appreciated the opportunity to confide in each other knowing that others were going through the same situation as them. *"Seeing people who look like me and have similar problems is motivating"*³⁶. Having an open, comfortable group relationship enabled participants to seek advice and unload small problems to the group. *"Participants recognized this support as instrumental in countering stress and negative emotions [referring to the group]"*⁴¹.

Participants were especially fond of being in a "special group" setting (compared to a public class). Being among others of the same level and size made participants feel more comfortable. *"We were in classes [group] working together and that builds up your confidence. I wouldn't have had the confidence to go straight into a mainstream class"*³⁸. Participants were able to build confidence in this environment. *"Like everything the more you get familiar with it, the more confident you get and the more rewarding it became"*³⁸. Working with the same individuals made participants more aware of each other's progress as well as their own, increasing social comparison.

Social comparison was mentioned as a positive effect from program participants. Seeing what similar individuals could achieve increased the motivation for participants to try and achieve the same. Participants looked to the other members of the program and would gain motivation from positive role models. *"Those people are examples for the rest of us (walkers in the group)."*⁶³ AND *"If I haven't increased from last week and everyone else has increased, . . . I'm gonna take the extra time [to walk]"*⁶⁰. Social comparison was also used for comparing individual to group progress and benchmarking personal levels. *"I was actually informed by the pace that other people walked at because I'll lollygag if I can, and walking with K. or L. [was motivating]. I mean she has like flames flying after her"*⁵⁶. Participants also valued others in the group that were similar in ability to them. Having these individuals allowed participants to feel more comfortable (if another individual was struggling with the same task). This setting also allowed for more verbal persuasion about capability from other group members as the group became more aware of other individuals' progress.

Having a similarly composed group eased the effort for participants to find a friend, walking partner, fitness buddy etc. This is especially relevant for those that do not have as much social support outside of the program (family/friends). Finding a friend or buddy (either within the group or outside of the program) helped participants gain positive experiences associated with PA. Without this relationship participants felt more on their own; struggling with feelings of not fitting in. *"It's not*

necessarily that I don't have any one person to exercise with, it's that I don't have necessarily someone that's out there with the same motivation that I have . . . if you aren't with someone who has that same level of commitment, that can be difficult..."⁵² AND *"...if you were in with another class you would feel out of the ordinary"*³⁷. In programs consisting of an ethnic minority, participants enjoyed being surrounded by similar individuals, to share common cultural barriers and experiences. *"Being all Aboriginal women was good, you didn't feel out of place"*⁴⁹. This also created a sense of ease as the participants could communicate in their native language and practiced culturally relevant sports.

Participating in a program was a great opportunity for participants to meet other people. The friendly, convivial atmosphere of group programs helped participants adhere to their PA program. They appreciated the new friendships that were created and some came to appreciate their time exercising as more than just exercising. *"When you come to the gym, you get your exercise and social time"*³⁶. When strong bonds were made between group members, often this led to increased commitment. *"Most of us don't have the backbone to exercise on our own and we will stay home if it is raining. But knowing that four idiots will give you a telling-off if you didn't show up –well, that's enough to make me show up"*⁴⁰. Participants described feelings of commitment to the group and often wanted to avoid letting the group down, which in effect had positive outcomes on adherence. *"The days that I just did not want to come, I came because I felt I would be letting the group down and I did make a commitment to it. And that tends to be what motivates me."*⁴³.

For some participants the program provided an escape, a time for them to meet people, make friends and get out of the house. *"I stayed alone at home and I felt so lonely. I got depressed. For me, meeting days are like holidays, you know? ... Mutual aid ...companionship ... loyalty ... before nobody helped me. This justifies continuing. Now, I talk to everybody, I laugh ... I am so different from before ..."*⁶⁷. This finding was more prominent from the publications with an older population, who typically have less friends and family nearby.

Having a supportive sharing environment led to additional knowledge gains. Participants shared common symptoms, setbacks, comforts and stresses. *"I now know all the symptoms (frequent urination, feeling tired, blurred vision, numbness or tingling in toes or finger) and tips for managing high blood sugar (medications; diabetes meal plan; eat more food high in fibre such as fruits, vegetables, etc. ...)"*⁶⁷. Some participants referred to this knowledge as *"more effective than receiving similar advice from health care professionals because it was being given by people who had 'been there'"*⁴¹.

4.1.3.2. Supportive Role of the PA Instructor

A striking finding from the data analysis was the central role the instructor in a program. Instructors were used to provide technical information, acted as a credible source, provided individual tailoring, graded tasks and verbal persuasion.

Instructors were celebrated for providing knowledge by instruction and demonstration of PA. Participants valued receiving this information coming from a credible source (physiotherapist or exercise trainer). *"[The instructors] have been very professional and their knowledge has been outstanding ... always there for moral support"*³⁷. Participants feel more confident knowing that someone trained and knowledgeable is available. Many of the participants had little to no previous experience in PA and required a lot of guidance, especially at the beginning of the program. *'The best*

thing when Trainer 2 . . . showed us how to use the equipment properly⁴². This guidance permitted participants to feel more encouraged and more confident in their abilities to perform PA. Even simply the presence of the trainer could influence the confidence level of the participants and support them in the new environment (gym environment). *"They know the equipment, and it is all new to me"*⁴⁴. For some cases, such as the publications with participants with MS, the participants felt at ease knowing that the trainer understood their symptoms and could emphasize better with them. *"That Trainer 1, a physiotherapist, 'was very knowledgeable about the effect that MS might be having'"*⁴². *"I think it's encouraging because it's [a] neuro physio"*⁵⁰. When a publication had no professional, this was mentioned as a barrier and de-motivator. In one publication, a participant with MS felt misunderstood when the professional did not understand her symptoms correctly and pushed her too hard, leading her to quit the program. Therefore, the quality/ability of the credible source is important.

Having options and building-up PA slowly helped participants gain confidence and avoid discouragement. *"I am more comfortable on the machines now. I can do it"*³⁶. This was discussed as a beneficial aspect of the instructor. *"The instructor would say if you can't do that one well you do it this way and she'd show you a different way and that was good"*⁴⁹. Participants appreciated it when an instructor was able to tailor the activity to a participant's level. *"(They) catered for all different levels, you know what I mean, like say if you were just a beginner or something... you could work at that level or you could be higher fitness level, whatever and it's a, it accommodates to that as well"*⁴⁹. This was evident for both making a task easier or harder depending on the participant. When a participant became injured, continued instruction by the instructor was beneficial in maintaining adherence. *"My left knee hurts—because it's getting old. [This participant continued on the NuStep with modifications]"*³⁶ AND *"Several participants described how mentors would prescribe isotonic exercises to be performed in bed when they were bed-bound"*⁷⁰. The instructor provided this additional support.

Similar to task tailoring, incorporating graded tasks allowed participants to naturally increase the level of difficulty of PA. As the program progressed participants appreciated the continued instruction for new activities, strategies and/or exercises. Graded tasks also had the additional benefit of helping participants keep track of progress. *"I was really impressed with the fact that there were [exercise] options for different levels of difficulty and because you were writing things down [progress cards] at what level you had been exercising at. It was encouraging because after a few weeks you could look back and see, oh, yes I am getting better"*³⁷. This is related to goal-setting and enabled participants to more view progress towards goals, *"Incremental steps were encouraged and contributed to a pathway towards goal achievement"*⁷¹.

Often participants were new to PA and valued the verbal persuasion from instructors. This verbal persuasion motivated participants to work a little harder and believe in themselves. *"When the instructors sort of pushed you, and challenged you to try the new things actually it was surprising to think, oh my goodness I can actually do that exercise.."*⁴⁹ AND *"She was so nice, and she said, 'let's go, let's go you can', because I never did exercise before and I thought I would never do it, and she always pushed me to doing it."*⁴⁶. The participants appreciated this attention from the instructor felt comfortable and safe. *"It would have taken very little at that stage to put me right off. She [instructor] got me over the first hurdle"*⁶⁸. Participants were encouraged from the positive support of the instructors. *"The emphasis in the programme was on praise for success. One participant*

*described being disappointed because they had not lost much weight, but then being pleased when the NLNY trainers emphasised how many inches the participant had lost from their waist measurement*³⁸.

4.1.3.3. External Support - Family and Friends

Social support outside of the group was also important for participants. Some examples of practical support include; having family members helping remind/encourage the participant to go to the PA classes *“I don’t think he would have gone if I hadn’t been pushing him, and some nights that I didn’t want to go he was—so we encouraged each other.”*³⁸; help remove family obligations (e.g. offer to take care of the children in the morning (to allow the participant to be free to go to the PA class); or provide transportation, *“My friend... she’s been at GRx for a long time. She comes and picks me up, takes me to the programme and then drops me home afterwards. If it wasn’t for her, I probably wouldn’t go”*⁷³. Other forms of practical support included participants purchasing a dog with the intention to take the dog for walks. In a few cases, participants described unsupportive family members. *“[Name removed] mentioned that her overweight family members did not support her in dragon boating or other lifestyle changes because they felt she should stay overweight so as to fit the family profile”*⁵². Having an unsupportive family was described as a hindrance to PA, however not limiting, as participants could overcome this hindrance through another source of support (group/instructor) or from themselves (knowing that PA is good for them).

Participants social groups also had an influence on behaviour. These participants noticed the effect of social norms on their behaviour and the struggle that ensues if a new behaviour remains outside of the social norm. *“You do not change your social relations and when you try to change your behaviour they notice it. In the beginning it is cool to be different, but after a few months seeing the same people, you have returned to your old habits”*⁴⁸. However, one participant was able to positively change his routine with his friend group. *“I used to go to the club with the lads and I could drink 10 pints easy, on a Friday night but they no longer did this because they had established a routine of running on a Saturday morning”*³⁸.

Although not prominent, the idea of identifying oneself as a role model was evident among participants. The idea emerged that becoming a role model could have positive benefits on the lives of their family and friends surrounding them. *“Participants described their desire to be a ‘role model’ for family and friends who were struggling with similar conditions”*⁴¹ AND *“For me, it was my mother, her blood pressure was high for 5 years and just the other day, her blood pressure was down and it made me feel good when she told the nurse that ‘my daughter made me change my eating habits and made me get on that treadmill.’ That helps me knowing that I am able to help my mother get her blood pressure down”*⁴¹.

4.1.3.4. Summary

Overall, support was the most important finding. Support networks are vital for participants' adherence to PA programs. Support was provided by the group, instructor and/or family/friends. A group atmosphere played a significant role for participants. This role is heightened when the group is composed of similar individuals. The group provided additional benefits that cannot be provided for by a program, and are dependent on group formation and bonding. Such additional benefits include friendship, improved social network to unload stress, gain confidants and knowledge from peers. Secondly, the role of the instructor was central to program success. Instructor support was largely

connected to increasing participants' feelings of safety, competence and ability. Finally, external support in the form of family and friends can have positive and negative effects. External support is beneficial in logistical support/barriers. However, practical (prompts) and emotional support (encouragement) is also common.

4.1.4. Institutional Level (Program Design)

The third level of the SEM is the institutional level and this level includes the program design. The most common program components commented on by participants includes: type of program, routine formation, goal setting, monitoring by others (without feedback), self-monitoring, prompts and research influence.

4.1.4.1. Type of Program

Group, individual, combination

Most programs were group based (n=26)^{35-39, 41-57, 63}, individual programs (n=11)^{48, 54, 56, 58-62, 64, 67}, or a combination (n=9)^{40, 65, 66, 68, 69, 71-74}. More individual based programs (walking program, home program, gym program) mentioned social support (as described in the previous section) less often than participants in a group. Instead, these types of programs often had participants mentioning social support components as improvements to the intervention. For example: wanting help in making social connections, having a buddy program and having more contact points with the instructors. Their recounts of their experience with the program often did not mention friendship as a factor that influences adherence. *"It would have been cool if I knew somebody else [in the study] because then we could have, we could have said, 'you know what? Let's walk at lunch time.' And, you know, that might have been real helpful."*⁶⁰ AND *"In the fitness centre it's like getting on the bus. You work out with the ones who randomly sit next to you. We have no social interaction because there's not time. You come in, sit on the bike and leave again and don't talk to anyone"*⁵¹.

When participants were not in a group setting, participants were generally curious about the results and progress of their peers. Some publications provided this information by providing participants information about the population norm. This helped them better gauge what their level was and where they should/want to be. *"Having a look and seeing that you know, the sort of general average for unfit people was about two thousand steps and you know, I'm like that . . . a couple o' hunner [hundred]!"*⁶¹. The only critique by participants was to include more social comparison as a method to improve about the program. *"A few women said they wanted to know the average number of steps that other participants were walking to gauge their own progress."*⁶⁰ AND *"Men suggested expanding opportunities for measurement so participants could measure individual progress and compare themselves with others in similar age ranges"*⁶⁵. These comments were more prominent in individual-based programs as evidence from group programs demonstrates facilitating social comparison naturally.

Combined interventions

Combined interventions included an education component (n=9)^{35, 41, 53, 54, 59, 62, 63, 65, 73}, a diet component (n=4)^{39, 49, 69, 70}, a group reflection (n=1)³⁸ or socialization time (n=1)⁴².

Incorporating an additional component, especially an education, group reflection or group socialization component seems to have positive effects. Examples include additional social support (group reflection and group socialization) providing benefits (similar to those described under the

heading "social support" above). Incorporating an education component led to additional knowledge gains, as described under the heading "knowledge acquisition".

A program that incorporated a nutrition portion has less clear-cut results and is beyond the scope of analysis of this research. These programs include a second behaviour change in addition to PA, which leads to additional factors taking place. There may be additional knowledge gains understanding proper nutrition however additional barriers might also arise specific to eating behaviour which might lead to an overall decreased motivation (from build-up of barriers and burn-out)

4.1.4.2. Routine Formation

PA programs created a structured method for participants to incorporate PA into their life. The structure of a weekly program helps create a habit of PA and routine formation. For some, this led to PA becoming interlaced in their lifestyle. However, participants struggled when the routine was broken.

The PA classes became a process for participants to form a habit. *"Of course, at the beginning it is hard to do physical activity. There are always pains ... you don't always feel well. Then gradually, one tames down, learns how to know oneself, with better self-management. I integrated the physical activity into my life"*⁶⁷. The formation of a habit was greatly appreciated by the participants; *"The group walk and discussion were scheduled at the same time every week. All of the women reported that this routine provided a foundation from which they could create a regular pattern of walking on the other days of the week"*⁵⁶.

Involvement in a PA program had positive benefits on replacing negative past routines into positive routines. This was most often in the form of switching from driving to walking. *"I find it's great, like I walk to football on a Saturday, I'd have took a taxi every time. But noo [now] it's a 40-minute walk to the football. I just don't even think about it noo..."*⁶¹. Participants became more aware of ways to incorporate small changes to increase PA into their everyday life. *"I now use the stairs and the, instead of the lift... it's just little things like that and I'm making a conscious effort every day"*⁶¹.

Many participants came to the realisation that fixed patterns made incorporating PA into a busy schedule easier, contrary to their earlier belief. These participants found that when you place a greater importance on PA and schedule it in, rather than left as a last minute add-in, it becomes possible. *"Football players found that having a set time, a routine, was useful in the challenge of fitting sports and exercise into the everyday-life schedule they share and negotiate with spouses and other family members"*⁴⁰.

A barrier occurs when participants experience a break in their PA routine. Participants discussed the struggle to regain a habit once it was broken. This was especially common after an illness or injury. *"Women reported that it was actually more difficult to re-establish a routine than it had been to start the routine, and that this was extremely frustrating"*⁵⁶

4.1.4.3. Goal-Setting

Goal setting was often discussed by participants in both positive and negative ways. Participants could become motivated by goals (feelings of accomplishment and confidence) or de-motivated (anxiety and frustration from not reaching goals). Motivation from goal setting was very much determined by who set the goal (self or others) (overview in table 3) and whether an achievable goal was set.

Table 3: Overview of Goal Setting in the Publications

Goal Setting
Set by program (n=4) ^{55, 58, 59, 67}
Set by individual (n=7) ^{35, 38, 39, 41, 60, 71, 73}
Set by individual with help (n=2) ^{57, 64, 65}
Set by individual, without prompt from program (n=6) ^{52, 56, 61-63, 69}

In four publications the program automatically set goals for the participants. Having a pre-set goal did not adjust for individual factors or abilities. Some participants found it difficult to achieve goals in interventions with automatic or pre-set goals. *“Personally for me, it’s quite a jump of 20%, for someone who is out of shape. It was like a beginning rush, but if you do that in the first week, then the second week it’s steep. 20% for the last week was just out of reach because it was about 6,000 steps”*⁵⁹. This sometimes led to participants ignoring the goal because it was “out of reach” or creating their own lower goal.

Seven publications had participants creating their own goals, which was both a positive and negative aspect. For some, having the opportunity to set their own goals was described as a positive feature, *“Coz you know yourself best...and I think that if people can set their own goals it’s an advantage isn’t it”*⁷¹. However, often participants struggled to create a suitable goal and had doubts whether the goal was good.

Two publications incorporated goal setting support and helped participants create appropriate and achievable goals or adjust goals when it was noticeable that a participant would not achieve the goal. *“As a result, she stated that she decided to shift her focus from monitoring her weight to monitoring her fitness and other physiological benefits. She stated that as she noticed increased fitness, she was even more motivated to persist with a regular regime and continue walking for health”*⁵⁶. This additional support enabled participants to set better goals that were easier to achieve and maintain motivation.

For participants, achieving a goal led to positive emotions, feelings of satisfaction, pride and increased confidence and self-esteem in their abilities; *“satisfied since you have done it”*⁵⁶. On the contrary, not achieving a goal led to participants feeling disappointed, shame and doubt in their (future) abilities. Not achieving ones goals was a major reason for dropping out of the program. This anxiety was heightened in the participants struggling with achieving their goals when monitoring involved. *“I just felt like I was letting people down because I hadn’t done my step count that week”*³⁵. Monitoring will be further discussed in the following section.

4.1.4.4. Monitoring

27 publications included some form of monitoring/feedback. Monitoring of outcome (blood pressure, cholesterol, blood sugar, weight etc.) or behaviour (PA completed) were both utilized and was mostly a form of motivation for participants with the exception of some who felt shame and doubt when struggling with the program. Participants felt both tests were motivating, mostly depending on the goals they have set.

Table 4: Overview of Monitoring used in the Publications

BCT label	Example
2.1 Monitor by others without feedback (n=11)	Monitor logs (n=3) ^{49, 60, 62} Monitor HR (n=2) ⁵¹ Monitor wellness key (n=1) ³⁸ Supervision of exercise (n=5) ^{40, 44, 45, 53, 67}
2.2 Feedback on behaviour (n=13)	Meeting/phone call with investigator to discuss achievements (n=9) ^{47, 49, 56, 58, 61, 70, 71, 73} Automated feedback (n=2) ^{59, 64} Group review (n=1) ³⁵ Call if a participant does not show up (n=1) ⁶³
2.3 Self-monitoring of behaviour (n=17)	Pedometer (n=3) ^{57, 61, 64} Pedometer + log (n=3) ^{49, 59, 60} Accelerometer + log (n=1) ⁵⁸ Exercise Log (n=6) ^{44, 55, 56, 62, 65, 69} Gym key (n=2) ^{36, 38} Progress cards (n=1) ³⁷ Not specified (n=1) ³⁹
2.4 Self-monitoring of outcome of behaviour (n=8)	Heart rate monitor (n=6) ^{46, 47, 51, 56, 62} Weight log (n=1) ⁶¹ Gym key (HR) (n=1) ³⁶
2.6 Biofeedback (n=5)	Monitor HR by staff (n=4) ^{46, 47, 51} Monitor exercise response (n=1) ³⁶
2.7 Feedback on Outcomes of Behaviour (n=1)	Formal weigh-in (n=1) ³⁵
Note: Gillis ⁶⁵ , Bredal ⁴⁸ and Ingram (2011) ⁶² both used telephone support calls with motivational interviewing. Could not code for monitoring and feedback because not explicitly specified in description.	

One intervention used sandbags as a visual example of both individual and group weight loss as a vicarious consequence. The participants described this demonstration as a positive motivator. *"I thought that was thoroughly good because there was one person in the group, we'll not name anybody, had a bag full, and I thought, "Look at that bag", and then I looked at mine, and I went, "Hey, wait a minute here!" And that guy actually pushed me to say "Right, I'm going to go even harder now" [...] and the last five weeks, bang, as if everything just dropped off"*³⁵.

In contrast, behaviour monitoring (PA tests, PA logs) would provide an objective look into subject's PA improvements. When the program incorporated monitoring in the form of checking logbooks, the participants felt that this *"helped to keep me on track"*⁶². This included interventions that incorporated phone calls as periodic check-ups with participants (n=2;^{65,63}). In general, these phone conversations were seen as a positive component to keep participants engaged. *"If you slacked off on something, then you got a call. And it's a reminder that they'd read your chart. That is very important I think, that one-on-one contact, to keep tabs on people, of how they're doing"*⁶⁵ AND *"I enjoyed hearing from the young lady that was taking care of me. She was charming and encouraging without being pushy. I think it's a good idea. I need someone to encourage me"*⁶⁵. However, in some cases

participants felt guilt, embarrassment and shame when they felt they had a negative report. Some participants began *“not responding to calls when they had not walked”*⁶².

Self-Monitoring

Self-monitoring was a positive program component that allowed individuals to increase their awareness. Type of self-monitoring can be found in above in table 6. All methods helped participants gain PA consciousness and mark progress with some technological barriers mentioned for each device.

Self-monitoring helped participants gain a “PA consciousness”. Many participants in pedometer programs were shocked to find out their total steps for the day, often realising that they walked far less than they had thought or hoped. *“I really liked being able to see what I had done. And I can say, not exercising at all is a condition of extreme unconsciousness. And so, it just brings some form of exercise into consciousness. To be able to see how little or how much I did and how was I feeling and why did those things occur and how did I feel about it. It was just an awesome wakeup”* (Fukuoka, 2012). This was also found from a heart rate monitor and log books. *“I think [the heart rate monitor] gave me a better sense of ...what I should feel like when I am working out”*⁵⁶. *“The alternate week when you didn't have to log in your exercise didn't help me at all. I think it was easy to be lazy”*⁶⁵.

Self-monitoring also allowed participants to follow their progress more easily. It allowed for participants to learn how small changes or increases can add up. *“One woman said she was “shocked” to learn she could accumulate a large number of steps by parking her car far away from a destination and walking the rest of the way or by walking around a large store”*⁶⁰. Heart monitors were used in a similar way. *“I documented my average heart rate, and that helped me to see some progress. It also helped me to see that, that if I had been at that same average heart rate, maybe I really need to push myself a little bit harder, you know, that I should be able to, to get a little bit more out of it myself”*⁵⁶. The heart rate monitor allowed some participants to better gauge the intensity of their workout. Finally, logbooks were also beneficial for some participants and enabled them to take charge of their progress.

Although mostly positive comments were mentioned, a few barriers for each self-monitoring method were brought up as well, most relating to “technological aspects”. Individuals described disappointment when activities were not accounted for (by the pedometer/accelerometer) such as swimming or yoga. Faulty equipment and the device being uncomfortable to wear were also mentioned for the pedometer and heart rate monitor. Logbooks were sometimes found as tiresome and annoying to fill in.

The article that used an accelerometer as a form of self-monitoring did not have extensive qualitative results and therefore analysis is limited. Results only indicated that the accelerometer was motivating for adherence as it allowed participants to relate amount of calories burned to the foods that they had eaten⁵⁸.

4.1.4.5. Prompts

Prompts were additional methods for the program to nudge participants into action. An overview of the prompts used in the publications can be found in Table 5. Prompts were described as positive reminders used to keep participants on track with the program. In one publication, daily messages acted as both a prompt and action planning, which had positive or negative effects depending on the nature of the message.

Table 5: Overview of prompts used in publications

Type of Prompts
Phone Calls (n=2) ^{63, 65}
Newsletters, e-mails, SMS (n=2) ^{38, 60}
Daily Message (n=1) ⁵⁹

Overall many participants were positive about the use of prompts. In one publication, e-mails were used as prompts. Participants highlighted that this helped remind them of the program and to be physically active. *"I'm being silly right now, but, I mean, it [each email] made you feel, it kept reminding you that you're involved in this thing, and so you wouldn't sort of abandon the whole program. So, that was good"*⁶⁰.

Fukuoka (2012)⁵⁹ sent via SMS messages/questions to the participants prompting them to problem solve. This was a positive feature or a negative feature depending on the message. Participants described situations when the prompt actually lead to an increase in PA if they had been able to find a situation to use the strategy. When a prompts was used and not applicable to the participants' situation participants did not see as much value of the prompt. *"One of the daily messages advised women to take a short walk before turning on the television. One subject reported: "I have two small children. I simply don't have time to watch TV"*⁵⁹. Although for some a specific situation was not required for them to increase their PA. *"I liked having the questions on how I was going to manage it. Even though sometimes they weren't applicable to me, it made me start thinking. I enjoyed that because it made me think more about my walking during the day so that I increased steps"*⁵⁹.

4.1.4.6. Other

A verbal form of confirming commitment was another strategy that had a positive impact on subsequent adherence. As one participant describes, *"When I've got an appointment, she says you've got to come at 10 o'clock next Monday. I'll come but if I haven't got to go, if I haven't got an appointment, I don't know... it's like going to the dentist. You don't go 'til you've got an appointment, then you have to go"*⁶⁸.

4.1.4.7. Participating in Research

When conducting a research project, participants might have trouble separating results from research and the program. Participating in research can lead to different results. This includes commitment to the research/researcher, incentive from the research and added tests from research.

When participants enrol in a research program, consent is required. This might lead the participant to feel additional commitment to the project. This feeling of commitment can be very strong among participants and the act of signing the consent form acted as a form of behavioural contract. *"Simply by signing the paper [consent form] that we signed you are committed"*⁶². This was discussed by many participants and enhanced adherence; wanting to contribute and knowing that their involvement is necessary for the researcher.

Participating in research also lead to a few participants in one publication (⁶⁴) with a feeling of being coerced. The research offered an incentive which made participants feel *"... forced to participate on*

*account of the financial incentives*⁶⁴. In this publishing, commitment to the program felt like coercion. *“When I first started this I wasn't sure, and kind of thought it would be annoying especially since I was being forced to do it”*⁶⁴. In one publication, participants mentioned wanting a material incentive. The participants discussed that a material incentive would have increased their incentive for participating, increase their physical activity involvement and resulted in a few more participants. *“They knew women who would have participated if there had been an incentive”*⁶⁰.

Finally, in five publications (^{47,42, 44, 57 51}) participants received additional tests in addition to the program, as part of the research. These tests were not part of the program although might have had influences on motivation and commitment. Participants were very curious about their results from outcome monitoring (blood pressure, blood glucose, cholesterol tests and body weight). *“I really would have liked to have results every time we met. That's the main reason I took part (blood pressure etc.)”*⁵⁷ and *“that's why I go. Hopefully the reduced sugar level when I measure it and I know it's healthy”*⁴⁴.

Participants discussed some tests are motivating although distinguishing (in these articles) might be difficult between monitoring from the program and monitoring from the research.

4.1.4.8. Summary

Program design is important for adherence. Major program components include the type of program (group vs. individual), monitoring (self or by others) involved, goal setting, routine formation and prompts. Group programs have positive benefits of providing additional resources for participants to gain social support (group mates, instructor). An individual program provides resources for the participant to learn self-regulation strategies. In both group and individual programs, the use of monitoring was very beneficial. Group programs have additional monitoring build in by the other group members and instructor, individual programs use more self-monitoring devices for participants to track their progress. Often the incorporation of additional monitoring by a program facilitator provided additional motivation to continue to attain goals and to be active. Goal setting was also very useful for participants to track progress and celebrate achievements but had some negative aspects if goals were not set appropriately. PA was easiest to follow if a routine was formed, enabling the physical activity to become incorporated into a habit. Prompts are a great way to sustain motivation by maintaining interest or renewing interest in a participant that has lost some interest. Finally, the influence of participating in a research project is also noticeable here. Participants that engaged in a research project might have gained additional motivation from the additional attention, tests and/or commitment to the research.

4.1.5. Community Level

The fourth level of the SEM is the community level; this includes the built, natural and social environment and local resources. The setting of PA can be an important factor for subsequent activity. This included the program providing resources (e.g. free access or transport), tailoring the setting to the target group and small environmental changes. Barriers that were difficult to change included the built, natural and social environment.

4.1.5.1. Providing Resources

When available, provision of resources such as access to a facility for free or free transportation is extremely helpful for the participants^{38, 42}. Financial barriers are often described among participants and offering a free program significantly removes this barrier. *“It is being given something [gym*

access card] for a year so I can change something. I think if I do less than 3 [sessions] it's not paying for my [gym access] card"³⁸. For some, this restructuring even leads to increased motivation, "It's being given something (free gym access) for me to get a year when I can change something"³⁸. In one publication, transport was provided to the program⁷² and was positively received by the participants. "They've got the transport. So I mean, I probably would not have come if it wasn't for the transport"⁷².

4.1.5.2. Environmental Barriers (build, natural and social)

The natural and built environments cannot always be restructured and for some participants this will lead to non-adherence. Barriers such as weather, location, and neighbourhood are examples. "Yeah I did half the program. I stopped because it got too far away for me"⁴⁹ AND "Some participants were able to get exercise by walking in their neighbourhoods, though many avoided doing so because they felt unsafe"⁷⁰. In these cases the programs might benefit from additional support to provide transportation or a walking group to make these environments more accessible.

One method of restructuring the physical environment included tailoring the setting for the target group as depicted in two publications with success (^{39, 61}). For one group of ethnic women the intervention organized a women's only program, ensuring the entirety of the program to be women's only, included change facilities, instructors and the gym. This was a major facilitator for this group of women and their families. "It's easy for me to say, 'I'm going to a ladies only gym, there's no men there', and I know there will be no disapproval from the male side of our family"³⁹. In another publication, the program was based and set inside a football club stadium. This was the ideal setting for the target group and lead to many positive statements from the participants including feeling more connected to their [football] team. "You're doing it at a place where you go to support your team and you are actually involved in it (the team) you're inside the stadium and you are actually getting shown about. It's fantastic."⁶¹.

Even small environmental adjustments, like music, smell of sweaty floors, heated pool and changing in front of strangers could impact adherence. Loud music recurred in three publications^{39 42 51}. "Then [the trainer] said, 'No, they don't like music on' then [everyone] agree as well. They said, 'Oh you are so kind, because we don't like music'"³⁹. These seemingly small adjustments can have an impact on the adherence, "Many of them thought that the music in the fitness centres is "too loud" and had quit spinning class because of this"⁵¹.

The social environment is troublesome to change as well. Many participants described family obligations as a barrier (n=10;^{41, 46, 48, 56, 62 39 35, 43 69, 74}) "For me, being a single parent, I am always on the go . . . It is hard for me to say I am going to the gym today because she may have something at the school and I have to go do that."⁴¹.

4.1.5.3. Summary

Major barriers for participants include fees, location, transportation, weather, timing, facility factors and the social environment. Programs that (try to) control for these barriers might have some benefit to the participants.

4.2. Facilitators and Barriers of Physical Activity Maintenance

4.2.1. Summary of the Publications

To answer the second research question a search was performed for articles that had published qualitative results about maintenance of PA after a program had finished. Thirteen publications^{38, 40, 44-46, 48, 51, 54, 55, 57, 58, 69, 70, 72, 73} were included for this sub question describing 20 types of PA. Data collection method included interviews (n=10) and focus groups (n=3). The participants' age ranged from 22-92 years and the number of participants ranged from 16-38 (interviews) and 16-28 (focus groups). Publications included male and females (n=10), males only (n=2) and female only (n=1). The majority of the publications were conducted in the UK (n=4) followed by the Australia (n=2), Denmark (n=3), Canada (n=2), US (n=1) and New Zealand (n=1). Most participants belonged to the majority ethnic group of their country (n=11) with two publications including minority ethnic groups. The conditions under investigation were older people (65+) (n=3), T2DM (n=5), sedentary (n=1) and at risk populations (n=4). Programs included group based PA (n=12), individual PA (n=5) or a combination (n=2) (table 6). Programs were physical activity only (n=8), were a combination of PA and education (n=2), PA and diet portion (n=2) or PA with diet and group reflection (n=1).

Table 6: Overview of PA program in SQ2

Program Type	Type of Physical Activity
Group Training (supervised) (n=12)	Unspecified Group Training (n=2) ^{38, 40}
	Resistance/ Strength Training (n=2) ^{44, 45}
	Aerobic (endurance) exercise (n=2) ^{44, 46}
	Combined Resistance and Aerobic (Endurance) (n=2) ^{44, 48}
	Cross fit + HIIT (spinning) (n=1) ⁵¹
	Falls Prevention Program (n=2) ^{54, 55}
Individual Training (n=5)	Football Program (n=1) ⁵¹
	Walking program (n=3) ^{57, 58, 64}
	PA at the Gym (n=1) ⁴⁸
Group or Individual Training (n=2)	Fall prevention home program (n=1) ⁵⁴
	Choice between community group programs (n=2) ^{69, 70, 72, 73} (e.g. tai chi, dance, strength training) or using the community facilities individually (e.g. swimming pool, gym, walking)

As the program was over, maintenance could not be directly linked back to a BCT. However, when possible, the responses are linked back to BCTs (see Appendix VI).

4.2.2. Four Types of Participants

Directly after a PA program has finished participants must decide their course of action. The results have been organized into four characterizations of participants that emerged from the analysis: participants that found a new PA plan, participants that did not find a new PA plan, participants that tried to maintain PA and participants that lost interest in PA. The final section describes common barriers that all individuals encountered.

4.2.2.1. Participants that Found a New PA Plan

There were some successful participants that were able to maintain physical activity in their life. Two main options emerged from the analysis: finding a new PA program or incorporating PA into a daily routine.

Other participants were able to continue with the same PA or start a new PA program. Some participants resulted in beginning to walk as their form of PA, *'I do a lot of walking'*⁴⁶. The more independent participants were able to continue PA on their own such as this participant by, *"swimming or running, usually before work, on a regular basis"*³⁸. Some participants described continuing the program in a modified format, by replicating the exercises at home⁵⁴. There was even evidence of participants continuing PA from a television program⁵⁴.

After participating in a PA program, successful maintainers described being able to find time for PA. *"They had managed to generate more time and motivation to exercise regularly"*⁴⁸. They were able to positively find moments during the day where they could easily incorporate a small PA session. *"Yes, when I drop off my daughter and go for a walk I feel invigorated. It makes you wonder why you don't do it more"*⁵⁷. Participants demonstrated the ability to overcome barriers and placed greater importance on PA in their life. For one participant, going on vacation was no longer a time to slack off, *"We took a cruise and I walked a kilometre around the boat every morning..."*⁴⁶. One participant even gave up his car to better maintain his walking habit. *'I gave up my car after my first session (referring to CHIP programme). I take taxis in the winter, but I walk 6 blocks to catch a cab'*⁴⁶. Finding time within a day is a valuable method to incrementally increase PA.

General facilitating factors as described from the participants are further explored below from most to least salient.

Social Support

Consistent with the results of SQ1, support remains to be highly relevant for maintenance of PA. Participants value the support given by professionals and other group members. Maintenance seems to be related to either finding support outside of the program (family, friends) or obtaining enough support from the program to feel confident enough (self-efficacy) to continue PA outside of the program.

The impact of family and friends on maintenance is very important. Family and friends can act as external motivators for the participants. Often participants describe the support they receive from family and friends as helping them to *"[make] it out the door"*⁵¹. This type of support also acted as a form of practical support. Participants feel more responsible to act when they are committed to a friend/ family member. *"If somebody says, Will you be here on Wednesday? ' ... I can't let them down, I will be here on Wednesday"*³⁸. This additional motivation has enormous "pull" on participants. A similar form of commitment exists between partners and exercise buddies. Having two individuals with a common goal results in more consistency. When one participant is having low motivation the other can influence and increase it and vice versa. This creates a positive partnership in PA. *"I get my husband to drag me out of bed in the morning. It's helped that he's going with me, so it's like a combined effort"*⁴⁴.

In one publication, a very intense bond formed within the football program participants that once the intervention finished the team decided to continue on their own. The participants booked their own football pitch and organized the group themselves. This is an excellent example of how social support in the form of friends and enjoyment can overcome most barriers to lead to maintenance of PA. *"All participants agreed that being part of a group, regardless of the group's activity, encouraged them to continue to exercise on a regular basis"*⁵¹.

Some individuals will assume the position of a role model for their family or friends. Hoping that their new positive behaviour will have a positive effect on the group. *“Not only were the positive outcomes affecting them individually, but some participants mentioned their behaviours were having an influence on their family and friends.”*⁷³ AND *“Quite often participants would refer with pleasure to ways in which their lifestyle changes influenced people round them. For example how visiting grandchildren would eat fruit if that is what was available and would stop looking for biscuits, or a friend or partner might be persuaded to join the gym or go walking”*⁶⁹.

Feeling Better

The second most salient finding from the participants that were able to incorporate PA into their lifestyle was the mention of additional health benefits and generally feeling better. Participants discussed the positive benefits on blood sugar, weight loss, feeling lighter and staying off insulin. *‘I continue my exercise because I have to lose a lot of weight, and I see a lot of results’*⁴⁶ AND *“And then even after I started getting sleep apnea, what made me start again was the only thing that could control my blood sugar”*⁴⁶.

Individuals who are able to continue to be physically active often comment on the enjoyment they receive from being physically active. *“The motivation has increased just by the pleasure I’m getting out of continuing”*⁴⁴. The participants reveal positive experiences of PA *“I just always feel good when I come out of the gym”*⁶⁹. The positive experiences have led to participants incorporating more PA into their lifestyle. *“Yes, when I drop off my daughter and go for a walk I feel invigorated. It makes you wonder why you don’t do it more”*⁵⁷. As one participant described, he felt a change in his motivation to be PA. *“...the driving force in that period (the beginning), that was the experiment. It was the effect of intermittent training, if it could change your blood pressure and all that. It’s a completely different situation we are in now. Now we’re here to have a good time and because we like each other and we like to play football.”*⁵¹. Participants also mentioned that they had feelings of achievement from the program that they did not want to lose. *“There is no way I am going to let go of what I have done because I worked too hard”*³⁸.

Routine

Participants often discussed that PA had become a routine for them. Participants acknowledged the beneficial impact of creating a habit out of PA became, often this routine was as a result of following the PA program, *“the supportive effect of the structure of a fixed time and exercise schedule”*⁴⁰. When PA became a routine, participants experienced more commitment and less excuses. *“It is just something you do without reflecting, negotiating and making the choice every time”*⁵¹. However, it was discussed that it took participants time to develop and maintain this routine. *“Many mentioned the time it took, usually about two years, to absorb the changes and routines into their lifestyles”*⁶⁹.

Confidence and Skills Gained from Program

Another theme that emerged from the data analysis was the knowledge and confidence gained from the program. Participants appreciated the experience and knowledge gained from participating in the PA program. The skills the participants gained enabled them to be better prepared for maintenance of PA. *“Learning how to use different equipment through the programme helped them to know their capabilities so they could exercise on their own post programme”*³⁸. Programs gave participants the boost that they needed. For some individuals, the program alone provided enough self-growth to enable participants to successfully continue in a standard exercise environment. *“The improved levels of confidence and competence empowered some participants to meet the challenge*

of moving from a highly supervised environment to a more standard exercise environment”⁵⁵. Completing a PA program in the environment of future activity was beneficial as it “broke down the barriers” associated with that environment. *“It was lovely to meet up with everyone twice a week. It broke down the barrier eventually of being nervous of going to the gym, because one has this idea of everyone being in their slinky leotards, fantastic gear and everything”*⁵⁵.

Goal setting

Of less importance was the impact of goal setting. This was not commonly discussed among follow-up interviews, although, some participants mentioned the benefit of having a target/goal for motivation. Having a goal gives meaning to an individuals' progress and something to work towards. *“Many mentioned the satisfaction of achieving a goal, [‘satisfied since you have done it’]”*⁶⁹. A goal can provide motivation when motivation is lacking, an extra reason for wanting to do some PA that day. *“I think that target has pushed me or pulled me, or kept me going... ..where I might have slipped and thought I won’t do this exercise today”*⁶⁹. Similar to goal setting, one participant valued the self-monitoring from the program. When the program ended, the participant continued this technique into the future. *“I think writing down what you’ve done is really useful. Since we’ve stopped I’ve been writing it down in a chart I’ve drawn myself”*⁵⁷.

Other

In two of the publications, participants felt so happy with the program that they want to contribute back. In these publications participants volunteered with the program and in one case a participant completed the training required to become an instructor for the program. *“I like helping out at the programme. It’s my turn to help others, like the programme helped me. So for new people to just see a welcoming, friendly smile would make me feel like I am doing my bit. That was a big difference for me, so I want to make a difference for others.”*⁷³.

In one publication, the intervention had a "follow-up" portion that extended after the intervention had finished. Participants highly valued these continued prompts and helped participants during the transition period. *“The programme has newsletters, so once the programme is finished, you’re still getting the newsletters. We get stuff on text, we get stuff on e-mail”*³⁸. This had positive effects and continued to place PA in the forefront of the participants’ minds. Another publication's included support during the transition period. Participants were very positive about this extra support. *“They praised the exercise class leaders’ support during the transitional phase”*⁵⁵. However, in this intervention it was possible to continue exercising in the same environment. This was beneficial to the participants because they had already become familiar and comfortable in the environment. The old environment was described as a more positive option than going to a new environment. *“At the end, we were given a list of other places to go to. I often thought, ‘sounds interesting, I think I’ll try it’, but it was so much easier to go to the same place where we had been doing our exercises, I knew it, I could park—it was easy for me, so I didn’t bother with any of the others”*⁵⁵.

4.2.2.2. Participants that Tried to Maintain PA

The third group of participants are those that more actively had a plan/strategy to maintain physical activity however, were unable to find something suitable to allow them to maintain PA. Most participants described the difficulties associated with trying to begin PA on their own. *‘I had a lot of trouble going from CHIP which was to me a class A programme and being dumped...to find yourself in another place...’*⁴⁶. The participants became comfortable with the program, with the program participants and the instructors. All of these become small barriers once trying to find a new

program. Even a small barrier such as music could hinder maintenance. *“Many of them thought that the music in the fitness centres is “too loud” and had quit spinning class because of this”*⁵¹.

Suddenly being grouped in with the general population was a barrier for most individuals. No longer being in the comfortable environment of having a group of similarly composed individuals created barriers for many participants. *“The subjects who were doing spinning and cross fit also felt marginalized because of their age when looking for a new place to exercise after the intervention had ended.”*⁵¹ AND *“For me it’s hard to go into a room full of these young people and mingle, because I can’t keep up and I feel they are judging me”*⁵¹.

Participants also valued the level of monitoring in the program. Participants struggled to find a new program that could support them in the same manner. *‘It was difficult to find a similar programme to the one [used in the study], with some sort of monitoring’*⁴⁵. This was especially present in the gym environment. *“They [commercial gyms] tend to leave you to your own devices, or push a programme of their own”*⁴⁵. A new environment presents a new challenge for the participants. *“I went to the gym once and kinda thought it was terrible. I didn’t want to go back”*⁶⁹. Some individuals tried starting a home program, but often felt this was not as enjoyable. *“When you have to do it at home it’s not as much fun”*⁵⁴. In one publication the difference was outlined between team sports in associations and fitness centres. Team associations (such as football clubs) were described as *“very closed”*⁵¹. This is in contrast to fitness centres where it is easier to gain access to but participants might leave more quickly from these associations⁵¹.

4.2.2.3. Participants that did not find a New PA Plan

The second group is composed of individuals that had the intentions to continue PA, however these participants were unsure of where to go and what to do. *“Unfortunately, when the programme stopped, I said where do I go from here?”*⁴⁶. These participants had not created a plan on how to continue their PA. *“Most of the MMU site participants stressed their intention to maintain the health benefits however they did not report specific strategies or plans.”*⁵⁵. Without a plan, participants would feel overwhelmed at the lack of structure following the program. Some participants referred to this as fear. *“When you walk out of this (CHIP), I’m really afraid of what is going to happen. When I get out of here...over the long term, I’m afraid all this is going to be undone. I just realized that it happened and it wasn’t on purpose.”*⁴⁶. Without a suitable plan, participants’ good intentions to maintain physical activity would often fail. *“I have not had the resources to start up exercising as fast as I had expected. I had expected to be roller skating and training at a fitness centre by now.”*⁴⁸.

Participants described wanting a transition period as a positive enabler to maintain PA. This generally consisted of wanting continued monitoring, *‘Maybe we should have some follow-up every 3 months or every 6 months... for a meeting or even to know where we end up and what’s the results you know.’*⁴⁶ and support in finding a new program *‘CHIP should have a package programme... at least being able to say to people like us... ok we’re going to show you what you have to do. We’re going to check you out and then after that, we’re going to give you some place that you can go to that we approved of how they operate. And you are going to be allowed if you want to call one of our trainers to update your programme...’*⁴⁶.

4.2.2.3. Participants that Lost Interest in PA

The last group is composed on participants that did not see positive benefits of PA. These participants, *“Found exercising to be a waste of time and the cause of her back pain”*⁴⁸. Not all

participants were able to increase their self-efficacy and some still felt, *“exercise seemed like a lot of effort”*⁶⁹. In addition, some participants just had a general disinterest for PA⁴⁸. For some participants, the positive benefits of PA could not increase their motivation to become PA. *“...When I check my blood, I see the difference if you don’t exercise so you know it’s an investment that I am making on that part of my life...The only thing is my motivation...not there all the time”*⁴⁶. Although these participants demonstrated knowledge of the positive benefits, these did not have an effect (outcome) on their behaviour. *‘My brother was diabetic, and had his leg amputated. I mean I should be like... hum... But some reason I am not!’*⁴⁶ AND *“I hear you my sister is diabetic, and she is on insulin, and my brother is diabetic...”*⁴⁶.

4.2.3. Barriers that Everyone Encountered

The transition period is a very important time for all participants. This is the time between terminating the intervention and continuing PA on their own. Most participants discussed difficulties with maintaining PA after a program had finished. The majority of participants valued the programs they had been enrolled in and wished the program would continue. *“I think I am conscious that I have got to keep fit and if this exercise was repeated for another year I would be more than willing to take part”*⁵⁵. Participants wanting to continue to be physically active were generally positive that they would continue with the program if made available, *“If they were prepared to keep the classes on here, we would come indefinitely”*⁵⁵. As this was often not the case, participants were required to find their own method to maintain PA.

A prominent theme among publications included participants describing an accumulation of barriers as time progressed. *“As their experience with exercise increased over time so did the number of barriers reported”*⁴⁴. While at the beginning a few barriers could be overcome, as time passed and more barriers became prominent and participants had more difficulty maintaining PA. *“I think in life you can cope with so many things and then it just gets too much for you. You need to deal with some things before you can move on and deal with others”*⁶⁹. These barriers included illness/injury and family obligations, weather, work, vacation and money.

While family and friends can be positive external motivators, they can also create barriers. Family (caring) obligations were often described as a barrier to PA. Participants have certain obligations that limit their abilities to be physically active. Some participants acknowledge this as a barrier in itself, while others demonstrate a wish for it to be different. *“She (daughter) slows down a part of my life. I have nobody who is able to take care of her yet. It slows me down a little and that irritates me”*⁴⁸. Friends (and family) can also have a negative effect when the new behaviour is not concurrent with a social groups norm. Participants find it more difficult to remain physically active if their friends/family are not physically active. *“The interviewed informants stated that a close-knit behavioural pattern amongst friends can be a barrier for behaviour change. Furthermore, none of the informants had friends who exercised on a regular basis”*⁴⁸. However, this is not always the case.

Of these, the most common barrier to PA cited was illness or injury that disabled the participant from continuing with their PA program. *“I’ve had a sore back since about the end of June. At times it’s so bad I can’t even get on the treadmill. I find it really tough to stay motivated at the moment because I try something then I can’t move for about 2 to 3 hours”*⁴⁴ AND *“They found a tumour in my kidney and I started to worry, and this threw me off ”*⁴⁶. After illness, weather (rain, ice, cold/hot temperatures) was cited as de-motivators. *“In the winter, I figured I would go for walks from the*

mountain, but I am afraid of the ice... So basically the season is a problem for people... this winter is a problem”⁴⁶ AND “I hit a rough patch when we had that wet period”⁵⁷.

Other barriers were mentioned included work, time, transportation and cost. Together these barriers form common setbacks that individuals will encounter in everyday life. Some publications were able to help participants prepare for these setbacks through planning, demonstration of performing the behaviour in not ideal conditions (e.g. walking in the rain) and planning to incorporate changes to lifestyle to benefit the person (e.g. take some extra time to walk to work instead of drive). These are examples of methods that future programmers can think. While it is difficult to remove barriers for everyone, programmers can incorporate strategies and skills that can equip participants to better learn to deal with the inevitable barriers.

4.2.4. Summary

Overall, social support remains the most important factor related to maintenance of PA. Participants often struggled with the transition period and required additional support from the program (most often the instructor/ other participants), their family or their friends. Secondly, in order to have successful maintenance participants must gain skills, knowledge, confidence and a routine from the program in order to support themselves once the program has finished. This includes either learning how to self-sustain individual exercise by gaining confidence to continue individually in a gym or other facility environment and giving PA more priority in one’s life. Finally, enjoyment from PA must be present for successful maintenance. This could include enjoyment from achieving health/body improvements, social time (exercising with friends) or an escape from life. Motivators for maintenance are generally the same as motivators for adherence during a program.

All participants encountered barriers. Barriers such as cost and transportation remain important for most individuals. Other barriers such as illness, time, family obligations, confidence, ability and weather are present in most individuals; however some participants are more equipped to deal with these barriers. Methods to overcome these barriers include having friends and family for support and learning techniques to overcome barriers from the program (routine, walking in bad weather).

5. Discussion

This study reviewed 40 publications using participants' views and experiences of physical activity programs at two time points. Participants were either at risk of developing a chronic disease (overweight, sedentary, older adults) or had a chronic disease. Many program components have been identified from this review as facilitating adherence during a program. In addition, this review looked at 15 publications that included post-program maintenance interviews, revealing common facilitators and barriers that participants encounter after program completion, a time referred to as the transition period. The transition period remains a major barrier for participants after a program, as indicated by the constant finding of approximately 50% of participants discontinuing PA after program completion^{4, 5, 14, 19}.

Overall, the most salient finding is the effect of social support on both adherence and maintenance of PA. The main finding is in line with results from previous research indicating social support or having an exercise companion is beneficial in adherence and maintenance^{15, 20, 75}. This finding is closely related to another major finding of general enjoyment of the program contributing to positive experiences and health benefits, with participants describing physical activity time as social time⁶³. An interesting and significant result is the central role of the instructor for adherence to a program, although this may have negative implications for maintenance. Other program components such as monitoring (with or without feedback), self-monitoring, goal-setting, prompts, action planning, self-talk and social comparison seem to have benefits in a program.

Group programs tend to increase enjoyment of participants and may have additional benefits on adherence in comparison to individual-based programs. In line with previous research, findings from this study indicate that group based activity helps participants adhere through social interaction with others⁷⁵⁻⁷⁷, natural peer support⁷⁶, mutual commitment among friends^{75, 76}, opportunities for instruction in proper technique⁷⁵, social comparison⁷⁷, role modeling⁷⁷, increasing comfort⁷⁷ and qualified supervision⁷⁵. Results from this review indicate that participants in a group program encounter many barriers to continuing PA after the program has finished. This is largely from the sudden lack of support.

In general, programs must provide an overall positive experience for the participant. Many participants that continued being physically active described enjoyment and gaining benefits that bridge from the program to their lifestyle. While this form of intrinsic motivation takes more time to develop⁷⁸, it has implications for maintenance as long-term adherence can be enhanced by making physical activity a part of one's lifestyle⁷⁵. Participants that drop out, generally attribute it to the fact that a program did not benefit them. For example, studies show that if a participant joins a program to lose weight and then doesn't, they are less likely to adhere⁷⁶. However, the present findings indicate that if a program is able to provide additional benefits that override this original goal (weight loss) and replace it with other positive benefits (improved health, friendships, feeling better) then participants might adhere and have maintenance. This is one of the ways that social support acts as such a strong adherent factor.

The instructor has been found to be a central component in adherence, often taking on a dual role of both mentor and instructor⁷⁷. However, this can lead to participants having an increased dependence on the instructor because of the strong feeling of comfort and support received from them⁷⁷. This

might be one of the reasons participants struggle with the transition zone. The group participants have been taught in a specific environment with an instructor and tend to rely on the instructor⁷⁷. When the environment and instructor are no longer there, participants feel like they are missing the prior support that used to guide them through their program. An exception to this was found in one publication, when a football team decided to continue, independently, because they had found support in each other and no longer needed the programs' support⁵¹.

Individual programs have potential to enhance adherence and subsequent maintenance through the use of external social support (in the form of friends/family)^{15, 20, 79}. The probing of self-awareness and self-motivation is important for both individual and group programs however, might be more important in individual programs because of the individual nature of the program. Self-monitoring and goal setting seem to be two program components that can contribute to this. Self-monitoring has been found in walking interventions to increase self-efficacy and reduce perceived barriers⁸⁰. Evidence suggests the benefit of combining self-monitoring practice with goal setting⁷⁹ because self-monitoring helps to realize progress towards goals.

The participant population of this review might struggle more with setting appropriate goals as their PA knowledge might be insufficient and the task too complex for them⁸¹. Often individuals with or at risk for chronic disease are sedentary and have limited previous experience (and therefore knowledge) of PA. Process goals have been reported to lead to more enjoyment and less pressure⁸², which can have additional impacts on maintenance of behaviour. Decreasing the pressure of achieving outcomes (e.g. weight loss) might lead to more participants realizing gains in PA ability or general health (improved mood/feeling more fit).

As shown from the review, additional components are beneficial for adherence. This includes the use of prompts, action planning, self-talk and social comparison. The use of prompts is another BCT that shows great promise. In a systematic review, the use of prompts lead to the largest positive change in PA⁸³. Action planning was not very present in the data. It is defined as prompting detailed planning of the behaviour (must include context, frequency, duration and intensity)²². Action planning might have additional relevance in maintaining physical activity by planning ways to remain active following program completion and therefore reducing some barriers faced during the transition period. In a systematic review by Greaves (2011)⁷⁹, self-talk was found to be associated with maintenance of behaviour change. Self-talk was described by a small minority of participants in a positive way, and demonstrated increased self-awareness and personal responsibility (attendance, effort, progress). Finally, social comparison is very effective for behaviour change, while this can be enhanced in group programs, individual programs should try to incorporate this by providing population averages (e.g. average daily steps).

Similar to previous studies, programs with additional components seem to have an overall positive benefit^{76, 79}. The present findings indicate that an additional knowledge component further developed better understanding of participants' disease, how to perform PA, the importance of PA and strategies to increase PA. Evidence from a systematic review by Greaves, Sheppard, Abraham, Hardeman, Roden, Evans, Schwarz⁷⁹, indicated causal evidence that interventions targeting both PA and diet produced greater weight loss. Evidence from present findings also indicates this trend, with participants appreciating the complementary information of diet and/or health education and exercise provided together.

5.1. Implications for Practice

A few implications for practice have been created based on the major findings from this review and previous literature. This includes incorporation of social support during and after a program, ways to increase self-awareness (goal-setting, self-monitoring), multiple components in a program and emphasis on the support during the transition period. The care sport connector (CSC) can use these recommendations when planning future programs.

Social support was the strongest finding from this review and therefore future programs should include social support (group based program) or help find social support for participants (buddy program, encourage family involvement). The present results indicate that it is more important for social support to be present than from whom it is coming from (group, family, friends, instructor). While any type of support is beneficial, depending on a participants' situation, a certain type of support might have more benefit. Situations where participants do not have support at home might be more encouraged by support from the group/instructor; in contrast, participants with a supportive home environment do not require the additional supportive environment of a group.

The most beneficial strategy would be to have an on-going program, keeping the environment and instructor steady over time. This requires more resources and planning and therefore may not be always feasible. Another method is to foster social networks amongst participants. This will help participants learn to rely more on each other in place of the instructor, a method found beneficial to physical activity maintenance⁷⁷ and exemplified by the football association⁶³. Methods to achieve this include helping participants find an exercise companion or having the instructor try to shift dependence from the instructor to the group. Individual programs also have potential, however, social support should be stressed by having participants seek out an exercise companion or have the program provide possible exercise buddies (most often in the form of friends/family) to enhance adherence and subsequent maintenance^{15, 20, 79}.

Programs, especially individual programs should aim to increase self-awareness. Methods to achieve this can include self-monitoring (log book, pedometer and/or heart rate monitor) and goal setting. These two components are highly linked and when used together can increase self-motivation. Goal setting has potential to increase motivation and self-efficacy⁸¹ however, must be incorporated into programs effectively. Additional support in this area (through the program) would be beneficial to maximise benefits of goal setting.

Finally, incorporating health education or food/nutrition information in the form of meetings, workshops or cooking lessons are all additional components that can have positive effects on gaining lifestyle behaviour changes.

As the CSC is a relatively new role in the Netherlands, the precise responsibilities of the CSC vary between communities, either setting-up/adapting PA programs or being the instructor in the program. In both cases the CSC can use the recommendations below either directly or to ensure these recommendations are being implemented in practice (by someone else).

Summary of recommendations for CSC:

- Create groups composed of similar individuals (age, culture, disease status)
- Provide opportunities for bonding within group activities and foster a supportive atmosphere
- Match up similar individuals as exercise buddies
- Be aware of the "transition period" requiring additional support and ready to provide that support or find a method to continue being supportive for the individual between PA programs
- Provide self-monitoring devices (pedometers, log books, heart rate monitors)
- Help form goals with participants and review goals with participants, adjusting if necessary
- Include health education and/or nutrition workshops in addition to physical activity
- Perform random phone calls to check-in on participants

5.2. The Use of Theory

Two theories (SEM and PAM) and the BCT taxonomy were used to guide the analysis of data. The use of the SEM in PA programs was very beneficial, while the use of PAM was less useful.

The use of the SEM was very helpful as factors from all levels of the SEM influence adherence and maintenance of PA. For PA, the interpersonal level, intrapersonal and institutional levels play key roles for both maintenance and adherence. From the current results, the interpersonal and institutional levels (provided by the program) have significant influence on the intrapersonal level, and must be stressed in future programs to have the most influence on an individuals' adherence and maintenance.

The PAM model was incorporated in this study as one of the only theories specific to factors associated with maintenance of PA. This model was used for the analysis of SQ2, however the results did not appropriately fit in this model. While the PAM postulates that factors are different between adherence and maintenance, our results indicate that many factors carry-over.

The PAM model places more emphasis on three psychosocial variables (goal setting, motivation and self-efficacy) and less emphasis on the main factors identified in our results; life stress and PA environment. The physical activity environment (including social support, access and exercising among similar individuals) was the most important factor and should be incorporated in an intervention program. Life stress was also an important component from the PAM. Evident from our results barriers tend to build up over time, which is in line with the PAM model.

Overall, the SEM was very useful to use in this research and should be used in future research projects on the topic of physical activity adherence and maintenance to ensure that a program is represented at least at the intrapersonal, interpersonal, institutional and community level. The PAM model was not useful in this research and requires modification to place more emphasis on the life stress and physical activity environments.

5.2.1. Use of the Taxonomy Tool

The BCT taxonomy was useful to ensure comprehensiveness of program components, however a few coding difficulties emerged. This included difficulties related to the length of the taxonomy and applicability difficulties due to vague reporting of program descriptions.

A smaller version may be of use for PA interventions. Only 47 of the 93 BCTs were coded from the results section of the publications. Indicating that many BCTs included in the taxonomy are not being used in PA interventions, at least not reported in this literature review study. There were also some findings that emerged from the results that are not incorporated into the taxonomy. Examples of these include individual tailoring, having a similarly composed group (age, disease status, ability) and study design characteristics (number of meetings, time, length). The components were also found to have an important role in behaviour change and should be included in the taxonomy.

For comparison purposes, the method section of included publications were coded and compared against the BCTs coded from the results section of the same publication. Coding of the method section resulted in 33 of 93 BCTs, indicating that 14 less BCTs were coded by methodological program description compared to what participants described. This discrepancy can be a result of two main reasons. The first is that reporting of interventions is often inadequate. Reporting of intervention description greatly varies in the amount of wording and details provided. Often BCTs could not be coded in the method section due to lack of specificity (e.g. motivational interviewing could only be coded as social support), however after detailed qualitative recounts from participants, a better more accurate detailing of the intervention can be created (additional components from motivational interviewing were revealed). As indicated by previous research^{80, 84} interventions are often not adequately described which might have led to some BCTs being missed. Secondly, some BCTs might have been described in the results section as a result of the participants' own doing and were not actually "prompted" by the program (e.g. never told to try self-talk but spontaneously found a benefit of using the technique). This might indicate that these BCTs may be more important for individuals than previously thought and could have additional benefits if included in future research.

It should also be noted that in some interventions the reporting and execution of the program might not be synonymous. This was evident in one publication where a BCT was described in the intervention protocol, however results indicated that the BCT was not executed as planned. This indicates that not all BCTs coded in a method section will be executed adequately, which has been found in other intervention studies⁷⁷. This indicates the limited use of BCT coding by the method section however, this also indicates a benefit to qualitative research to be included in evaluation designs. Qualitative research will enable more in-depth recognition of what actually was done in the intervention.

Finally, the optimal use of BCTs in PA programs had not been concluded. BCTs must be chosen with a specific program in mind. Simply including a BCT will not lead to an effective program. This includes being aware that there is variation within BCTs (e.g. pedometer vs. log book vs. both) and in the execution in BCTs (e.g. variation in abilities of instructors coded as a credible source). In addition, there may be additional benefits of pairing or clustering BCTs such as goal-setting plus self-monitoring or goal-setting plus self-monitoring plus feedback. Only general recommendations could be made and this can only be discovered through additional research, such as RCT trials.

5.3. Strengths and Limitations of the Review

A strength of this review was the incorporation of qualitative data to discover participants' views'. As far as we know, this is the first qualitative review from the participants' perspective that looked into program components as quantified by the BCT taxonomy (v.1). Qualitative data is very beneficial information for obtaining participants' views and experiences of PA programs. 40 publications were included in this review, providing a large sample of qualitative data. Although there was a lot of heterogeneity in terms of program design, type of physical activity, study population, age, length of program and follow-up periods, this was not found to have an effect on the conclusions drawn. In addition, this review used a large (93-item) taxonomy to evaluate program components, giving a comprehensive overview of program components used in the literature and therefore is useful for future program planning.

Methods to increase reliability and validity were used. Two researchers completed the systematic inclusion and exclusion process, aside from the initial search, which was completed by one researcher and checked by the second. Prior to coding, the first researcher completed an online training course for coding using the BCT taxonomy (v.1) and received a certificate of completion after completing all of the modules and tests (Appendix VII). This prepared the researcher prior to initiating the coding process and enabled familiarization with the taxonomy and associated definitions. Initial coding was completed by the first researcher and was further discussed with two other researchers to increase objectivity.

This review looked at maintenance after a program had finished. This is in contrast to the definition of maintenance from the transtheoretical model (TTM) that defines maintenance as persisting in a habitual behaviour (in this case PA) for at least 6 months⁸⁵. The definition used was chosen because literature shows that participants struggle during the period following program completion^{4, 5, 14, 19}. As evident from the current results, this definition is more useful than the TTM's definition for maintenance, as programs that are longer than 6 months still have participants struggle with the transition period. This indicates that the transition period is an important component that must be overcome for successful maintenance of PA.

The role of research might have had an effect on the responses of participants. In this review, an attempt was made to distinguish between responses that referred to research and program components (e.g. commitment to the study vs. commitment to the group/class). In some cases, responses were difficult to separate, as the research was integral in the program.

5.4. Recommendations for Future Studies

This review indicated benefits of looking at qualitative data to discover participant's views on PA programs. This review included many qualitative publications however; still many publications on PA activity programs were excluded, as they did not incorporate a qualitative component. Knowing the benefit of qualitative data, future PA programs should include a qualitative component as part of data collection and/or program evaluation. Qualitative data can also be used to as a form of validation of methods used.

As indicated by previous research improvements in program reporting is required to more accurately extract program components and will benefit future research. Researchers ought to report program details in greater detail in the method section, which will allow the program components to be more

salient. The BCT taxonomy presents one method to more accurately specify intervention components. This benefit will be at its' highest when more researchers accept the taxonomy and use the language appropriately to enabled greater comparison. However, the use of a BCT does not necessarily lead to execution or behaviour change and should be complemented with evaluation studies to verify whether the BCTs were all implemented and how effectively. Finally, the BCT taxonomy should not be used alone, but combined with additional theory to help determine which BCTs are necessary and useful for the specific behaviour change. Specific to PA programs, the creation of a smaller BCT taxonomy should be considered. A starting point for a future PA taxonomy can be the summary table found in Appendix V.

This research looks at a wide variety of programs. Additional research on group compared to individual programs might be beneficial to detangle the effective program components for each and to further investigate the role of the transition period. In addition, this study could not determine which methods are best within the program components (e.g. pedometer, heart rate monitor, log book or a combination). This is an area for further investigation requiring different research methods.

6. Conclusion

This review provides an in-depth analysis of the views and experiences of participants in PA programs, exploring the facilitators and barriers associated with various program components. This review investigated factors associated with adherence to a PA program and maintenance after a program has finished.

Social support is a crucial component of a program for this population and has a role in both adherence and maintenance of physical activity. Closely related, the general overall experience of the program (enjoyment) has a large effect on adherence and maintenance. Most individuals experience difficulties during the period immediately following program completion. Experiences during the program provide support, skills and tools for the participant to use during this time. Future programs should aim to foster social connections within the program to enhance both adherence and maintenance. These social connections are also one method to decrease the dependency on the program/instructor.

The behaviour change taxonomy was a useful tool to comprehensively extract important program components from the publications. A smaller tool, specific to physical activity, might be beneficial for future research and/or for the development of future physical activity programs.

Multiple factors play a role at different levels of the social ecological model. This indicates that engaging in physical activity is a complex, multifactorial process. Future programs should ensure that the first four levels (intrapersonal to community) are represented in a PA program. The most prevalent finding is the role of the interpersonal layer where the influence of peers, family and friends come into play on an individual's physical activity levels. Additional emphasis on this level might have positive benefits to future programs for both adherence and maintenance of physical activity.

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Appendix I

Table 7: Critical Appraisal Tool used to assess the publications, by Boulton, Fitzpatrick and Swinburn (1996)

	Publication [Year]	Publication [Year]	Publication [Year]
Introduction			
1. Is the aim of the study clear? <i>(i.e. clearly formulated at the beginning and consistent with the way data were collected and analysed)</i>			
2. Is the approach appropriate to the aim? <i>(i.e. quantitative, qualitative, mixed-method?)</i>			
Sample and generalizability			
3. Are the criteria for selecting the sample clearly described? <i>(i.e. exclusion and inclusion criteria specified)</i>			
4. Is the method of recruitment clear? <i>(i.e. an account of from where, by whom and how those potentially included in the sample were contacted)</i>			
5. Are the characteristics of the sample adequately described? <i>(i.e. age, gender, ethnicity, social class and other relevant demographic characteristics)</i>			
6. Is the final sample adequate and appropriate? <i>(i.e. large and diverse enough for the aims of the study to be fulfilled)</i>			
Methods of data collection			
7. Is the fieldwork adequately described? <i>(i.e. an account of where data were collected, by whom, in what context)</i>			
8. Are methods of data collection adequately described? <i>(i.e. an account of ways the data were elicited, and the type and range of questions)</i>			
9. Are the data collected systematically? <i>(i.e. evidence of consistent use of interview guide or rationale for ceasing questioning)</i>			
10. Are the data collected sensitively? <i>(i.e. evidence of flexible approach, responsiveness to participants' agendas, following up questions and adequate time given)</i>			
11. Are careful records of data kept? <i>(i.e. audio/video recordings and fieldnotes which can be independently inspected)</i>			
Data analysis			
12. Are the processes of data analysis adequately described? <i>(i.e. an account of how data were processed and interpreted; of how concepts, themes or categories were developed)</i>			
13. Is evidence provided in support of the analysis? <i>(i.e. excerpts from original data, summaries of examples, or numerical data presented as evidence for interpretation made)</i>			
14. Is sufficient original material presented? <i>(i.e. original material not just a token illustration)</i>			
15. Is there evidence that supporting material is representative? <i>(i.e. excerpts are named or numbered and sources given)</i>			
16. Is there evidence of efforts to establish validity? <i>(i.e. evidence that accounts of the phenomenon reflect it accurately)</i>			
17. Is there evidence of efforts to establish reliability? <i>(i.e. evidence that accounts of the phenomenon are consistent over time or between researchers)</i>			
Discussion			
18. Is the study set in a broader context? <i>(i.e. compared with other studies in terms of methods, findings or implications; related to a wider literature and body of knowledge)</i>			
Score			

Appendix II

Table 8: Summary table of publications including country, setting, sampling technique, sample characteristics, study population, type of study, methodology, data collection method and qualitative data analysis

Authors, Year of Publication	Country	Setting (Urban/Rural)	Sampling Technique	Sample Characteristics (Sample Size/Gender/Age/Ethnicity)	Study Population	Type of Study	Methodology	Data Collection Method	Qualitative Data Analysis
Aubrey, 2012	United Kingdom	Urban	Convenience sample	25, M/F, 32-85, UK	MS	Intervention	Qualitative	Focus Group	Inductive
Bredal, 2011*	Denmark	Urban	Representative (Strategically selected key informants)	7, M/F, 22-82, Danish	Sedentary, with or at risk for lifestyle disease	Intervention	Qualitative	Interviews	Inductive
Canuto, 2013	Australia	Urban	Purposive sampling	51, M/F, 18-64, Aboriginal/Torres Strait	Overweight	Intervention	Mixed-Methods	Interviews	Inductive, Nvivo
Capal, 2014	Australia	Urban	Triangulated sampling method: community presentation and flyers and snowballing	10, M/F, 62-75, Australian	Older Adults	Research	Qualitative	Interviews	Inductive
Casey, 2010*	Canada	Urban	Invited everyone who completed the program	16, M/F, 39-65, Canadian	T2DM	Research	Qualitative	Focus Group	Inductive
Coghill, 2009*	United Kingdom	Urban	Purposive sampling	38, M, 49-59, UK	Sedentary, hyper-cholesterolemic	Intervention	Qualitative	Interviews	Inductive
Dodd, 2006	Australia	Urban	Invited everyone who completed the program	9, M/F, 27-61, Australian	MS	Intervention	Qualitative	Interviews	Inductive, QSR NUD*IST, member checking

Ferrand, 2008	France	Urban	Purposive and random sampling	23, M/F, 35-78, French	T2DM	Intervention	Qualitative	Interviews	Inductive, Independent coding
Fukuoka, 2012	United States	Urban	Invited everyone who completed the program	41, F, 25-70, Caucasian, Asian, Hispanic, African American, biracial	Sedentary	Intervention	Qualitative	Interviews	Inductive, Atlas.ti
Gillis, 2002	United States	Urban	Stratified random sampling	20, M/F, 67-82, American	Older Adults	Research/evaluation	Mixed-Methods	Focus Group	Inductive
Gram, 2014	Denmark	Urban	Selective/purposive	14, M, 23-38, Caucasian	Sedentary, overweight, fasting glucose, blood pressure	RCT	Mixed-Methods	Interviews	Inductive + Deductive
Gray, 2013	United Kingdom	Urban	Purposive sampling of completers; invited all drop-out participants	39, M, 35-65, UK	Overweight	Pilot study	Qualitative	Focus Group and Interviews	Framework Approach, Nvivo 9
Haas, 2014*	Australia	Urban	Purposive sampling	23, M/F, 71-92, Australians + ethnic minorities	Older Adults	Research (follow-up)	Qualitative	Interviews	Content Analysis, Framework approach, Nvivo, member checking, peer debriefings
Hardcastle, 2001	United Kingdom	Urban	Opportunistic + theoretical sampling	15, F, 50-80, UK	Older adults	Research	Qualitative	Interviews and Life Story	Content Analysis, Nud*IST
Heesch, 2005	Denmark	Urban	Invited everyone who completed the program	13, F, 35-49, majority Caucasian	Older adults	Research	Qualitative	Focus groups	Content Analysis, QSR N6

Hunt, 2013	United Kingdom	Urban	Random sampling	29, M, 35-65, UK	Overweight	Pilot study	Qualitative	Interviews	Content Analysis, QSR Nvivo 8
Ingram, 2011	United States	Urban	Invited everyone in the program	33, F, 44-69, African American	Sedentary, obese	Research	Qualitative	Focus Groups	Content Analysis, Nvivo 7
Ingram, 2009	United States	Urban	Invited everyone in the program	24, M/F, 33-95, Mexican American	T2DM	Research	Qualitative	Focus group	Grounded Theory
Kluge, 2014	United States	Urban, assisted living	Purposive sampling	10, F, 71-93, American	Cognitive impairment	Research	Mixed methods	Focus Group, Field notes, Interviews	Thematic content analysis
Learmonth, 2013	United Kingdom	Urban	Participants who had completed the program	14, M/F, 41-68, UK	MS	Research	Qualitative	Focus Group	General Inductive Approach; Thematic content analysis
Nielsen, 2014*	Denmark	Urban	Participants who had completed the cycling or cross fit program	28, M, 39-70, Danish	1) Elderly and 2) T2DM	Research/follow-up	Qualitative	Focus Group	Content Analysis, using Atlas.ti
Penn, 2014	United Kingdom	Urban	Purposive sampling	20, F, 26-45, (culturally adapted to Pakistani, UK South Asians)	Risk of T2DM	Evaluation	Qualitative	Focus Group	Framework approach, Nvivo V9 data analysis software
Penn, 2013*	United Kingdom	Urban	Purposive sampling	15, M/F, 45-63, British	Risk of T2DM	Evaluation	Mixed methods	Interviews	Framework approach, Theory domains framework
Penn, 2008*	United Kingdom	Urban	Purposive sampling	15, M/F, 51-74, British	Impaired glucose tolerance, overweight	Evaluation	Qualitative	Interviews	Framework approach, Nvivo data analysis software

Perry, 2008	United States	Rural	Everyone was invited from HTH group	17, F, 22-65, non-Hispanic white	Sedentary	Research	Qualitative	Field Notes and Focus Groups	Qualitative content analysis
Roessler, 2011*	Denmark	Urban	Strategically selected key informants	30, M/F, 25-79, Danish	Type 2 diabetes, hypertension and dyslipidemia	Research	Qualitative	Interviews	Thematic analysis?
Russell, 2013	United States	Urban	Purposive sampling	23, M/F, 25-70, African American	Overweight	Research	Qualitative	Focus Group	Framework Approach
Sabiston, 2009	Canada	Urban	Purposive sampling	8, F, 27-62, White Canadians	Overweight	Intervention	Qualitative	Interviews	Interpretive phenomenological approach, data software QSR N6
Seale, 2013	United States	Urban	Contacted previous participants	20, M/F, 50+, African American	At risk for diabetes	Research	Qualitative	Focus Groups, Nominal group activity	Qualitative inquiry
Shaw, 2011*	United Kingdom	Urban	Invited everyone in the program	17, M/F, 37-63, UK	At risk population	Research, evaluation	Qualitative	Focus groups	Thematic Analysis, Atlas.ti
Shiner, 2008	United States	Urban	Appreciative inquiry (successful behaviour change participants)	8, M/F, 28-58, Caucasian	Serious mental illness	Research	Qualitative	Interviews	Thematic Analysis
Sims-Gould, 2012	Canada	Urban	Invited everyone in the program	84, F, 65-75, half of participants foreign born	Older Adults	RCT, Intervention	Qualitative	Focus Groups	Framework Analysis; Nvivo 8.0 (QSR)
Smith, 2013	New Zealand	Urban	Invited everyone in the program	27, M/F, 34-71, New Zealand	MS	Feasibility trial	Qualitative	Interviews	General Inductive Approach

Sokunbi, 2008	United Kingdom	Urban	Invited everyone in the program	9, M/F, 29-56, UK	Chronic lower back pain	Pilot study	Qualitative	Focus groups	Thematic content analysis
Stathi, 2010*	United States	Urban	Invited participants who had completed the program	21, M/F, 72-80, American	Older adults	Research	Qualitative	Interviews	Interpretive qualitative analysis; QSR Nvivo; member checking
Stickney, 2005	Australia	Urban	Invited everyone in the program	58, M/F, 65+, Australian	Older adults	Research	Qualitative	Focus groups	Content and inductive analysis
Tava'e, 2012*	New Zealand	Unknown	Purposive sampling	20, F, 40+, pacific islander	At risk	Research	Qualitative	Interviews	Open coding?
Tulloch, 2013*	Canada	Urban	Individuals who had completed 3-4 interviews	28, M/F, 39-70, Canadians	T2DM	RCT	Qualitative	Interviews	Content Analysis using Nvivo
Wycherley, 2012*	Australia	Urban	Invited participants who had completed the program	24, M/F, 49-65, Australian	T2DM	Intervention	Qualitative	Interviews	Content Analysis
Zulman, 2013	United States	Urban	Everyone in the program	Not specified	Overweight	Research	Mixed methods	Online survey – written responses	Thematic analysis
* Indicates a publication included in sub question two									

Appendix III

Table 9: Summary of publications including aim of study, type of program, program components and results/conclusion and critical appraisal score per sub question.

Publication	Aim of Study	Program Description + Type of PA	BCTs in Method Section	BCTs in Results Section	Main Results/ Conclusions addressing sub questions	Critical Appraisal Score
Aubrey, 2012	To determine the perceptions of people with MS on the influence of a long-term, community-based, group exercise intervention on their management of MS	Exercise group by a local MS society. Standing or seated, physiotherapist lead, circuit class fortnightly. Groups based on severity of mobility and balance disabilities. Program included volunteers and was free for participants.	3.1 Social support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 9.1 Credible Source 12.1 Restructuring the Physical Environment 12.5. Adding objects to the environment	3.1 Social support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the behaviour 6.2 Social Comparison 9.1 Credible Source 12.2 Restructuring the social environment 12.6 Body Changes	SQ1: Support from similarly composed group. Friends among group More energy from PA, feeling better Support from the experienced trainers Understanding the importance of PA from the program Program was what they needed, nothing else worked - difficult adhering to previous home based programs or other options, need a long-term program	17
Bredal, 2011	To investigate the preconditions towards behaviour change and adherence to a physical activity regiment.	Exercise on Prescription <u>Treatment group (TG)</u> (individuals with medically controlled diseases (T2DM, MetS, CVD) had supervised group-based training 2x/week (first two months) 1x/week supervised training and 1x unsupervised training (last two months (n=8-12) + motivational counselling at baseline and 4	<u>Treatment Group:</u> 3.1 Social support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal <u>Preventive Group:</u> 3.1 Social Support (Unspecified)	3.1 Social support (Unspecified) 3.2. Social support (practical) 4.1 Instruction on how to perform the behaviour 9.1 Credible Source 12.1 Restructuring the Physical Environment 12.2. Restructuring the social environment 12.6 Body Changes	SQ1: Commitment to the intervention Support from experienced trainers Individually tailored exercise programs Family and friends as barriers SQ2: Want more support after program has finished.	11

		months with voluntary motivational counselling at 10 and 16 months. <u>Preventive group (PG)</u> was for individuals at risk for lifestyle diseases. Only motivational counselling, training was unassisted or at a local gym.	4.1 Instruction on how to perform the behaviour 8.1 Behavioural Practice/Rehearsal		Health benefits Family and social circles as barriers Lack of time as a barrier	
Canuto, 2013	To identify participants' perceived barriers and enablers to attend group exercise classes as part of a 12-week fitness program	12 week program consisting of progressive group exercise classes 60 minutes 2x/week + nutrition education workshops	3.1 Social Support (Unspecified) 9.1 Credible Source 4.1 Instruction on how to perform the behaviour 4.2 information about antecedents 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 12.1 Restructuring the Physical Environment 10.5 Social Incentive 10.4 Social Reward 12.5 Adding objects to the environment 2.1 Monitoring of others without feedback 1.1 Goal setting (behaviour) 2.2 Feedback on behaviour Group composed of similar individuals 2.3 Self-monitoring of behaviour	3.1. Social support (unspecified) 3.2. Social support (practical) 3.3. Social support (emotional) 4.1. Instruction on how to perform the behaviour 6.2. Social comparison 8.1. Behavioural practice/rehearsal 8.7. Graded tasks 9.1. Credible source 12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.5. Adding objects to the environment 12.6. Body changes 15.1. Verbal persuasion about capability	<u>SQ1:</u> Family and friends as support Group provides support Culturally specific group Supportive and knowledgeable staff Graded tasks as motivation for progress Free program to reduce financial barrier Build-up of barriers as reasons for stopping. Feeling more fit as motivation	13
Capalb,	To examine	10 participants (8F, 2M) who	3.1 Social Support	3.1. Social support	<u>SQ1:</u>	15

2014	reasons why older men and women chose to engage in a community-based physical activity program, specifically examining reasons why participants commenced, continued and recommenced the program.	had been participating in a community based physical activity program for minimum 6 months	(Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 9.1 Credible Source	(unspecified) 11.1. Pharmacological support 12.6. Body changes	Social interaction, making friends Feeling better and reducing medication
Casey, 2010	To assess barriers and facilitators of participation in a supervised exercise program, and adherence to exercise after program completion.	24 week supervised exercise program, 60 minutes 3x/week for weeks 1-8, 2x/week for weeks 9-16, 1x.week for weeks 17-24 and replace with independent exercise	2.4. Self-monitoring of outcome(s) of behaviour 2.5. Monitoring of outcome(s) of behaviour without feedback 2.6. Biofeedback 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 9.1 Credible Source	2.6. Biofeedback 3.1 Social support (Unspecified) 3.2. Social support (practical) 3.3. Social support (emotional) 4.1. Instruction on how to perform the behaviour 5.1. Information about health consequences 6.1. Demonstration of the behaviour 8.1. Behavioural practice/rehearsal 12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.6. Body changes 15.1. Verbal persuasion about capability	SQ1: Feeling better, obtaining results, reducing medication Supportive instructors for instruction and monitoring Weather as a facilitator and barrier Illness as a barrier Lack of time as a barrier SQ2: Want supervision to continue (difficulty with transition time) Incorporating PA into lifestyle Positive benefits on health (medication, blood sugar, feeling better) Injury, weather, work as barriers

Coghill, 2009	To investigate motivators, de-motivators and adherence to regular physical activity during and at 6 months after participation in a 12-week walking RCT	RCT of a 12 week home based walking program	1.1 Goal setting (behaviour) 1.5 Review behaviour goal(s) 2.2 Feedback on behaviour 2.3. Self-monitoring of behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 8.1 Behavioural Practice/Rehearsal 8.7. Graded tasks	2.2. Feedback on behaviour 2.3. Self-monitoring of behaviour 3.1 Social support (Unspecified) 9.1. Credible source 12.6. Body changes	SQ1: Monitoring as a motivator Pedometer as a motivator Having an walking buddy Commitment to the study Lack of additional support as a barrier SQ2: Health reasons (feeling more fit) Lack of professional support	11
Dodd, 2006	To explore the perceptions of adults with MS about the positive and negative effects of a progressive resistance-strengthening program and identify factors that might facilitate or create barriers to participation.	10-week 2x/week of a gym based progressive resistance strengthening program. The sessions included 60 minutes of exercise and 30 minutes of cool-down and socialization over light refreshments. (Tu/Th 10am; no cost) Physiotherapist and two registered fitness instructors	3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 8.7. Graded tasks 9.1 Credible Source 12.5. Adding objects to the environment	2.7. Feedback on outcome(s) of behaviour 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 6.1. Demonstration of the behaviour 8.1. Behavioural practice/rehearsal 9.1. Credible source 12.1. Restructuring the physical environment 12.6. Body changes	SQ1: Body improvements as motivation Friendship, enjoying the company/camaraderie Group composed of similar individuals Supportive instructors, knowledgeable in MS Free program and free parking	17.5
Ferrand, 2008	To examine perceived motives for regular physical activity in male and female individuals with T2DM involved in Move for	Move for Health program- autonomous physical activities throughout the week at a gym with some supervision	1.1 Goal setting (behaviour) 2.1. Monitoring of behaviour by others without feedback 3.1 Social Support (Unspecified)	3.1 Social support (Unspecified) 3.3. Social support (emotional) 4.1. Instruction on how to perform the behaviour 5.1. Information about health consequences 8.1. Behavioural	SQ1: Supportive instructors Similarly composed group Friendship, enjoyment of the group atmosphere Gaining knowledge	17.5

	Health.			practice/rehearsal 8.3. Habit formation 9.1. Credible source 12.2. Restructuring the social environment 12.6. Body changes 13.4. Valued self-identify 15.4. Self-talk		
Fukuoka, 2012	To explore acceptability of components of a mobile phone/pedometer-based PA program and to understand motivators and barriers to increase PA in a diverse sample of sedentary women.	3 week pilot walking intervention using mobile phones including daily random messages, goal setting, mobile phone diary	1.1 Goal setting (behaviour) 1.2 Problem solving 2.2. Feedback on behaviour 2.3. Self-monitoring of behaviour 3.1 Social Support (Unspecified) 4.1. Instruction on how to perform the behaviour 8.1. Behavioural practice/rehearsal 8.7. Graded tasks 10.4. Social reward	1.1 Goal setting (behaviour) 1.2 Problem solving 2.2. Feedback on behaviour 2.3. Self-monitoring of behaviour 3.1 Social support (Unspecified) 3.2. Social support (practical) 7.1. Prompts/cues 10.4. Social reward	SQ1: Pedometer as motivator Log book to monitor progress as motivator Goal setting generally positive except some participants found automatic goal setting too high. Prompts provide reminders and action planning	15
Gillis, 2002	To understand how useful various program components are in achieving program goals.	1-year study called the Community Healthy Activities Model Program for Seniors (CHAMPS) to promote increased PA among those enrolled in existing community programs and classes. Examples of activities include walking groups, swimming, general conditioning, tai chi, strength training, dancing	1.1 Goal setting (behaviour) 1.2 Problem solving 1.5 Review behaviour goal(s) 2.3 Self-Monitoring of behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 4.2. Information about antecedents 5.1. Information about health consequences	2.2. Feedback on behaviour 2.3. Self-monitoring of behaviour 2.7. Feedback on outcome(s) of behaviour 3.1 Social support (Unspecified) 3.2. Social support (practical) 4.1. Instruction on how to perform the behaviour 5.1. Information about health consequences 6.1. Demonstration of the	SQ1: Monitoring (check-up phone calls and meetings for feedback) Personal attention (support) Activity logs as motivator Monthly newsletters as continued prompts Feedback from fitness evaluation as motivation and monitoring to improve Goal-setting as motivator and marker of progress	11.5

		and recreational sports.	5.2. Salience of consequences 8.1 Behavioural Practice/Rehearsal 8.7 Graded Tasks 9.1 Credible Source 10.4. Social reward 12.1 Restructuring the Physical Environment 12.5. Adding objects to the environment	behaviour 6.2. Social comparison 8.1. Behavioural practice/rehearsal 8.7. Graded tasks 9.1. Credible source 10.4. Social reward		
Gram, 2014	To examine the effects of two different doses of endurance exercise on health behaviour and exercise compliance and use qualitative methods to produce insights into the perceived differences between the two participant groups.	Project FINE; a 12 week RCT consisting of a control, moderate or high dose endurance exercise groups.	2.2 Feedback on behaviour (Individual tailoring) 2.4 Self-monitoring of outcome of behaviour 2.5 Monitoring of outcome(s) of behaviour without feedback 3.1. Social support (unspecified) 4.1 instruction on how to perform the behaviour 8.1 Behavioural practice/rehearsal 12.5 adding objects to the environment	3.1 Social support (Unspecified) 12.6. Body changes	SQ1: Commitment to the project Monitoring by staff Feeling better, losing weight Feedback from tests Lack of diversity and too much exercise as barriers	7
Gray, 2013	*Three studies in one article. Study 2: To optimize the FFIT program using a process evaluation.	Football Fans in Training (FFIT) program consisting of a 12 week program including 90 minute weekly sessions of PA and group-based weight management classroom + pedometer program and education sessions	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 1.4 Action planning 1.5 Review behaviour goal(s) 1.7 Review outcome goal(s) 1.9 Commitment 2.2 Feedback on Behaviour 2.7. Feedback on outcome(s)	1.1 Goal setting (behaviour) 1.6 Discrepancy between current behaviour and goal 3.1 Social support (Unspecified) 5.2. Salience of consequences 6.2. Social comparison 11.2. Reduce negative emotions	SQ1: Friendship/ camaraderie; Similarly composed group; Group weight loss session (social comparison) as motivators	9

			of behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 4.2. Information about antecedents 6.1 Demonstration of the Behaviour 6.2. Social comparison 8.1 Behavioural Practice/Rehearsal 9.1 Credible Source 12.1 Restructuring the Physical Environment 12.5. Adding objects to the environment	12.1. Restructuring the physical environment 12.2. Restructuring the social environment 16.3. Vicarious consequences		
Haas, 2014	To examine the acceptability and impact on sustained participation in falls prevention activities of a combined exercise and education falls prevention program.	15-week Making a Move fall prevention program that includes an exercise (supervised) and educational program 1x/week for 1 hour in group (n=11) and home-based (n=12) settings + 12 month follow-up	4.1 Instruction on how to perform the behaviour 5.1. Information about health consequences 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 8.7 Graded Tasks 9.1 Credible Source 12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.5. Adding objects to the environment 3.1 Social Support (Unspecified)	3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 12.1. Restructuring the physical environment 12.6. Body changes	SQ1: Similarly composed groups; Support (group and instructor); Positive body changes (improved balance) as motivators SQ2: No longer doing group exercises, mostly walking as PA Program fees as a barrier	16
Hardcastle, 2001	To explore older women's	GP exercise referral program; group based	2.6. Biofeedback 3.1 Social Support	1.8 Behavioural contract 3.1 Social support	SQ1: Support from researcher	10

	accounts of their past and current experience of physical activity (in an exercise prescription) and their perceptions of what blocks or motivates them to be active	activities in the community	(Unspecified) 4.1 Instruction on how to perform the behaviour 9.1 Credible Source 12.1 Restructuring the Physical Environment	(Unspecified) 4.1. Instruction on how to perform the behaviour 6.1. Demonstration of the behaviour 8.1. Behavioural practice/rehearsal 9.1. Credible source	and instructor; Social interaction as motivators. Family and friend influences as both motivators and barriers	
Heesch, 2005	To explore women's experiences in a minimal contact pedometer-based intervention.	6 week minimal contact pedometer-based intervention. Program components: wore pedometers, completed weekly logs of daily steps taken, created PA goals, received weekly e-mails (strategies and reminders).	1.1 Goal setting (behaviour) 2.1. Monitoring of behaviour by others without feedback 2.3. Self-monitoring of behaviour 4.2. Information about antecedents 7.1. Prompts/cues 8.1 Behavioural Practice/Rehearsal 12.5. Adding objects to the environment	1.1 Goal setting (behaviour) 2.1. Monitoring of behaviour by others without feedback 2.3. Self-monitoring of behaviour 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 6.2. Social comparison 7.1. Prompts/cues	SQ1: Pedometer; Working towards goals Social comparison to judge goals and progress; Step logs and monitoring by the staff; E-mail reminders (prompts) as a motivator Mentioned improvements to the program: tips for staying active, help with setting goals, feedback to gauge progress, suggestions for where to walk and contact with other participants, wanted an incentive	14
Hunt, 2013	To explore men's views of a pedometer-based walking program, part of a weight-management intervention.	12-week pedometer-based walking program, part of a group weight-management program (Football Fans in Training (FFIT)) for men through the Scottish Premier League Football clubs.	1.1 Goal setting (behaviour) 1.5 Review behaviour goal(s) 2.2 Feedback on behaviour 2.3. Self-monitoring of behaviour 2.4. Self-monitoring of outcome(s) of behaviour 8.7 Graded Tasks	1.1 Goal setting (behaviour) 1.3 Goal setting (outcome) 2.3. Self-monitoring of behaviour 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 5.2. Salience of consequences	SQ1: Setting of the intervention as a motivator Pedometer as a motivator Goal setting and self-monitoring as motivators Feeling good, losing weight	15.5

				6.2. Social comparison 6.3. Information about others' approval 8.4. Habit reversal 8.7. Graded tasks 9.1. Credible source 12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.5. Adding objects to the environment 12.6. Body changes		
Ingram, 2011	To collect recollections of outcome expectations and barriers, feedback on program components and suggestions for program change.	12-month home-based, women's walking program. Enhanced treatment included an orientation and four weekly workshops + 16 telephone contacts providing advice and support and a tailored walking prescription (30 minutes of walking 3-4x/week)	1.2 Problem solving 2.1. Monitoring of behaviour by others without feedback 2.3. Self-monitoring of behaviour 2.4. Self-monitoring of outcome(s) of behaviour 3.1. Social support (unspecified) 4.1. Instruction on how to perform the behaviour 4.2. Information about antecedents	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 2.2. Feedback on behaviour 2.3. Self-monitoring of behaviour 2.5. Monitoring of outcome(s) of behaviour without feedback 2.6. Biofeedback 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 7.1. Prompts/cues 8.1. Behavioural practice/rehearsal 8.7. Graded tasks 12.1. Restructuring the physical environment 12.2. Restructuring the social environment	SQ1: Having a goal to work towards Establishing an exercise routine Heart rate monitor as self-monitoring Sharing with the group as motivating Tips for improvements included: Wanting feedback from automatic program; wanting continued feedback (not only for the first month) <u>(low adhering women)</u> Wanted more information on how to perform gradual increases Wanted anonymity with the reporting device Environmental barriers	15

				12.5. Adding objects to the environment 13.1. Identification of self as role	(High adhering women) Environmental barriers	
Ingram, 2009	To understand factors that motivate older Mexican Americans with diabetes to maintain regular physical activity and whether these factors can be used in future interventions. Specific focus on the role of self-efficacy and social support as associated with physical activity	Community walking groups with individuals previously attending diabetes classes. 12 weeks, 3x per week	2.2. Feedback on behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 12.5. Adding objects to the environment	1.1 Goal setting (behaviour) 1.3 Goal setting (outcome) 1.8 Behavioural contract 3.1 Social support (Unspecified) 3.2. Social support (practical) 5.1. Information about health consequences 6.2. Social comparison 7.1. Prompts/cues 12.2. Restructuring the social environment 12.6. Body changes 15.1. Verbal persuasion about capability 15.4. Self-talk	SQ1: Commitment to the intervention Support (calling, group, set group walks) Fun, friends Health benefits (reducing diabetes pills) Goal setting as motivation for progress Social comparison as motivation for progress Group composed of similar individuals (sharing)	13
Kluge, 2014	To understand how to encourage assisted-living residents to initiate and continue exercise in a gym setting.	12 month Fit and Fabulous exercise program in a gym setting. Open gym was 2 days/week. Prior attendance to PA classes regularly for 7-8 months.	2.3 Self-Monitoring of behaviour 2.4 Self-Monitoring outcome(s) of behaviour 2.5 Feedback on Outcome(s) of Behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 8.1 Behavioural Practice/Rehearsal 9.1 Credible Source	2.3. Self-monitoring of behaviour 2.7. Feedback on outcome(s) of behaviour 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 5.1. Information about health consequences 5.5. Anticipated regret 6.1. Demonstration of the behaviour	SQ1: Support from the instructors Positive body feelings, feeling stronger Social time, friends, associate with the group	18

				6.2. Social comparison 8.1. Behavioural practice/rehearsal 8.3. Habit formation 12.2. Restructuring the social environment 12.5. Adding objects to the environment 12.6. Body changes 13.5. Identity associated with changed behaviour		
Learmonth, 2012	To explore the experiences and views of people moderately affected with MS following participation in a 12-week exercise program.	Group exercise classes; 12 week exercise program 2hours, 2x per week group exercise	2.3 Self-Monitoring of behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 8.7 Graded Tasks 9.1 Credible Source 12.1 Restructuring the Physical Environment	1.3 Goal setting (outcome) 2.3. Self-monitoring of behaviour 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 8.1. Behavioural practice/rehearsal 8.7. Graded tasks 9.1. Credible source 12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.6. Body changes	SQ1: Feeling better, balance improving Social comparison, group Group composed of similar individuals Support of instructor, especially knowledgeable in MS Graded tasks for every ability	13
Nielsen, 2014	To explore how and how participants in structured exercise intervention programs continue or stop	Previously involved in intervention studies of group exercise (spinning and cross fit) or playing a team sport (football). <u>Spinning/ Cross fit group</u> 8 weeks of supervised high-intensity interval training	<u>Spinning/ Cross fit group</u> 2.1. Monitoring of behaviour by others without feedback 2.4. Self-monitoring of outcome(s) of behaviour 2.5. Monitoring of outcome(s) of behaviour without feedback 3.1 Social Support	1.3 Goal setting (outcome) 2.3. Self-monitoring of behaviour 2.4. Self-monitoring of outcome(s) of behaviour 2.6. Biofeedback 3.1 Social support (Unspecified)	(Split between football and cross-fit) SQ1: <u>Spinning/ Cross fit group</u> Instructor as motivator Heart rate target for motivation Group composed of similar	12.5

	exercising after the program has finished.	(cycle ergometer) twice a week and full body circuit training (Cross fit) once a week. <u>Football Group:</u> Football training was Performed twice a week for 1 h for a 24-wk period.	(Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 9.1 Credible Source <u>Football Group:</u> 2.1. Monitoring of behaviour by others without feedback 2.4. Self-monitoring of outcome(s) of behaviour 2.5. Monitoring of outcome(s) of behaviour without feedback 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 9.1 Credible Source	6.2. Social comparison 8.1. Behavioural practice/rehearsal 8.3. Habit formation 9.1. Credible source 12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.6. Body changes	individuals Feeling better, positive on health <u>Football group</u> Group support (Team>gym) Friendship. Having fun together Feeling better, positive on health Instructor as motivator Social comparison Group composed of similar individuals SQ2: <u>Spinning/ Cross fit group</u> Group fell apart Less enjoyment from the activity Felt marginalized by age when looking for a new place to exercise <u>Football group</u> Group stayed together Having a good time, friendship Having a routine Group composed of similar individuals	
Penn, 2013	Elicit participants' perspectives of their behavioural change and maintenance of new behaviours	"New life, new you" program; 10 week group program; one hour PA, one hour group reflection; Follow up at 12 months	1.1 Goal Setting 2.3 Self-Monitoring of Behaviour 2.1 Monitor by others without feedback 3.1 Social support (unspecified or practical) 4.1 Instruction on how to	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 2.1. Monitoring of behaviour by others without feedback 2.2. Feedback on behaviour 2.3. Self-monitoring of behaviour	SQ1: Support from the trainers Friends Prompts from the program Group composed of similar individuals (culturally relevant) Commitment to the program	15.5

	towards intervention optimization.		<p>perform the behaviour</p> <p>6.1 Demonstration of the Behaviour</p> <p>7.1 prompts</p> <p>8.1 Behavioural Practice/Rehearsal</p> <p>9.1 Credible Source</p> <p>10.8 Incentive (Outcome)</p> <p>12.5 Adding objects to the Environment</p> <p>15.4 Self-Talk</p>	<p>2.7. Feedback on outcome(s) of behaviour</p> <p>3.1 Social support (Unspecified)</p> <p>3.2. Social support (practical)</p> <p>4.1. Instruction on how to perform the behaviour</p> <p>5.5. Anticipated regret</p> <p>6.1. Demonstration of the behaviour</p> <p>6.2. Social comparison</p> <p>7.1. Prompts/cues</p> <p>8.1. Behavioural practice/rehearsal</p> <p>8.3. Habit formation</p> <p>8.7. Graded tasks</p> <p>9.1. Credible source</p> <p>10.4. Social reward</p> <p>12.1. Restructuring the physical environment</p> <p>12.2. Restructuring the social environment</p> <p>12.5. Adding objects to the environment</p> <p>15.4. Self-talk</p>	<p>as motivator</p> <p>Free program and culturally tailored environment</p> <p>Goal setting as motivation for progress</p> <p>SQ2:</p> <p>Continued provision of newsletters</p> <p>Setting up a routine, having an exercise buddy</p> <p>Exercise on their own because of gained confidence from the program</p> <p>Fees as a barrier</p>	
Penn, 2008	Develop an understanding of behaviour change maintenance with a view to improving intervention design.	RCT of diet and exercise. Seven sessions with a nutritionist and individual guidance to increase PA.	<p>2.3 Self-Monitoring of behaviour</p> <p>3.1 Social support (unspecified or practical)</p> <p>4.1 Instruction on how to perform the behaviour</p> <p>9.1 Credible Source</p>	<p>1.3 Goal setting (outcome)</p> <p>1.5 Review behaviour goal(s)</p> <p>2.7. Feedback on outcome(s) of behaviour</p> <p>3.1 Social support (Unspecified)</p> <p>4.1. Instruction on how to perform the behaviour</p> <p>8.3. Habit formation</p> <p>12.1. Restructuring the</p>	<p>SQ1:</p> <p>Feeling better and becoming fitter</p> <p>Family obligations as a barrier</p> <p>Goal setting, Routines and monitoring as motivators</p> <p>SQ2:</p> <p>Creating a routine (takes time though)</p>	15

				physical environment 12.2. Restructuring the social environment	Having a target to work towards Appreciation for being taught self-regulation strategies, but some wanted continued support Barriers include: family obligations, injury and the build-up of barriers (time, cost, transportation)	
Penn, 2014	To investigate Pakistani female participants' perspectives of their behaviour change and of salient intervention features.	Community based 8-week program of group PA with behavioural counselling and dietary advice, culturally adapted "New life, new you project".	1.1 Goal Setting 1.4 Action Planning 2.3 Feedback and Monitoring 3.1 Social support (unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 9.1 credible source 12.1 Restructuring the Physical Environment 12.2. Restructuring the social environment	1.1 Goal setting (behaviour) 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 6.1. Demonstration of the behaviour 8.1. Behavioural practice/rehearsal 8.3. Habit formation 12.1. Restructuring the physical environment 12.2. Restructuring the social environment 13.1. Identification of self as role model	SQ1: Body changes Supportive instructor (ethnically relevant) Friendship, support from the group Culturally appropriate program (women's only) Weather and money as barriers	14
Perry, 2008	To describe rural women's barriers and motivators for participation in a walking program.	12-week walking program HTH or comparison intervention <u>Individual:</u> individualized walking prescription for the 12 weeks, 1 exercise counselling session and 5-10 telephone boosters using	1.1 Goal Setting 1.5 Review behaviour goal(s) 2.2 Feedback on behaviour 2.3 Self-Monitoring of behaviour 2.4 Self-Monitoring of outcome(s) of behaviour 3.1 Social support	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 1.7 Review outcome goal(s) 2.3. Self-monitoring of behaviour 2.4. Self-monitoring of outcome(s) of behaviour	SQ1: Group support, association with the group Friendship/camaraderie Establish a routine Group helped individuals continue through barriers Social comparison	12.5

		<p>motivational interviewing, women were encouraged to set goals, wear heart rate monitors and complete log books.</p> <p><u>Group:</u> Women met weekly at a walking track (group), meeting included guided discussion and had a paired walking partner, target heart rates were given during individual exercise prescription and strategies to increase self-efficacy (role modelling and mastery experiences).</p>	<p>(unspecified)</p> <p>6.2 Social Comparison (buddy)</p> <p>8.7 Graded Tasks</p>	<p>3.1 Social support (Unspecified)</p> <p>4.1. Instruction on how to perform the behaviour</p> <p>6.2. Social comparison</p> <p>6.3. Information about others' approval</p> <p>8.1. Behavioural practice/rehearsal</p> <p>8.3. Habit formation</p> <p>12.2. Restructuring the social environment</p> <p>12.5. Adding objects to the environment</p> <p>12.6. Body changes</p> <p>13.5. Identity associated with changed behaviour</p>	<p>Feel more energized</p> <p>Associated with the group</p> <p>Family obligations and not able to establish a routine as barriers</p> <p>Heart rate monitors for progress and perceived effort</p>	
Roessler, 2011	To examine psychological aspects of intra- and interpersonal learning for patients with Type 2 diabetes, hypertension and dyslipidaemia treated with Exercise on Prescription.	Exercise on Prescription, community based exercise treatment four months of 2x/week physical activity	<p>2.1 Monitoring of Behaviour by others without feedback</p> <p>3.1 Social Support (Unspecified)</p> <p>4.1 Instruction on how to perform the behaviour</p> <p>6.1 Demonstration of the Behaviour</p> <p>8.1 Behavioural Practice/Rehearsal</p> <p>9.1 Credible Source</p>	<p>2.2. Feedback on behaviour</p> <p>2.3. Self-monitoring of behaviour</p> <p>2.5. Monitoring of outcome(s) of behaviour without feedback</p> <p>2.7. Feedback on outcome(s) of behaviour</p> <p>3.1 Social support (Unspecified)</p> <p>3.2. Social support (practical)</p> <p>4.1. Instruction on how to perform the behaviour</p> <p>5.1. Information about health consequences</p> <p>6.2. Social comparison</p> <p>8.1. Behavioural practice/rehearsal</p>	<p><u>SQ1:</u></p> <p>Social aspects as motivation (group, physiotherapist, family) - friendships</p> <p>Routines</p> <p><u>SQ2:</u></p> <p>Group as external motivator</p> <p>Positive health benefits as motivator (weight loss)</p> <p>Routine formation</p> <p>Absence of professional support as a barrier</p>	15

				8.3. Habit formation 9.1. Credible source 12.2. Restructuring the social environment 12.6. Body changes		
Russell, 2013	To identify factors that facilitate or hinder behavioural change among past participants of a healthy lifestyle intervention.	Healthy lifestyle intervention: group support, health education and group exercise. Goals: weight loss, increased PA and improved diet. 12 weeks, 24 biweekly 90 minute sessions; 60 minutes of group PA, 30 minutes behaviour change topic	1.1 Goal Setting (Behaviour) 3.1 Social support (unspecified) 4.1 Instruction on how to perform the behaviour 4.2 Information about antecedents 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal	1.3 Goal setting (outcome) 3.1 Social support (Unspecified) 3.2. Social support (practical) 4.1. Instruction on how to perform the behaviour 5.1. Information about health consequences 9.1. Credible source 10.4. Social reward 11.2. Reduce negative emotions 12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.5. Adding objects to the environment 13.1. Identification of self as role model 13.4. Valued self-identify	SQ1: Reaching goals, group as facilitator (friends) friends and relationships as main motivator Group composed of similar individuals Family as barrier (obligations)	12.5
Sabiston, 2009	Explore the experiences of overweight women while they participating in a PA intervention	Exercise intervention program. 12 week dragon boating (group) 2x/week ~60 minutes	3.1 Social support (unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal	1.1 Goal setting (behaviour) 1.3 Goal setting (outcome) 1.6 Discrepancy between current behaviour and goal 2.3. Self-monitoring of behaviour 3.1 Social support (Unspecified) 3.3. Social support	SQ1: Goals; Enhanced strength and health; Supportive coaches; Friendship as motivators Dissimilar group (age, goals) for making friends but similar group in size and shape (motivator and	15.5

				(emotional) 4.1. Instruction on how to perform the behaviour 6.1. Demonstration of the behaviour 6.2. Social comparison 8.1. Behavioural practice/rehearsal 9.1. Credible source 12.2. Restructuring the social environment 12.6. Body changes	barrier)	
Seale, 2013	To guide a community-based and culturally congruent development of a faith-based weight maintenance program for African American Church members.	Previously participated in a church based weight loss program	No program description	1.3 Goal setting (outcome) 2.3. Self-monitoring of behaviour 2.7. Feedback on outcome(s) of behaviour 3.1. Social support (unspecified) 5.1. Information about health 12.2. Restructuring the social environment	SQ1: Monitoring and feedback; Log book; Support from the group as motivators	14.5
Shaw, 2011	To explore perceived benefits and barriers associated with walking and the successful aspects and challenges associated with	Walking for Wellbeing in the West. Individual, pedometer based intervention.	<u>Maximal:</u> 1.1 Goal setting (behaviour) 1.2 Problem solving 1.5 Review behaviour goal(s) 2.3. Self-monitoring of behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour	1.1 Goal setting (behaviour) 2.3. Self-monitoring of behaviour 2.6. Biofeedback 2.7. Feedback on outcome(s) of behaviour 3.1 Social support (Unspecified) 15.1. Verbal persuasion about capability	SQ1: Group support; Pedometer as motivator; And monitoring (log book) and feedback of results as benefits of the program SQ2: Handing in the log book was a barrier, although some participants continued	10

	the (walking) intervention.		<p>4.2. Information about antecedents</p> <p>5.1. Information about health consequences</p> <p>11.2. Reduce negative emotions</p> <p>12.5. Adding objects to the environment</p> <p><u>Minimal:</u></p> <p>1.1 Goal setting (behaviour)</p> <p>1.5 Review behaviour goal(s)</p> <p>2.3. Self-monitoring of behaviour</p> <p>4.1 Instruction on how to perform the behaviour</p> <p>12.5. Adding objects to the environment</p>		<p>writing their logs down on their own.</p> <p>Incorporate PA (walking) into everyday life</p> <p>Difficulties with boredom, weather, work</p>	
Shiner, 2008	To identify elements of an individualized health-promotion program that persons with SMI perceived to be most influential in helping them achieve physical health improvements, and to use these insights to improve the In SHAPE program.	Exercise in gym or group sessions from health mentor SHAPE - health promotion program includes 1) fitness and healthy lifestyle assessment 2) fitness plan with diet and exercise goals 3) weekly meetings with fitness trainers 4) individualized healthy eating and exercise instruction 5) funded access to local fitness facilities 8) incentive program for meeting PA and nutritional goals and 9) group motivational celebrations	<p>1.1 Goal Setting (Behaviour)</p> <p>2.2 Feedback on Behaviour</p> <p>3.1 Social Support (Unspecified)</p> <p>4.1 Instruction on how to perform the behaviour</p> <p>6.1 Demonstration of the Behaviour</p> <p>8.1 Behavioural Practice/Rehearsal</p> <p>9.1 Credible Source</p> <p>10.1 Material Incentive</p> <p>10.4 Social Reward</p> <p>12.5 Adding objects to the environment</p>	<p>2.1. Monitoring of behaviour by others without feedback</p> <p>3.1 Social support (Unspecified)</p> <p>4.1. Instruction on how to perform the behaviour</p> <p>9.1. Credible source</p> <p>12.1. Restructuring the physical environment</p> <p>12.6. Body changes</p>	<p>SQ1:</p> <p>Free access to fitness facilities</p> <p>Support from health mentor (mentor as central to intervention – non-stigmatizing)</p>	13
Sims-Gould	To investigate	Participated in an RCT PA	4.1 Instruction on how to	2.2. Feedback on behaviour	SQ1:	15

	the decisional processes on why women continue to adhere to an exercise program and what features of an exercise program facilitate or impede their adherence to exercise.	(resistance exercise) intervention. A 52 week prospective group-based exercise study	perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 12.1 Restructuring the physical environment 12.5 Adding objects to the environment	3.1. Social support (unspecified) 4.1. Instruction on how to perform the behaviour 12.2. Restructuring the social environment 12.6. Body changes	Health benefits (balance, strength) Support from instructors, individual attention; Group support; Commitment to the group as motivators	
Smith, 2013	To investigate experiences of participating in a feasibility trial of a novel physiotherapy intervention, to increase PA for people with MS living in the community.	3-month intervention period with Blue Prescription. PA programs were community (group-based) programs.	1.1 Goal Setting (Behaviour) 1.2 Problem Solving 1.5 Review Behaviour Goal(s) 2.2 Feedback on Behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 7.1 Prompts 9.1 Credible Source (12.1 Restructuring the Physical Environment; 12.2Restructuring the Social Environment)	1.1 Goal setting (behaviour) 1.2 Problem solving 1.3 Goal setting (outcome) 2.3. Self-monitoring of behaviour 2.5. Monitoring of outcome(s) of behaviour without feedback 2.7. Feedback on outcome(s) of behaviour 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 8.3. Habit formation 8.7. Graded tasks 9.1. Credible source 12.6. Body changes 15.1. Verbal persuasion about capability	SQ1: Graded tasks helpful towards goal achievement Support from physiotherapist (Ongoing)	14
Sokunbi, 2008	To explore the experiences of a	Supervised group spinal stabilization exercise	2.1 Monitoring of Behaviour by others without feedback	1.3 Goal setting (outcome) 2.1. Monitoring of behaviour	SQ1: Knowledge acquisition	13

	sample of individuals with chronic lower back pain who participated in a RCT investigating the most efficacious dosage and frequency of spinal stabilization exercises	program 1,2 or 3 times per week exercise program with video education program	3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 9.1 Credible Source	by others without feedback 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 4.2. Information about antecedents 5.1. Information about health 6.1. Demonstration of the behaviour 8.1. Behavioural practice/rehearsal 8.3. Habit formation 9.1. Credible source 10.4. Social reward 12.6. Body changes 15.1. Verbal persuasion about capability	Supervision by therapist Feeling better, pain relief
Stathi, 2010	Investigate the processes associated with engagement of older adults in a research-based structured exercise programme.	12-month research based structured exercise program (falls prevention program: 2x/week instructor-led group exercise sessions lasting 60-80 minutes; 1 home-based exercise session per week lasting 40-60 minutes)	1.1 Goal Setting (Unspecified) 2.3 Self-Monitoring of Behaviour 3.1 Social Support (unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 8.7 Graded Tasks 9.1 Credible Source	3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 6.1. Demonstration of the behaviour 8.1. Behavioural practice/rehearsal 8.7. Graded tasks 9.1. Credible source 12.2. Restructuring the social environment 12.5. Adding objects to the environment 12.6. Body changes	SQ1: Support from the exercise class leader Graded tasks Feeling better Preference to the group based program because of social aspects. SQ2: Want program to continue Provision of "exit-route" opportunities and support from exercise class leaders Program removed barriers, gained confidence and allowed participants to feel comfortable on their own

Stickney, 2005	To identify AIM strategies that enhances participation of these groups of older adults.	Active involved mature (AIM) - community based (group) physical activity provider	No program description	2.2. Feedback on behaviour 3.1 Social support (Unspecified) 4.1. Instruction on how to perform the behaviour 6.2. Social comparison 8.1. Behavioural practice/rehearsal 9.1. Credible source 12.1. Restructuring the physical environment 12.2. Restructuring the social environment 12.5. Adding objects to the environment 12.6. Body changes 15.1. Verbal persuasion about capability	SQ1: Social aspects (decrease loneliness) Support from the instructor Free transport Individual tailoring of the program (culture, level) Friendship	12
Tava'e, 2012	To investigate the experience of the GRx programme for Pacific women in Auckland, New Zealand.	Green Prescription Program includes educational workshops on nutrition, medical conditions, smoking etc. and community group based activity programs or individual PA programs.	1.1 Goal Setting (Behaviour) 1.5 Review Behaviour Goal(s) 2.2 Feedback on Behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal	3.1 Social support (Unspecified) 3.2. Social support (practical) 4.1. Instruction on how to perform the behaviour 5.1. Information about health 8.1. Behavioural practice/rehearsal 8.3. Habit formation 9.1. Credible source 12.1. Restructuring the physical environment 12.5. Adding objects to the environment 12.6. Body changes	SQ1: Feeling fitter Health talks Friendship Routine formation SQ2: Support and information for options after the program Returning to help out The program taught participants how to exercise independently Became a family role model	12.5

Tulloch, 2013	To determine participants' perceived facilitators and barriers to exercise while enrolled in a randomized exercise trial including aerobic, resistance or combined exercise.	Randomized exercise trial DARE trial. 6-month intervention with aerobic exercise training, resistance exercise training, combined and control 3x/week increasing duration and intensity, 6 month follow up. (Group based)	2.1 Monitoring by others without Feedback 2.3 Self-monitoring of behaviour 2.7. Feedback on outcome(s) of behaviour 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 8.7 Graded Tasks 9.1 Credible Source 12.5 Adding objects to the environment	2.3. Self-monitoring of behaviour 2.7. Feedback on outcome(s) of behaviour 2.6. Biofeedback 3.1 Social support (Unspecified) 3.2. Social support (practical) 4.1. Instruction on how to perform the behaviour 6.1. Demonstration of the behaviour 9.1. Credible source 10.4. Social reward 12.6. Body changes	SQ1: Family reducing barriers to promote adherence Health benefits (reduced sugar levels, feel better, improve strength) Support from the trainer Weather, work, injury as barriers SQ2: Health benefits (body shape, blood sugar and hypertension) More barriers as time went on (weather, injury, time, vacations, boredom, family commitments, work)	15.5
Wycherley, 2012	To document factors reported by overweight and obese individuals with T2DM as enhancing or impeding sustainability of lifestyle behaviours following participation in a restricted diet and PA program.	One group had supervised resistance exercise. 16 week lifestyle intervention, three moderate/high intensity whole-body resistance-exercise training sessions/week	2.1 Monitoring by others without Feedback 3.1 Social Support (Unspecified) 4.1 Instruction on how to perform the behaviour 6.1 Demonstration of the Behaviour 8.1 Behavioural Practice/Rehearsal 8.7 Graded Tasks 9.1 Credible Source	1.2 Problem solving 3.1 Social support (Unspecified) 8.7. Graded tasks 12.6. Body changes	SQ1: Support from the staff Commitment to the study Health benefits (diabetes control and losing weight) SQ2: Health improvements Sense of achievement Fees and reduced access to gyms as barriers Trainer missing/ no support as barriers	14
Zulman, 2013	To evaluate the large-scale implementation	Internet-mediated individual walking program for obese adults. Including pedometer,	1.1 Goal Setting (Behaviour) 2.2 Feedback on behaviour 2.3 Self-monitoring of	1.3 Goal setting (outcome) 1.8 Behavioural contract 2.3. Self-monitoring of	SQ1: Participants felt coerced at times, due to financial	9

of an incentivized internet-mediated walking program for obese adults and to examine program acceptance, adherence and impact.	goal-setting, web-based feedback, online community, motivational and informational messaging and a diet logging component.	behaviour 3.1 Social Support (Unspecified) 12.5 Adding objects to the environment	behaviour	incentives
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Appendix IV

Table 10: Overview of program components

Publication	Group/Individual	Activity level prior to program	Respondents activity level	Type of PA	Additional Component	Program Description	Length + Follow up
Aubrey, 2012	Group	Not mentioned	14 had frequently exercised 6 occasionally exercised 5 never	Circuit training; Standing or seated exercise	Not applicable	-Neurological physiotherapist -Trained volunteers - Free program	Fortnightly for up to four years (ongoing program)
Bredal, 2011*	Group	Sedentary	Representative	Aerobic and strength training at gym	Not applicable	- Supervised Instructor-led (physiotherapist or exercise specialist) - Reduced instructor guided training over time - Motivational interviewing (MI) (personal 0, 4 months; phone based 10, 16 months)	12 week intervention (Progressive to unsupervised) Follow-up 12 months after program completion
	Individual			Individual at gym	Not applicable	Motivational interviewing (personal 0, 4 months; phone based 10, 16 months)	16 month with MI
Canuto, 2013	Group	Not specified	High and low attendees	Aerobic and Resistance training class	Nutrition workshops	- Progressive classes - Supervised and delivered by qualified exercise instructors - Progressively more difficult - Group goals - Additional research tests - Log books - Pedometer - Newsletters (fortnightly)	12 week intervention 2x/week PA
Capalb, 2014	Group communit	Not specified	Participated minimum 6 months	Community PA (Walking, chair	Not applicable	-Led by an instructor	Participating for minimum 6

	y programs			aerobics, tai chi)			months (ongoing program)
Casey, 2010*	Group	Not specified	Completed the program	Aerobic Exercise class	Dietary counselling	- Supervision by exercise specialist - Heart rate monitor	24 week intervention (Progressive to unsupervised) Follow-up 18 months after program completion ^{\$}
Coghill, 2009*	Individual	Sedentary	All participants	Walking program	Not applicable	- Goals set by investigator - Meetings with investigator every four weeks to discuss achievement of activity targets, calling was also available Caltrac accelerometers Logbooks	12 week intervention Follow-up 6 months after program completion
Dodd, 2006	Group	Not active	Completed the program	Strength/ resistance training	Socialization time	- Progressive training - Led by physiotherapist + two fitness instructors	10-week intervention 60 minutes, 2x/week PA
Ferrand, 2008	Group	Not specified	Participated in the PA for minimum one year	Community PA association	Not applicable	- Provide goals (by program) - Create community PA groups - Sometimes medico-sporting educators	Minimum 1 year in program (Ongoing program)
Fukuoka, 2012	Individual	Sedentary	Completed the program	Walking program	1 day education	- Set (weekly) goals, - Education about importance of PA, barrier counselling, increasing social support, safety for PA, daily messages - Mobile phone diary + feedback, Pedometer	3-week pilot intervention
Gillis, 2002	Individual	Previously Inactive	Completers from low, medium and high categories of	Community programs	Group education workshops	- Information meeting (benefits of PA) with keynote speaker - Physical activity planning	12 month intervention

			increased PA			session with PA counsellor - Activity logs - Monthly group Workshops - Telephone support - Fitness tests - Newsletters	
Gram, 2014	Group	Sedentary	Selected to represent SES and >80% compliance	Aerobic exercise (e.g. cross trainer)	Not applicable	- Supervision, instructor led PA - Research fitness tests, - Monitoring of HR and PA - Heart rate monitors	12 weeks 3x/week
Gray, 2013	Group	Not specified	Completers and non-completers	Exercise class	Education sessions + nutrition component	- Classroom sessions and PA sessions with instructors - Formal weigh-ins - Goal planning - Relapse prevention, action planning, barriers to being active	12 week 1x/week PA + walking program
Haas, 2014*	Group	Not specified	Equal representation of home and class based	Fall prevention class	Educational program Education program	- Exercise physiologist - Culturally made groups, - Transport provided	15-week 1x/week Follow-up 12 months after program completion
	Individual			Fall prevention program at home		- Physical therapist	
Hardcastle, 2001	Group or Individual	Not specified	Completed the program	Community PA	Not applicable	- Exercise referral scheme	10 week
Heesch, 2005	Individual	Inactive	Completed the program	Walking program	NA (weekly e-mails don't count)	- Orientation and follow up with staff, PA goals, weekly e-mails with strategies to increase PA and acted as a prompt to wear and submit logs, instruction on how to use the pedometer - Pedometer, weekly logs	6-week

Hunt, 2013	Individual	Not specified	Completed the program	Walking program	Not applicable	- Goal setting - Pedometer	12 week
Ingram, 2011	Individual	Sedentary	High and low adherers	Walking Program	Education Sessions	- Orientation and four workshops (overcoming barriers) m telephone support, tailored walking prescription - Heart rate monitor +logs (reported into automated telephone response system)	12 month walking prescription (30 minutes of walking 3-4x/week)
Ingram, 2009	Group	Not specified	Adherent participants	Walking program	*Previously attended diabetes classes	- Group walking, group leader, phone call if no attendance	12 weeks 3x/week
Kluge, 2014	Group	Not specified	All participants	Exercise in a gym	Not applicable	- Qualified PA instructor	12 month 2x/week
Learmonth, 2012	Group	Not specified	All participants	Exercise classes	Not applicable	- Graded tasks	12 week 2x/week
Nielsen, 2014*	Group	Inactive lifestyle	All participants	Spinning and cross fit	Not applicable	- Instructor led	8 weeks 2x/week spinning 1x/week crossfit Follow-up 16 month after program
	Group	Inactive lifestyle	All participants	Football	Not applicable	- Instructor led	24-weeks 2x football training Follow-up 17/18 month after program
Penn, 2013*	Group	Not specified	Successful participants who	Exercise class	Group reflection +	- Regular newsletters - Goal setting by individual	10-week 1x/week

			increased PA @ 6 or 12 months		Diet	- Self-monitoring (gym key)	Follow-up 6 and 12 months after program completion ^{\$}
Penn, 2008*	Group or Individual	Not specified	Increased activity, maintained for 2 years; 3 who had not achieved success	Community PA	Nutrition component	- Individually set goals - exercise log	Follow-up 3-5 years after program completion
Penn, 2014	Group	Not specified	Not specified	Exercise class	Education + nutrition component + Group reflection	- PA sessions, Behavioural counselling and dietary advice	8-week program
Perry, 2008	Individual	Physically inactive	Completers	Walking program	Not applicable	- Heart rate monitors and log books	12 week program
	Group	Physically inactive	Completers	Walking group	Not applicable	- Heart rate monitor	12 week program 1x/week
Roessler, 2011*	Group*	Not specified, but implied?	Mostly increased fitness levels (73%)	Group PA	Not applicable	- supervised PA, instructor led	4-month 2x/week PA Follow-up 8 months after program completion
Russell, 2013	Group	Not specified	Completed 8 of 24 sessions	Exercise class	Education component	- Individual goal setting - Instructor led group classes	12 weeks 2x/week PA
Sabiston, 2009	Group	Inactive (less than 30minutes/day 3x/week)	Completers	Dragon boating	Not applicable	- Individual goals	12-week 2x/week

Seale, 2013	Group or individual	Not specified	Participated in weight loss program	Community PA options	Not applicable	Not specified	Not reported
Shaw, 2011*	Group	Inactive participants	Mostly high adherers (14/17ppts)	Walking program	Not applicable	- Individualized walking program, individual PA consultation to produce plans and goals, overcome barriers) and a follow-up session with relapse prevention and maintenance with leaflet and follow-up consultation (at 36 weeks) Pedometer	12 week program Follow-up 12 month after program completion
Shiner, 2008	Group or Individual	Not specified, implied?	Participants who lost weight or waist circumference	Community PA options	Nutrition component	- Meeting/phone call with investigator to discuss achievements	12 month
Sims-Gould	Group	Not specified	In program	Resistance exercise	Not applicable	-Instructor led	12 month program
Smith, 2013	Group or Individual	Not specified, implied?	Finished prescription program	Community PA options	Not applicable	- Meeting/phone call with investigator to discuss achievements -Goal set by individual	3 month intervention
Sokunbi, 2008	Group	Not specified	Completed 18 week follow-up session	Spinal stabilization program	Video education program	-Supervised Exercise	6 week program 1x, 2x, or 3x/week
Stathi, 2010*	Group	Not specified	Completed the program	Falls prevention program	Not applicable	-Goal set by program -Exercise log	12 month 2x/week 1x home based Follow-up at 8 months after program completion
Stickney, 2005	Group or Individual	Not specified	In the program	Community PA options	Not applicable	Not Specified	Not specified
Tava'e, 2012*	Group or Individual	Not specified, but implied?	Graduates of program	Community PA options	Education Component	-Goal set by individual - Meeting/phone call with	Length of program

						investigator to discuss achievements	unknown. 3 weeks to 2 years follow-up after program completion
Tulloch, 2013*	Group	Previously inactive	During and after program completion	<u>Aerobic exercise</u> <u>Resistance exercise</u> Aerobic and resistance exercise	Not applicable	-Supervision of exercise -Exercise log	6-month 3x/week Follow-up 3 months after program completion
Wycherley, 2012*	Group	Sedentary	Completed	Resistance exercise	Not applicable	-Supervision of exercise	16-week 3x/week PA Maintenance interview at 1 year after program completion
Zulman, 2013	Individual	Not specified	Not specified	Walking program	Not applicable	- Pedometer	12 months
* Indicates a study included in sub question two							

Appendix V

Table 11: Overview of codes classified into the main themes and then into the social ecological model. The codes are a combination of BCTs and inductive codes are ordered from most to least salient.

SEM level	Theme	# Codes	BCTs and Inductive Codes
Intrapersonal	Physiological Changes	100-2	12.6 Body Changes
		-18	Illness as a barrier
		-1	Lack of success in program
	Knowledge Acquisition	10-6	5.1. Information about health consequences
		-6	Not prepared for dealing with life stress
		-4	Time as a barrier
		3	5.2. Salience of consequences
		1	More Education Classes
		1	4.2. Information about Antecedents
	Attitudinal Changes	36	Positive Gain on Life (from program)
		20	Incorporate PA into Lifestyle
		19	Commitment to the program
		19	Enjoying the Program
		3	15.4. Self-talk
		2	5.5. Anticipated regret
	Medical Changes	2	13.4. Valued self-identify
		5	Reduce Medicine with Exercise
		2	11.1. Pharmacological support
Interpersonal	Group Support	239-46	3.1 Social Support (Unspecified)*
		38-30	12.2 Restructuring the Social Environment
		24-4	6.2. Social comparison
		12	3.3. Social support (emotional)
		11	10.4. Social reward
		7	Formation of Group Identity
		7	Social Commitment
		4	13.5. Identity associated with changed behaviour
		4	11.2. Reduce negative emotions
		3	Competitive Challenge
		2	6.3. Information about others' approval
	Instructor	62-14	4.1 Instruction on How to Perform the Behaviour
		49-6	9.1 Credible Source
		24-1	6.1 Demonstration of a Behaviour
		15-2	8.7. Graded tasks
		11	10.4. Social reward
		11	15.1. Verbal persuasion about capability
	Family and Friends	239-46	3.1 Social Support (Unspecified)*
		28-1	3.2. Social support (practical)
		38-30	12.2 Restructuring the Social Environment
		7	13.1. Identification of self as role model
Institutional (Program)	Type of Program	239-46	3.1 Social Support (Unspecified)*
		15-2	8.7. Graded tasks
		-11	Boredom in PA
		-6	Program PA not appropriate level

		5	Trying New Activities
	Routine Formation	42-6	8.1. Behavioural practice/rehearsal
		25-5	8.3. Habit formation
		6	Routine
		2	8.4. Habit reversal
	Goal-Setting	23	1.3 Goal setting (outcome)
		19-7	1.1 Goal setting (behaviour)
		8	1.2 Problem solving
		2	1.4 Action planning
		-3	1.6 Discrepancy between current behaviour and goal
		3-1	1.8 Behavioural contract
		1	1.7 Review outcome goal(s)
		1	1.5 Review behaviour goal(s)
	Monitoring and Feedback	42-18	2.3 Self-Monitoring of Behaviour
		19-4	2.2. Feedback on behaviour
		13-4	2.7. Feedback on outcome(s) of behaviour
		9	2.4. Self-monitoring of outcome(s) of behaviour
		7-1	2.1. Monitoring of behaviour by others without feedback
		5	2.6. Biofeedback
		1	16.3. Vicarious consequences
		1	Feedback from group members
		1-2	2.5. Monitoring of outcome(s) of behaviour without feedback
	Prompts	9-3	7.1. Prompts/cues
	Other	-4	Financial Barriers
		3	Individual Tailoring
	Research	10	Contribution to Research
		7	Additional Monitoring by Research
Community	Providing Resources	24-4	12.5. Adding objects to the environment
	Environmental Barriers (build, natural, social)	38-30	12.2 Restructuring the Social Environment
		35-17	12.1 Restructuring the Physical Environment
		-13	Work as a barrier
		-8	Weather
		-5	Competing Family Obligations
		-2	Holiday as a barrier
Policy	-	-	-
<p>Note: Codes are numbered: positive (7), positive - negative (12-7) or negative (-7) according to the coding rules explained in the method section.</p> <p>*Some BCTs are mapped at multiple levels due to the definition of BCTs not specifying from whom, but rather the presence or absence of a BCT</p>			

Appendix VI

Table 12: Overview of main themes and linkages to BCTs. BCTs and inductive codes are ordered from most to least salient.

Type of Participant	# Codes	Themes	BCTs Identified (most coded to least) and links to PAM
Maintain PA	26	Family/friends/group as support	3.1. Social support (unspecified) 3.2. Social support (practical) 12.2. Restructuring the social environment 1.9 Commitment PAM- Physical Activity Environment
	18	Health benefits as a reason for maintaining	12.6. Body changes
	13	Enjoyment of activity as motivator	No BCT linkage
	13	Continuing with PA	8.3. Habit formation
	11	Incorporating PA into daily routine	8.3. Habit formation
	10	Having a routine/strategy	8.3. Habit formation
	9	Knowledge/confidence gained from program	4.1. Instruction on how to perform the behaviour 5.1. Information about health consequences
	9	Group composed of similar individuals	12.2. Restructuring the social environment PAM- Physical Activity Environment
	5	Having a target/goal to work towards	1.1 Goal setting (behaviour) PAM – Goal setting
	5	Importance of self-monitoring	2.3. Self-monitoring of behaviour
	4	Not wanting to lose the results achieved	5.5. Anticipated regret
	4	Volunteering with the program (staying committed)	13.1. Identification of self as role model
	4	Program helping find a new post program	3.1. Social support (unspecified)
	3	Making friends	3.1. Social support (unspecified) 12.2. Restructuring the social environment
	3	Positive physical environment	12.1 Restructuring the physical environment PAM- Physical Activity Environment
	2	Identifying self as a role model	13.1. Identification of self as role model
	1	Type of exercise to help maintenance	8.3. Habit formation
	1	Positive thinking	15.1 Verbal persuasion of capability PAM- Motivation
Tried to maintain PA	-16	Want continued professional support	3.1 Social Support (Unspecified) 9.1 Credible Source
	-6	Not knowing what to do after	12.2 Restructuring the Social environment
	-6	Family Comes First	3.1 Social Support (Unspecified)
	-3	Social environment as a negative influencer	No BCT linkage PAM- Physical Activity Environment
	-3	Loss of group support	3.1 Social Support (Unspecified)
	-2	Want a transition period	3.1 Social Support (Unspecified)
	-1	Boredom	No BCT linkage

Did not find PA program	-16	Want continued professional support	3.1 Social Support (Unspecified) 9.1 Credible Source
	-12	Unable to find a suitable new program	No BCT linkage
	-11	PA environment as a barrier	12.1 Restructuring the Physical Environment PAM- Physical Activity Environment
	-9	Want program to continue	No BCT linkage
	-2	Want a self-monitoring device	2.3. Self-monitoring of behaviour 12.5. Adding objects to the environment
	-2	Want a transition period	No BCT linkage
	-2	Want continued prompts in the future	No BCT linkage
Lost Interest	-5	PA too much effort	No BCT linkage
	-3	Reducing Medicine is not enough for motivation	12.2 Restructuring the Social environment
	-3	Do not think PA is necessary	No BCT linkage
	-2	Loss of interest	3.1 Social Support (Unspecified)
Barriers that everyone encountered	-6	Illness/injury	No BCT linkage PAM – Life stress
	-5	Weather	
	-4	Increasing barriers over time	
	-4	Work	
	-5	Cost	
	-5	Time	
	-3	Transport	
Notes: Codes are identified by positive (7) or negative (-7) numbering. BCTs can be in more than one theme.			

Appendix VII



Figure 1: Certificate of Completion of Online BCT Taxonomy v.1 Training Course, December 2014