

# A narrative synthesis investigating the use and value of social support to promote physical activity among individuals with Schizophrenia

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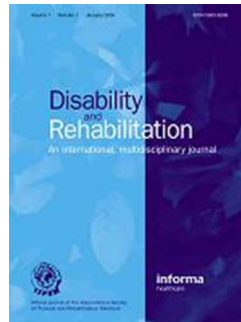
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## **A narrative synthesis investigating the use and value of social support to promote physical activity among individuals with Schizophrenia.**

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Implications for rehabilitation

- Limited evidence is available that considers the role, value and use of social support within physical activity interventions for individuals with schizophrenia.
- Social support appears most likely to aid an individual’s initiation, adherence and compliance to physical activity interventions.
- There may be an indirect benefit of social support on maintaining or enhancing health outcomes.

For Peer Review

### Abstract and key words

**Purpose.** To review and synthesize the literature detailing the use of social support to facilitate physical activity participation in individuals with schizophrenia

**Method.** A systematic review of major electronic databases was conducted to identify literature regarding the use of social support to promote physical activity among people with schizophrenia. A narrative synthesis was undertaken in 4 stages, including; development of a theory; developing a preliminary synthesis; exploring relationships; and assessing the robustness of the synthesis.

**Results.** From a total of 110 studies, 23 met the inclusion criteria including 883 individuals with schizophrenia. Informational support was the most documented form of social support, followed by emotional, esteem and tangible. Providers included research personnel, healthcare professionals, family members and peers. Details of the content of the different dimensions of functional support are given. Social support appears to have an important role to help individuals with schizophrenia initiate, comply and adhere with exercise interventions. Social support may have an indirect benefit on weight maintenance. However, due to the limitations of the selected literature it was difficult ascertain what the (in)direct benefit of social support are on health outcomes.

**Conclusions.** Social support appears to play a pivotal role in initiating physical activity as well as ensuring compliance and adherence to physical activity. Future research is required to investigate the optimal type and mode of delivery of social support on health outcomes.

**Key words:** *schizophrenia, social support, physical activity, physical activity, exercise, synthesis*

1.Introduction

There is widespread acknowledgement of the importance of physical activity to the physical [1,2] and psychological [3,4] health of individuals with schizophrenia. However, a challenge remains as to how to engage individuals in physical activity despite complex barriers (physical, environmental, situational and psychosocial) to participation [4-6]. Social isolation, reported in around half of individuals with schizophrenia [7], combined with a lack of motivation has been identified as a significant barrier to participation in physical activity [1,8]. Further, decreased social interaction is a key barrier to participation [4,9]. However, physical activity which is accompanied by positive social interactions and relationships can improve challenge ambivalence to participation [5] and can also aid adherence, enjoyment and motivation [6,10-14]. Thus, social support has been identified as having an integral role in promoting physical activity initiation and adherence in people with schizophrenia. [4,6,14].

If individuals are going to successfully initiate and adhere to a physical activity intervention, positive interactions utilising different types of social support are required [15]. Emerging research recognises the need to consider the types of social support that are used to influence physical activity in individuals with schizophrenia, from the perspective of the health care professional [6,14] and the patient [10,16,17]. For instance, staff that support individuals are required to be knowledgeable about the physical activity, be encouraging and providing esteem support to overcome motivational barriers [18-20]. However, there is still considerable uncertainty regarding the optimal type and mode of delivery of social support [6,14,15,21].

Given the potential for social support to improve physical activity uptake and adherence among individuals with schizophrenia and also the lack of clarity around the optimal type and method of delivery, a review of the literature is needed to inform clinical practice. A narrative synthesis was adopted since it provides a useful way of collating information to synthesize findings and enables new interpretations of findings [22-24]. This type of review is able to bring together evidence from

studies that are heterogeneous [25] and is useful as it enables researchers to utilise different synthesis tools (e.g., translation of information from different studies, idea webbing and conceptual mapping, see[23]) and techniques which answer questions which traditionally can't be answered using a systematic approach [25].

### *Aim and Objectives*

The aim of the current research is to provide a critical consideration of the role, value and use of social support as a part of physical activity interventions for individuals with schizophrenia.

## **2.Methods**

A narrative synthesis review was conducted following recognised criteria [23]. The process is conducted in 4 stages: (1) developing a theory; (2) developing a preliminary synthesis; (3) exploring relationships; and (4) assessing the robustness of the synthesis.

### *2.1 Developing a Theory*

Social support is considered a vital condition for therapeutic change in psychiatry [26] as such it was hypothesised by the author that it has a direct and significant impact on the outcomes of physical activity interventions. Previous literature [15,27] defines social support as having four fundamental dimensions of functional social support and one dimension of structural support (group membership and belonging). The functional domains include (a) emotional support; defined by a feeling of being cared for and an ability to go to others for security and comfort at stressful times. (b) Informational support; defined by the provision of guidance and advice which enables an individual to have solutions to problems they perceive. (c) Tangible support; which is defined by the assistance and resources provided to an individual at times of stress e.g., financial assistance. (d) Esteem support; which is defined by the bolstering an individual sense of self-esteem and competence and expressing a belief that an individual is capable of coping with a stressful situation. This support is aided by the provision of positive feedback about an individual ability or skills to perform a task. These forms of

support can be effective in enabling individuals with schizophrenia to engage in physical activity [6,14,28].

2.2 *Developing a Preliminary Synthesis*

A systematic search of the literature was conducted to identify and evaluate literature that has considered social support and physical activity intervention studies. We focused on physical activity interventions in order to study the interaction between physical activity and the reported outcome measures. We assessed the consistency with which the different domains of support were used, who the provider of support was and whether social support could be attributed to direct or indirect benefits identified from outcome measures assessed by each study. For the purpose of this study we define physical activity as any bodily movement undertaken by the skeletal muscles which results in energy expenditure [29].

2.3 *Information sources and search strategy*

Electronic searching was conducted, from database inception to August 2013, using Cochrane Library, AMED, CINAHL, EBSCO, EMBASE, Medline, PEDro, PubMed, PsychINFO, SPORTSdiscus, Science Citation Index and Social Science Citation Index; ZETOC databases; selected Internet sites (e.g. Chartered Society of Physiotherapy) and Indexes (Turning Research into Practice, Health Services/Technology Assessment). Each search strategy combined key terms for the population and the topics of physical activity and social support of interest [30], key terms included; PHYSICAL ACTIVITY, SCHIZOPHRENIA, PSYCHIATRIC, EXERCISE, SOCIAL SUPPORT, SOCIAL CAPITAL, GROUP, and SPORT. Hand searches were made on the reference lists of articles including recent review articles [1,3,31] related to physical activity and schizophrenia.

2.4 *Eligibility criteria (inclusion and exclusion criteria) for the review*

Eligibility criteria was arranged around the acronym SPIDER [32] and included:

(S) Sample- individuals with a diagnosis of schizophrenia or schizophrenia spectrum disorders from a structured clinical assessment (DSM-V, ICD-10).

(P) Phenomenon of interest-studies must make reference to at least one of the four dimensions of social support or the one structural dimension of social support [6,14,15,27].

(D) Design –a mixture of design methods were included, including (randomised control trials, quasi-experimental trials, pre-experimental trials, case control trials, cohort studies and case studies.

(E) Evaluation-all outcome methods were included as well as subjective interpretation of data relating to social support from the authors of studies.

(R) Research-types included explanatory studies if they considered the concept of social support within their physical activity intervention and descriptive or exploratory studies if they considered the role, value, or use of social support as a part of physical activity.

We only considered articles written in English. Studies before 1968 were excluded.

### *2.5 Study selection process*

The primary author screened articles by title, and abstract. Full text was retrieved when it was decided (by the primary and corresponding author) that the article could not be indubitably excluded based on its title and abstract. The full text was obtained and eligibility criteria applied.

### *2.6 Critical appraisal*

Two methods for critical appraisal were undertaken. Case studies (n=4) were appraised using a set of screening questions [33] and risk of bias was utilised to assess trials (n=19) [34].

### *2.7 Synthesis*

The synthesis was undertaken in four stages. Stage one involved the identification of demographics (for instance, age, gender, weight) and the social support and physical activity intervention



processes using a pre-determined data extraction form. Stage two involved identifying the provider of social support, using vote counting (see supplementary Table 1) to document the frequency of different groups (mostly groups healthcare professionals e.g., physiotherapists). Stage three identified the domains of functional support utilised in each study. The primary synthesis (See supplementary Table 2) documented each type of support as presented by each study. A secondary synthesis (undertaken by the corresponding author) used a content analysis to bring this information together. In the final stage, the corresponding author undertook a primary synthesis using tubulisation (Supplementary Table 3) this recorded how and if social support was attributed to beneficial effects from the study. This included columns which summarised the implication and proposed mechanisms, a column which utilised existing reviews [1,4,28,35-37] to support the implication and mechanisms statement. A final column identifies the likelihood (three strength statements: possible, likely, very likely) of creating statistically and clinically meaningful changes for an individual, score was decided upon by three authors [AS, PG, BS] and was weighted by current evidence combined with existing review evidence. A secondary synthesis using content analysis was then used to present the consistency across studies of the attributions made.

### 3. Results

#### 3.1 Search output and stage 1 considering the summary of included studies.

From a total of 110 studies, 80 were excluded since they did not meet the inclusion criteria. A total of 883 participants were represented across the 23 studies [11,12,38-58]. The full search process can be considered within the PRISMA flow diagram (Figure 1).

INSERT FIGURE 1 HERE

The included studies used a range of study designs including randomised control trials (RCT's, n=10), single group pre-post (n=1), prospective non-blind pilot study (n=1), single group prospective (n=3), experimental (n=1), quasi-experimental (n=2), cohort (n=1) single group feasibility (n=1) and case studies (n=3). Information regarding the demographics of study participants was variable and often lacking. For instance, 12 studies did not provide details regarding gender, the remaining divided into male (n=552), female (n=319). The age of participants ranged from 18-64 years, when reported the average age of most studies (n= 12) participant was between 30-50 years. The main intervention settings included of outpatients facilities (n=9) and inpatients facilities (n=9). Interventions lasted from one week to twelve months with treatment sessions ranging from once to 3 x per week with one study having 3 x exercise sessions plus 1 x session around healthy behaviours education [55]. Full details of the study demographics and design are provided in Table 1.

INSERT TABLE 1 AROUND HERE

#### 3.2 critical appraisal

##### 3.2.1 Critical appraisal of trials

All except three trials [50,52,53] rated high for selection bias-allocation concealment. Types of bias were identified as selection bias-random sequence generation, (n=7); selection bias-allocation concealment, (n=16); detection/performance bias (n=13); attrition bias, (n=7); reporting bias, (n=3) and other bias, (n=14). Eleven out of nineteen trials [11,12,40-42,49,52,54,55,57,58] contained at

least four out of a possible 6 types of bias. For details, see Table 2. Fourteen studies [11,12,39-42,49-52,54,55,57,58] rated high for detection bias as no blinding of participants or study personnel was undertaken. Attrition bias, associated with participant dropouts, was a risk in seven studies [11,41,42,49,55,57,58].

3.2.2 Critical Appraisal of case studies

The researcher’s perspective was not taken into account across any of the case studies. One study [45] did not have a clearly described method of data collection, which could introduce reporting bias. No details were given regarding the methods of data analysis or quality control measures across any of the case studies, it is difficult to accurately assess whether the data is likely to be valid and reliable which decreases external validity and rigour.

INSERT TABLE 2 AROUND HERE

3.3. Synthesis

The final three stages of the synthesis are presented below:

3.3.1 Stage two-Provider of Social Support within each study

The main providers of social support identified were healthcare professionals (n = 13) as well as research staff (n=13) and exercise or fitness specialists (n=7). A full breakdown of staff can be identified within supplementary Table 1.

Stage Three-Identifying Types of Social Support Utilised by each Intervention

Informational support was identified as the most consistently utilised type of support across all interventions (n=22/23). Emotional support (n=20/23) was the second most utilised, followed by esteem support (n=15/23) and tangible support (n=11/23). The full detailed description of the content of each type of support is provided in Table 4 (the content where at least 3 studies support a sub-theme/code is identified below). Details by study can be seen in supplementary Table 2.

The content of emotional support included; (a) supervision and generalised support for individuals during sessions (n=5), (b) the use of family members to support individuals (n=4), (c) care giving for individuals such as providing a friendly atmosphere or asking individuals how they felt.

The content of informational support included: (a) technical instructions of how exercise, flexibility should be performed and how injury or discomfort limited (n=5). One study also considered breathing and relaxation techniques, (b) sessions on topics around an individual's diet (n=9), this included healthy eating, food shopping reading labels, preparing food and food sampling, (c) sessions on topics around an individual's physical activity (n=8), this included information about the importance of physical activity, how to use instruments (e.g., pedometers), and how to choose suitable physical activity, (d) sessions on how to undertake a healthier lifestyle or improving health were given (n=8), identifying how to modify lifestyle, how to prevent relapse, how to cope with withdrawal symptoms, how to manage anxiety and the importance of sleeping, (e) informational support in the form of assessments included; fitness (n=5), weight and diet (n=3), perceived exertion during exercise (n=3), goal setting and exercise planning (n=4), (f) informational sheets or booklets which covered the educational guidance within the sessions were provided frequently (n=10). (g) phone calls to identify when session took place or when to attached a pedometer were made (n=3), (h) finally, enhanced consideration to consent was given (n=3).

The content of esteem support within studies included: (a) verbal encouragement for individuals (n=5), (b) reinforcement of positive and negative behaviour (n=8), (c) having peer role models that could encourage others (n=3), (d) interaction which assisted behaviour change outside the physical activity (n=9), this included different motivational techniques like motivational interviewing to encourage adherence and achieve goals.

The content of tangible support most frequently identified (n=3) included using privileges to enhance weight loss for instance meal or food privileges or tokens which could be used to purchase gift items. In older studies work privileges were also identified.

Stage four-Outcome Measures and Results attributed to Social Support

The attribution of the benefits of social support from physical activity interventions for individuals with schizophrenia is identified fully in supplementary Table 3 and summarised in Table 4. Overall the indirect health benefits of social support were difficult to ascertain. However, providing esteem support, emotional support and verbal reinforcement (n=8), general social support (n=4) and peer /group social support (n=5) appeared to facilitate individuals compliance and attendance of programmes.

INSERT TABLE 3, 4 & 5 AROUND HERE

**4. Discussion**

Twenty-three studies were analysed in this synthesis to determine the type and use of social support used to facilitate physical activity in individuals with schizophrenia. The most frequent provider of support was the research staff or exercise instructors. The current findings were able to detail how the utilisation of different functional and structural domains of social support act to help individuals overcome the barriers which influence physical activity initiation, adherence, as well as compliance to programmes. Indeed, previous literature has suggested that support given during a familiarisation phase [12] or pre-intervention phase [44] can allow patients to feel that they are known and valued, trusted and feel cared for. This may help them overcome the psychosocial barriers to attendance[53]. Further to this a novel finding identified the possibility of an indirect influence of social support on the success of maintaining and losing weight (the most frequently reported outcome).

Informational support was identified as the most utilised and this correlates with previous literature to some extent [6]. This type of support can be readily implemented in clinical practice as it may require less expertise to deliver it, as it relies on the participant to read and be informed by the information. It is also the easiest domain of support to document within research. These findings may explain why it was the most documented/utilised type. Further research is required to

determine how informational support should be disseminated and constructed in order to maximise the effects.

Esteem support is highlighted in several studies [6,14,28] as the most valuable from the perspective

of both staff and patients. Past literature has identified the importance of individualised verbal encouragement[44] and reinforcement[45,47] likely enhances an individuals perceived ability to continue with their efforts and not give up, it may be especially important due to a-motivation, the current results go some way to support this, especially when considering the value on adherence, attendance and compliance. This makes sense, when one considers that individuals with schizophrenia lack an internal locus of control, therefore find it difficult to make and maintain change as they rely on the actions of others, or environmental or situational events to enable this [20]. However, emotional and esteem support may require greater time for contact with individuals, a higher level of knowledge and training from the provider, especially when working with individuals who have complex needs [10,16]. Further to this there is less understanding of how emotional and esteem support work e.g., what should be said, how it should be said. Importantly, peer support and group settings appeared to be of value for adherence and compliance of physical activity. One reason for this could be that isolation from living alone acts as a barrier to attendance e.g., in one study [41] individuals who lived alone attended significantly ( $p = 0.32$ ) fewer sessions than those who lived with others.

The current review suggests that individuals with schizophrenia will benefit greatly from friendships that develop alongside the physical activity that is undertaken. Such friendships provide access to positive identities [4] and acts as a positive form of social control [37], which, in turn help to increase an individual's confidence for further participation in physical activity [59] and that the cohesion that is developed with others during physical activity can encourage interest and aid on-going commitment to physical activity [60]. Further to this, evidence has identified that friendships

with peers developed within the physical activity setting are associated with a reduction in psychiatric symptoms [1,18,19].

The current review suggests that it is very likely that social support can have an indirect benefit on efforts to maintain weight or even enhance weight loss when it was measured across studies. This finding, as in other studies [52], should be considered tentatively as requires direct measurement.

Past literature has identified that individuals with schizophrenia who are overweight should have a target weight loss of between 5% and 10% [61] and that a in body weight of 5% will have a clinically meaningful reduction in morbidity for individuals [62]. Importantly past reviews have suggested that this is a challenging target [2,31,61,63]. However, evidence from this review implicates that the utilisation of different forms of functional and structural social support with ‘very likely’ chance of having an effect on outcomes (see Table 4 and 4.4.2) has the potential to allow individuals to reach and surpass this target.

4.2 Implications

The current results have identified the value of emotional, esteem, and peer support on the initiation compliance and adherence of exercise in individuals with schizophrenia as well as the indirect benefit of esteem and informational support on weight maintenance and loss. Given this, the current implications have drawn on the most common forms of these dimensions of functional and structural support to provide clinical recommendations from this review (please note that further evaluative research is required to test these implications):

4.2.1 Recommendations to support the initiation, compliance and adherence to physical activity

Attention should be given to the individuals needs on a personal level. Within intervention settings, a friendly and welcoming atmosphere is required where individuals feel accepted and cared for. Individuals should receive frequent encouragement about progress and encouraging statements to

keep going when undertaking an intervention. Encouragement for compliance to the recommended exercise level or intensity should be given but not forced and any amount of maintenance or progress valued. Positive behaviour should be reinforced. Pre-intervention contact and support will likely enhance the potential for initiation and adherence. Additionally peer support should be considered within interventions for it's value in helping individuals change their lives and increase their sense of belonging and life satisfaction[64]. The use of peer support or having a training partner can enhance the experience of exercise through individuals knowing and supporting one another [11,12,40,43], as well as reducing the feelings of being uncomfortable in the physical activity setting or the consequence of not having anyone to go with [65].

It may be useful for clinicians' to consider the trans-theoretical model of behaviour change [66] when using social support to promote behaviour change. Importantly, it may be at different stages of the behaviour change model certain types of support are more effective or useful. The use of counselling techniques or motivational interviewing techniques [67] should be used to assist initiation and adherence, and the importance of establishing rapport, trust and a relationship should be consistent and used to enhance the effects of esteem and emotional support. Groups where positive reinforcement and interactions can be obtained by peers are important and will like aid initiation, compliance and adherence of exercise. These types of support should be used within the exercise session as well as outside the exercise session.

#### 4.2.2 Recommendations for the use of social support to aid the maintenance of weight or reduction of weight

Social support must be considered for interventions if psychological barriers including cognitive biases are to be prevented and physical activity is going to be initiated. Before maintenance of physical activity is established individuals can experience feeling isolated and vulnerable and not feel comfortable to attend sessions without social support. Individuals will significantly benefit from having others (health care professionals, positive peer role models, family or carers) to go with and



encourage them to participate. Positive behaviour should be reinforced when it would likely help the individual achieve weight maintenance or weight loss. Providing individuals with information about diet and physical activity and the value of it is important as it, techniques to encourage behaviour change to occur such as motivational interviewing and exercise counselling. This finding can be supported in future studies by a mediator analysis.

4.3 Limitations

4.3.1 Methodological Limitations

Several types of bias have been identified which could have influenced results therefore findings must be interpreted with caution. Limited number of randomised control trials (n=10) may increase risk of a selection bias within the results [68] and thus may influence the interpretation of findings associated with understanding the benefit of social support on outcome variables. Further to this, allocation concealment is crucial in the randomisation process to increase internal validity and decrease the risk of bias. The lack of blinding throughout the studies could potentially compromise the validity of the findings and any conclusions made as it may have introduced participant or performance bias [69]. None of the studies (n=7) that had an attrition bias performed intention-to-treat analysis, leading to missing outcome data which makes interpretation of the results more difficult and undermines the validity of the conclusions reached [70].

Although strategies such as the use of data extraction tables were implemented to minimise bias, the primary and corresponding author performed all aspects of the review non-blinded, therefore researcher bias may have been introduced. Including quantitative and qualitative studies may introduce bias to the findings due to the latter having a less rigorous design approach, therefore allowing for collection of biased results. Language bias may also have been introduced due to

exclusion of non-English articles, excluding potentially relevant literature. Due to a current lack of research in this area to date, the sample size of included literature was small (n=23).

#### 4.3.2 Bias's within the data

The population of the sample shows a higher ratio of males to females than the general population of individuals with schizophrenia (1.7 compared to 1.4) [71]. This may reduce external validity and therefore generalizability [72]. External validity may be further reduced due to lack of indication of participants' ethnicity. Evidence suggests the potential presence of over or misdiagnosis of psychotic symptoms in African American inpatients [73]. Affective disorder symptoms can be misinterpreted as psychosis, which may introduce sampling bias. However, in the studies reviewed, there were equal numbers of inpatient and outpatient settings (n=9).

Few studies report on the symptom profile or the degree of symptoms experienced by the participants selected for inclusion. There is evidence that the presence of negative symptoms is the most significant correlate with physical inactivity [1] and as such clinicians may wish to target this symptom profile in interventions for patients with schizophrenia designed to increase physical activity. The lack of specific information on symptom profiles of the samples in the studies in this review limits the extent to which we can comment on the generalisability of findings to this particular population. The lack of information on the degree of symptoms experienced by participants also makes it difficult to ascertain generalisability. Although participants throughout studies are reportedly medicated for their symptoms, few report on dosage and adherence to medication. In addition, none of the studies report on whether samples are constituted of individuals experiencing first episode psychosis, which further reduces generalizability to the population. Finally, with the exception of weight, waist circumference and body mass index, the studies did not utilise a standard set of outcomes, thus this limits the attributions regarding the value of social support.

4.3.3 Limitations in the review technique

The techniques used in narrative synthesis are limited by subjectivity of results, techniques chosen by author and stance or understanding of the author who undertook the analysis. The interpretation of findings which attribute the value of social support to particular outcome is subjective, and should be viewed with caution. The review was not able to consider the optimal dosage of support, or was it able to elucidate the unique effect generated by the different forms of social support. Further research is needed to specifically investigate this.

4.4 Recommendations for future research

A great understanding of how the different functional dimensions of social support are used within clinical settings is needed. Greater detail on what social support practices are reported as valuable by patients is required and further understanding of how policy can be changed in order to utilise the potential value of social support is required. Future research should try and establish what the direct effect of social support to facilitate physical activity engagement is on important health outcomes.

4.5 Conclusion

The current review established that a wide range of different types of social support are currently used by a number of different professionals. There is some evidence to suggest that providing social support may improve adherence and indirectly aid positive health outcomes (e.g. BMI). However, due to limitations in the literature it was difficult to disentangle the direct effects of social support on health outcomes. Therefore, future research should more clearly investigate the value of social support on important health outcomes from physical activity engagement.

Acknowledgements

None.

#### Declaration of Interests

The authors report no declaration of interests.

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Table 1 Demographics of individuals from the included studies

Study	N	Diagnosis	Age, Gender and Weight	Details of Intervention	Intervention Process
Dodd 2013	8	DSM-IV Schizophrenia or Schizoaffective	<b>Gender:</b> 6 male <b>Age:</b> 45±10 years <b>Weight:</b> 75.5±9.3 <b>Marital Status:</b> Not identified	<b>Intervention Setting:</b> Gymnasium of the local rehabilitation setting <b>Time:</b> 28 week intervention <b>Design:</b> Single group pre-post. Phase 1: 4-week familiarisation. Phase 2: 24 week aerobic exercise and walking programme. <b>Aim:</b> Consider the feasibility of a group-based aerobic exercise and walking program on aspects of physical health and behaviour.	4 week familiarisation phase-exercises performed at very low intensities Groups 2-3 people-each supervised by qualified exercise physiologist with previous experience with implementing exercise programmes with people with severe mental illness.
Attux (2013)	160 Intervention: 81 Standard Care: 79	DSM-IV schizophrenia spectrum. Breakdown not given.	<b>Gender:</b> Intervention: 50♂ / Standard Care: 46♂ <b>Age:</b> Intervention: 32.6±9.9 years / Standard Care: 38.3±10.7 <b>Weight/BMI:</b> Intervention: 81.1±14.3kgs. Standard Care: 84.3±17.8 <b>Recruitment setting:</b> from 4 outpatient programmes <b>Marital Status:</b> Intervention: 64 Single, 8 Married, 9 Other (divorced widow). Standard Care: 62 Single, 10 Married, 7 Other (divorced widow).	<b>Intervention Setting:</b> Outpatient setting for meetings <b>Time:</b> 12 weeks <b>Design:</b> Randomised control trial <b>Aim:</b> to test the efficacy of a 12-week group lifestyle wellness program	12-week weight management One hour per week... 1 session for intro, 4 discussing dietary choices, 3 discussing importance of physical activity, 1 for self-esteem and motivation, 1 for management of anxiety, 1 open to relatives, 1 to end programme.
Archie (2003)	20 Intervention: 10	DSM-IV Schizophrenia or schizoaffective disorder	<b>Gender:</b> 10 male <b>Age:</b> 27 years <b>Weight/BMI/WC:</b> 31 kg/m2 / 105 cm. <b>Recruitment setting:</b> Psychiatric Disorders Inpatient Clinic <b>Marital Status:</b> Detail not given	<b>Intervention Setting:</b> Community fitness centre <b>Time:</b> 6-month full membership to setting <b>Design:</b> Prospective non-blind pilot study <b>Aim:</b> Consider if individuals would initiate and maintain exercise if provided with free access to a local community Young Men's Christian Association (YMCA) fitness facility.	Membership to YMCA (Young Men's Christian Association) fitness facility.
Bernard (2013)	12	DSM-IV-TR 9 Schizophrenia, 3 Schizoaffective disorder	<b>Gender:</b> Not detailed <b>Age:</b> 45.7±10.8 years <b>Weight/BMI/WC:</b> 4 were > 25kgs/m2, 2 were >30 kg/m2. <b>Recruitment setting:</b>	<b>Intervention Setting:</b> Inpatient location <b>Time:</b> 8-week counselling and exercise intervention <b>Design:</b> Oxygen group intervention Single group prospective design.	8 week counselling and exercise intervention. Five 75 min 'smoking reduction' group sessions Three 90 min exercise sessions

			inpatients <b>Marital Status:</b> Not detailed	<b>Aim:</b> "to evaluate the feasibility, acceptability and effects of the oxygen group on smoking consumption" (pp., 24)	
Beebe (2010)	17	DSM-IV 12 Schizoaffective Disorder 5 Schizophrenia	<b>Gender:</b> 10 male <b>Age:</b> 43.2 years <b>Weight:</b> not identified. <b>Recruitment setting:</b> Outpatients at a community mental health setting <b>Marital Status:</b> Not given. 6 Living alone 7 living with family 4 with paid carer	<b>Intervention Setting:</b> Outpatient centre <b>Time:</b> 4-week <b>Design:</b> Single group prospective design <b>Aim:</b> Determine the feasibility and acceptability of a Walk, Address sensations, Learn about exercise, Cue exercise behaviour intervention (WALC).	WALC....Walk, Address sensations, Learn about exercise, Cue exercise behaviour Nutritional counselling Exercise Motivational counselling inc. professional support, encouragement and strategies to improve exercise habits.
Duraiswamy (2007)	61	DSM-IV Schizophrenia	<b>Gender:</b> 42 male <b>Age:</b> Yoga group: 32.5±7.9 years Exercise group: 31.1±7.9 <b>Weight:</b> not detailed <b>Recruitment setting:</b> National institute of mental health and neuro sciences, India <b>Marital Status:</b> 18 married 43 unmarried	<b>Intervention Setting:</b> Outpatient therapy hall <b>Time:</b> 4-month intervention <b>Design:</b> Randomised control trial <b>Aim:</b> "examine the effects of a 4 months of yoga treatment as an add-on treatment on the psychopathology of schizophrenia patients" (pp 227).	4-month yoga therapy or physical exercise therapy
Centorrion (2006)	17	DSM-IV Schizophrenia or Schizoaffective disorder	<b>Gender:</b> 17 male <b>Age:</b> not detailed <b>Weight:</b> 105.0±18.4 kgs / 36.6±4.6 <b>Recruitment setting:</b> Inpatient hospital <b>Marital Status:</b> Not given.	<b>Intervention Setting:</b> In patient hospital, weight management centre on hospital grounds <b>Time:</b> 12 month trial 2 phases lasting 24 weeks each. <b>Design:</b> Single group prospective design <b>Aim:</b> Consider the effect of a weight-control study for individuals with schizophrenia	2 x 24 week programmes <b>First phase-</b> -Twice weekly for diet and exercise counselling. -Sessions lasted 90 mins-first 45 mins nutritional counselling, followed by 45 mins of personalised fitness training. (During the first four weeks, food plans were developed for each subject incorporating individuals sleep, activity and hunger patterns) <b>Four sessions were devoted to identifying strategies to decrease social isolation and inactivity.</b> <b>Second phase-</b> as detailed above but less intensive. -minimum commitment of one session every

					4 weeks
Beebe (2005)	10	DSM-IV of Schizophrenia or any sub-type	<b>Gender:</b> 8 male <b>Age:</b> not identified <b>Weight:</b> not identified <b>Recruitment setting:</b> Outpatient clinic <b>Marital Status:</b> 7 single, 3 married	<b>Intervention Setting:</b> Outpatient clinic in a specified room <b>Time:</b> 16 week study <b>Design:</b> Pilot randomised control trial <b>Aim:</b> To consider the benefits of a walking program to the physical and psychosocial health of individuals.	12 participants randomly assigned to experimental (n=6) and control (n=6) groups for a 16 week treadmill walking programme 3 x per week 2 participants did not attend any scheduled exercise sessions so were dropped.
Beebe (2011)	97	DSM-IV 28 Schizophrenia 69 Schizoaffective	<b>Gender:</b> 51 male <b>Age:</b> 46.9±2.0 years <b>Weight:</b> not identified <b>Recruitment setting:</b> Community outpatients centre <b>Marital Status:</b> Living alone 36 Living with family 42 Living with paid carer 19	<b>Intervention Setting:</b> Psychiatric research centre <b>Time:</b> 20 weeks. <b>Design:</b> Randomised control trial <b>Aim:</b> To consider the benefits of a motivational group exercise on individuals with schizophrenia Intervention group 4-week WALC + 16 week walking intervention. Control: 4 week time and attention control group + 16 week walking intervention	<b>WALC-S Group (Walk, Address sensations, Learn about exercise, Cue exercise behaviour for SSDs)</b> 1 hour weekly for 4 weeks, 8 subjects per group  <b>TAC Group (Time and Attention Control)</b>  <b>16 week walking programme</b> Two different blinded graduate students. Began with warm up stretches, walking- beginning with 5 mins, increasing to 30 mins over the first 4 weeks. Cool down exercises-5 mins slow walking followed by stretches. Reminder and follow up calls.
Thyer (1984)	2	Psychiatrist diagnosis of Schizophrenia	<b>Gender:</b> 1 male <b>Age:</b> 64 & 53 years <b>Weight:</b> not identified <b>Recruitment setting:</b> Outpatient facility <b>Marital Status:</b> Not identified	<b>Intervention Setting:</b> Outpatient group care facility <b>Time:</b> 78 days <b>Design:</b> ABAB experimental design <b>Aim:</b> To consider the effectiveness of a contingency-management program on the exercise behaviour of individuals with schizophrenia	First baseline phase...7 days Stationary exercise bike with odometer was placed in the living room, in front of the TV. Residents were informed that it was for their health and recreation. They could ride it whenever they wished. They were asked to inform staff before and after riding the bike so that staff could collect readings from the odometer. First reinforcement phase...7 days Extra cigarettes and coffee and tea would be available if they used the exercise bike first. Specifically...one reinforcement for each one tenth of a mile (1/10) for the first mile, then one reinforcement for each 2/10 of a mile for the second mile and so on. Second baseline phase...7 days

					Cigarettes and coffee/tea made available solely on request. Second reinforcement phase...7 days As above
Bernard (1968)	1	Psychiatrist diagnosis of Schizophrenia	<b>Gender:</b> Female <b>Age:</b> not identified <b>Weight/BMI/WC:</b> 407 lbs <b>Recruitment setting:</b> Inpatient hospital <b>Marital Status:</b>	<b>Intervention Setting:</b> Inpatient hospital <b>Time:</b> 27 weeks <b>Design:</b> Case study <b>Aim:</b> To produce weight loss in a ward setting.	Single subject, 'experimental behaviour modification' 18 week calorie controlled diet. Weight loss 'rewarded' with 10 tokens for each pound lost. Tokens could be exchanged for privileges such as; phone calls, admission to dances, movies, rent on a private room on the ward.
Moore (1969)	1	Psychiatrist diagnosis of Schizophrenia	<b>Gender:</b> female <b>Age:</b> 24 years <b>Weight:</b> 170 lbs <b>Recruitment setting:</b> Inpatient hospital <b>Marital Status:</b> single	<b>Intervention Setting:</b> Inpatient hospital <b>Time:</b> 26 week period <b>Design:</b> Case study design <b>Aim:</b> To consider the effects of social reinforcement on the patient	Weight loss via reinforcement of social approval and acceptance to help inhibit eating. If 'S'(subject) had lost weight, E would respond with positive reinforcement around approval and acceptance for her weight loss. If she had gained weight or stayed the same, the E would respond negatively, by simply shaking his head. He would record the weight, inform the subject and then instruct her to return to the ward.
Upper (1971)	2	Psychiatrist diagnosis of Schizophrenia	<b>Gender:</b> male <b>Age:</b> 36 and 42years <b>Weight/BMI/WC:</b> 233 lbs and 201lbs <b>Recruitment setting:</b> Psychiatric inpatient ward <b>Marital Status:</b> Single and divorced	<b>Intervention Setting:</b> Psychiatric inpatient ward <b>Time:</b> 28 weeks <b>Design:</b> Case study <b>Aim:</b> Consider the effects of different forms of reinforcement on weight loss on an inpatient unit	Weight reduction programme. 1500- calorie diet with weekly weight ins. Use of reinforcing agents. Administration of tokens Privileges to be taken off-ward-4 types-meal, work, full and partial Social approval
McKibbin (2006)	57	Physician confirmed diagnosis 48 Schizophrenia 9 schizoaffective disorder	<b>Gender:</b> Intervention: 18 male Control: 17 male <b>Age:</b> Intervention 54.8±8.2 years Control: 53.1±10.4 <b>Weight/BMI/WC:</b> Not identified <b>Recruitment setting:</b> Community outpatient settings <b>Marital Status:</b> Not identified	<b>Intervention Setting:</b> Community outpatient setting <b>Time:</b> 24 sessions <b>Design:</b> Randomised control trial measurements at baseline and 6-month <b>Aim:</b> "test the efficacy of a novel, manualised 24-week lifestyle intervention to reduce obesity in middle aged and older persons with schizophrenia" (pp 37)	24 week Diabetes Awareness and Rehabilitation Training (DART) Behavioural change strategies implemented such as: Weekly weigh ins Pedometers Healthy food sampling Reinforcements for attendance and behavioural change (raffle for health related prize)



Methapata ra (2011)	64	DSM-IV Diagnosis of schizophrenia	<b>Gender:</b> 30 Male <b>Age:</b> Intervention 43.16±9.27 Control 37.59±10.83 years <b>Weight/BMI/WC:</b> Intervention 76.27±10.81 Control 73.70±12.31 <b>Recruitment setting:</b> Inpatient psychiatric hospital <b>Marital Status:</b> Not given.	<b>Intervention Setting:</b> Inpatient psychiatric hospital <b>Time:</b> 12 week intervention <b>Design:</b> Randomised control trial <b>Aim:</b> To examine the effects of a walking plus motivational interviewing intervention	12 week RCT, pedometer walking with motivational interviewing (PWMI). PWMI consists of 5 x 1 hour sessions- 1 <sup>st</sup> session-individual MI focused on obesity and motivation for daily walking 2 <sup>nd</sup> -group education re nutrition, exercise (warm up, cool down, pedometer use) 3 <sup>rd</sup> -SMART goals used to set individual goals 4 <sup>th</sup> -group session practising pedometer walking under supervision 5 <sup>th</sup> -feedback from therapist on patients practice, information on self-regulation strategies to cope with lapse and relapse.
Beebe (2013)	22	DSM-IV-TR 8 Schizophrenia 14 Schizoaffective disorder	<b>Gender:</b> Intervention: 6 Male Control: 6 Male <b>Age:</b> 48.1±13.3 years <b>Weight/BMI/WC:</b> Not given. <b>Recruitment setting:</b> Outpatient centre <b>Marital Status:</b> Intervention: 6 Lived alone, 3 with family, 2 paid caregiver. Control: 6 Lived alone, 4 with family, 1 paid caregiver.	<b>Intervention Setting:</b> Home based intervention <b>Time:</b> 1 week <b>Design:</b> Cohort study: Assessment of activity levels post an exercise intervention <b>Aim:</b> To consider the level of physical activity post intervention	Pilot study exploring the physical activity level of 22 people with Schizophrenia Spectrum Disorders (SSDS) 14-34 months (mean 22) after an exercise intervention during an RCT. 11 participants wore a pedometer every day for one week with no alteration of their normal activity.
Chen (2009)	33	DSM-IV Schizophrenia or Schizoaffective (breakdown not given)	<b>Gender:</b> 6 male <b>Age:</b> 31.9 ±6.4 years <b>Weight/BMI/WC:</b> 77.9±15.5 kgs <b>Recruitment setting:</b> Inpatient hospital <b>Marital Status:</b> N/A	<b>Intervention Setting:</b> Inpatient hospital <b>Time:</b> 10 weeks <b>Design:</b> Quasi-experimental multi modal weight control trial <b>Aim:</b> Evaluate the effectiveness of a weight control trial	10 week, multimodal weight control programme, "A Meaningful Day". Incorporating exercise, nutrition counselling and behavioural interventions. 10 x 90min group sessions consisting of: Drug adherence and relapse prevention (3 sessions) Structured life schedule (1 session) Healthy eating (6 sessions) 45 minutes aerobic exercise incorporated into each session except the first and last due to intro to programme and 'wrap up'. Participants encouraged to keep a food diary and to do an additional 45 mins exercise 3 x per week at home.
Marzolini (2009)	13	DSM-IV Schizophrenia or schizoaffective disorder	<b>Gender:</b> 8 male <b>Age:</b> 44.6±3.0 years <b>Weight/BMI/WC:</b> Intervention 81.5± 3.7kgs control 82.7±5.6 kgs <b>Recruitment setting:</b> Community outreach	<b>Intervention Setting:</b> Exercise to take place at a community recreation facility <b>Time:</b> 12-weeks <b>Design:</b>	12 week, community based exercise programme of resistance and aerobic training. Tests- Six minute walk test One rep max

			<b>Marital Status:</b> 13 single	Randomised control trial <b>Aim:</b> Consider the effects of an exercise program of aspects of physical and mental health	Anthropometric measurements
Ball (2001)	22	DSM-IV Schizophrenia or schizoaffective disorder	<b>Gender:</b> 15 Male <b>Age:</b> Treatment 43.8±8.1 years Comparison 43.3±7.1 <b>Weight/BMI/WC:</b> Treatment 237.9±57.8lbs Control 167.6±48.2 <b>Recruitment setting:</b> Outpatients for both groups <b>Marital Status:</b> Not given	<b>Intervention Setting:</b> Psychiatric research centre <b>Time:</b> 10-weeks <b>Design:</b> Control trial <b>Aim:</b> Consider if the weight watchers programme could be successful in reducing weight	'Weights Watchers' programme for patients with schizophrenia and olanzapine related weight gain. 6 week programme, although states 10 weekly WW meetings Exercise sessions 3 times per week, monitored by research staff
Warren (2011)	18	DSM-IV Schizophrenia or schizoaffective disorder	<b>Gender:</b> Male <b>Age:</b> 18-64 years <b>Weight:</b> <b>Recruitment setting:</b> Inpatient and outpatient mental health facility <b>Marital status:</b>	<b>Intervention setting:</b> Inpatient and outpatient mental health facility <b>Time:</b> 10 weeks <b>Design:</b> Single group, feasibility study <b>Aim:</b> To assess the feasibility of preparing people with schizophrenia for a 5K event using an exercise programme	Exercise programme adherence using 5K event as the goal 10 week training programme consisting of; 3 supervised walking/jogging sessions per week Once weekly educational meeting on healthy behaviours
Wu (2008)	128	DSM-IV Schizophrenia	<b>Gender:</b> Male <b>Age:</b> 18-45 <b>Weight/BMI/WC:</b> 62.4-66.7 kg/24.2-25.1/82.8-84.5cm <b>Recruitment setting:</b> Mental Health Institute Hospital <b>Marital Status:</b> Not given	<b>Intervention setting:</b> Mental Health Institute Hospital <b>Time:</b> 12 weeks <b>Design:</b> Randomised control trial <b>Aim:</b> To test the efficacy of lifestyle intervention and metformin alone and in combination for antipsychotic induced weight-gain and abnormalities in insulin sensitivity	128 patients randomly assigned to either: 12 weeks of placebo 750mg/d of metformin alone 750mg/d of metformin and lifestyle intervention Lifestyle intervention alone Lifestyle intervention included psycho-educational, dietary and exercise programmes Patient also continued their antipsychotic medication
Kwon (2006)	48	DSM-IV Schizophrenia or schizoaffective disorder	<b>Gender:</b> Male and female <b>Age:</b> 19-64 <b>Weight/BMI/WC:</b> <b>Recruitment setting:</b> Outpatient facility <b>Marital Status:</b> Not given	<b>Intervention setting:</b> Outpatient facility <b>Time:</b> 12 weeks <b>Design:</b> Randomised control trial <b>Aim:</b> Assess the efficacy of a weight management programme for patients with schizophrenia or	12-week weight management randomised control trial of patients with schizophrenia or schizoaffective disorder taking Olanzapine. Main study components consisted of diet and exercise management based on cognitive and behavioural therapy. Weight management, measurements of QOL, safety, and compliance with olanzapine treatment comprised the remainder of the

				schizoaffective disorder taking Olanzapine	study. Diet management Nutritional advice and keeping a food diary Exercise management Advice on lifestyle modifications regarding weight control Exercise diary Control group-food and exercise diaries only
Littrell (2003)	70	DSM-IV Schizophrenia or schizoaffective disorder	<b>Gender:</b> Male and female <b>Age:</b> 18+ <b>Weight:</b> <b>Intervention group at baseline:</b> Male: 192.93 ±31.67 Female: 155lbs ± 21.02 <b>Standard care at baseline:</b> Male: 202.1 ± 25.05 Female: 148.86 ± 40.36 <b>Recruitment setting:</b> Local community mental health centres and private psychiatrists <b>Marital Status:</b> Not given	<b>Intervention setting:</b> Outpatient facility <b>Time:</b> 6 months <b>Design:</b> Quasi-experimental <b>Aim:</b> Assess the effect of an educational interview on antipsychotic medication induced weight gain in patients with schizophrenia	Over 4 months, weekly psycho-education classes, using the 'Solution of Wellness' models (Ryan et al., 2000), focused on: Nutrition Fitness and exercise Healthy lifestyle Patients were followed for a further two months to assess weight change

Table 2 Summary Assessment of the Overall Risk of Bias

Trial*	Components of risk of bias/key risk criteria						Summary within trial	Comments on high risk components
	1	2	3	4	5	6		
Littrell (2003)	U	H	H	H	L	H	H = 4 L = 1 U = 1	Selection bias = no allocation concealment Detection bias = no blinding Attrition bias = no intention to treat Other bias: No protocol previous published with a register
Beebe 2005	L	H	L	L	L	H	H = 2 L = 4 U = 0	Selection bias = not enough detail to consider if allocation concealment was achieved Other bias: No protocol previous published with a register
*Beebe 2010	H	H	H	H	H	L	H = 5 L = 0 U = 0	Selection bias = no randomisation or allocation Detection bias = no Blinding Attrition bias = not intention to treat Reporting bias = few outcomes considered
*Beebe 2011	L	H	L	L	L	L	H = 1 L = 5 U = 0	Selection bias = no allocation concealment
Ball 2001	H	H	H	L	H	H	H = 6 L = 0 U = 0	Selection bias = No randomisation or allocation Detection bias = no blinding undertaken. Attrition bias = 11 out of 21 completed = no intention to treat, but reasons for non-completion given. Reporting bias = summary analysis not given for ♀ results Other bias: No protocol previous published with a register.
Beebe 2013	L	H	H	L	L	L	H = 2 L = 4 U = 0	Selection bias = no allocation concealment Detection bias = no blinding
Marzolini (2009)	U	L	L	L	L	H	H = 1 L = 4 U = 1	Other bias: No protocol previous published with a register
Chen (2009)	H	H	H	L	H	L	H = 5 L = 2 U = 0	Selection bias = no allocation concealment or randomisation Detection bias = no blinding Attrition bias = no intention to treat Other bias: No protocol previous published with a register
Wu 2008	L	L	L	L	L	H	H = 1 L = 5 U = 0	Other bias = No protocol previous published with a register
*Methapata 2012	L	L	H	L	L	H	H = 2 L = 0 U = 0	Detection bias = no blinding Other bias = No protocol previous published with a register
*Warren 2011	H	H	H	H	L	H	H = 5 L = 1 U = 0	Selection bias = no randomisation or allocation concealment Detection bias = no blinding Attrition bias = no intention to treat Other bias: No protocol previous published with a register
McKibbin 2006	U	H	H	H	L	H	H = 4 L = 1 U = 1	Selection bias = no randomisation or allocation concealment Detection bias = no blinding Attrition bias = no intention to treat Other bias: No protocol previous published with a register
Dodd 2010	H	H	H	L	L	H	H = 4 L = 2 U = 0	Selection bias = no randomisation or allocation concealment Detection bias = no Blinding Attrition bias = not intention to treat Other bias: No protocol previous published with a register
Attux 2013	L	H	L	L	L	L	H = 1 L = 5 U = 0	Selection bias = no allocation concealment  Other bias: "participants needed to be motivated to lose weight or show concern about weight gain." (pg., 2)
Archie 2003	U	H	H	L	L	H	H = 3 L = 2 U = 1	Selection bias = sequence generation was not clear or detailed. No allocation concealment Detection bias = no Blinding Other bias: No protocol previous published with a register
Bernard 2013	H	H	H	L	L	H	H = 4 L = 2 U = 0	Selection bias = no randomisation or allocation concealment Detection bias = no blinding

								Other bias: No protocol previous published with a register
Duraiswamy (2007)	L	H	H	H	L	H	H = 5 L = 2 U = 0	Selection bias = no allocation concealment Detection bias = no blinding Attrition bias = no intension to treat Other bias: No protocol previous published with a register
Centorrion (2006)	H	H	H	H	L	H	H = 5 L = 1 U = 0	Selection bias = no randomisation or allocation concealment Detection bias = no blinding Attrition bias = no intension to treat Other bias: No protocol previous published with a register
Kwon et al (2006)	U	H	H	H	L	H	H = 4 L = 1 U = 1	Selection bias = unclear randomisation or allocation concealment Detection bias = no blinding Attrition bias = no intension to treat Other bias: No protocol previous published with a register

\*Trial denoted by first author. Risk of bias criteria: 1, Selection bias= random sequence generation; 2, selection bias=allocation concealment; 3, Detection/Performance bias=blinding of personnel, assessors and participants; 4 Attrition bias= incomplete outcome data; 5 Reporting Bias=short-term selective outcome reporting; 6, Other bias= potential threats to validity e.g., consideration of a protocol.

Levels of risk of bias: H, high risk of bias; U, unclear risk of bias; L, low risk of bias.

Table 3 Identifying the different functional types of support used by studies

Theme	Sub-theme	Code	Unit and study	No. of Studies
Emotional Support	Support outside exercise sessions	Knowing the individual well	Familiar member of staff from unit assisted individuals. [1]	1
		Phone calls	Call from therapist to check for difficulties with programme. [15]	1
	Accessing and Utilising Others	Accessing family	One session open to relatives and family. [2] Family member accompanied each individual to the consent sessions in order to help them understand form. [6] family support in terms of them not bringing sugary sweets/snacks [11] Family members encouraged to attend the race... [20]	4
		Access to professionals	Patients had regular visits to the psychiatrist [2] Reasons for missing session elicited by interview with clinician. [18]	2
		Access to other forms of support	Patients...attended sessions of other psychosocial interventions offered by the program.[2] Peer support. [7] Dietary counselling [7] Dairies and role play for dealing with distress. [2]	2
	Supervision of Exercise	General support	Supervised exercise sessions were included. [4] Special attention given to subjects with medication related impaired balance and coordination. [7] Attention...from staff or 'experimenter' were provided on a regular basis. [12] Provided with attention [13] Training sessions for 5km event were supported. [20]	5
		Care for individuals	Individuals were asked how they were feeling at the start and end of each session. [1] 'strategies used by the exercise trainer...' -allowing a break if participants became upset. [1] 'Friendly' atmosphere maintained during training rather than 'boot-camp'. [20] SP surveyed participants for any discomforts during basic stretches at WALC. [5:9]	5
		Practice with peers	Group practice for pedometer walking. [15]	1
Informational Support	Identifying how physical activity and exercise is performed	Technical instruction	Taught exercises...[1] Provided information on how and why to warm up the muscles, considered appropriate attire for exercise, importance of starting slowly and gradually increasing walking time and maintain adequate hydration. [5:9] Identified common discomforts experienced during exercise and suggested ways of reducing this e.g., heat or massage.... Individuals were told to notify participants if discomforts occurred. [5:9] Yoga teaching included breathing practice and relaxation techniques [6] Study personnel present at exercise sessions and demonstrated exercise and stretches.[8]	5
	Sessions used to inform the individual	Diet	Information sessions....to discuss dietary choices (4 sessions, focused on the food pyramid) [2] All subjects given information on diet [3] individuals interviewed about their eating [7] Dietary counselling and low calorie food plan – including a reduced-calorie nutritionally complete food plan individualised for each subject. [7] Health food sampling [14] Advice regarding ... healthy eating [17] Weight watchers point system to evaluate food choices [19] Dietary advice given by a registered dietician who ensured calorie intake worked. [21]	9

			Dietary advice... Dietician discussed food diaries and exercise coordinator the exercise diaries. For diet the following concepts were considered; food exchange table, using food models, importance of regular meals, healthy snaking, food shopping and preparation and reading food labels. [22] Content included ...healthy nutrition [23]	
		Physical Activity	Information sessions....to discuss physical activity (3 sessions for discussing its importance). [2] All subjects given information on exercise [3] Therapist taught yoga and exercise....exercises and yoga adherence and correctness reviewed once a month. [6] Individuals interviewed about their ... activity exercise [7] Researchers set and instructed participants on use of pedometer.[16] Exercise sessions directed by exercise physiologist for first week. [21] Exercise advice... Chose suitable forms of exercise and correct misconceptions. [22] Content included living ... fitness and exercise. [23]	8
		Health & Lifestyle	One session for the management of anxiety. [2] Sessions to help patients cope with withdrawal symptoms (anxiety). [4]All subjects given information on health [3] Individuals interviewed about their ... sleeping patterns [7] individuals were informed by staff that an exercise bike was purchased to benefit their health. [10] advice regarding ...lifestyle.... relapse prevention, and drug adherence. Emphasis of program was on a healthy lifestyle and structured life schedule. [17] Weekly healthy behaviour sessions in hour long classes were provided. [20] Education about modifying lifestyle. [22] Content included living a healthy lifestyle, wellness [23]	8
		Psycho-education	Psycho-education sessions including awareness of dietary habits. [2] Psycho-education of solutions of well-ness class was provided. [23]	2
		Opportunity for questions	Questions could be asked by participants about this. [15] Questions from participants were answered [16]	2
	Assessments, goal settings and other interactions	Fitness	Fitness assessment by coach [3] Monthly fitness evaluations. [7] Amount of exercise recorded. [19] Participants taught how to take their own pulse. [20] For exercise individuals were checked waist/hip ratio, educated on considering calorie consumption in activities, correct exercise performed. [22] Amount of exercise recorded for patient. [19]	5
		Weight and Diet	Periodic weight checks. Weight was undertaken daily and recorded on a wall chart. [12] Weekly weight ins [14] Assessment of food and caloric intake was undertaken. [21]	3
		Perceived exertion during exercise	Adapted physical activity educator ... recorded perceived exertion. [4] Ratings of perceived exertion monitored. [7] Information on how to stay hydrated and signs and symptoms of over exertion. [20]	3
		Goal Setting and exercise planning	SP assisted with individualised goal setting, included independent walking increasing days or minutes walked each week along with improvements in flexibility, energy level or psychiatric symptoms. [5:9] Personalised physical activity sessions were provided. [14] Goal setting using SMART goals (specific, measurable, acceptable, realistic, and timed). [15]	4
		Over-coming barriers	Study personnel assisted participants to generate solutions to barriers if needed [5:9].	2

	Hand outs of information	Calendar	Study personnel (SP) will provide calendars to cue exercise.... Calendars provided to track attendance. [5:9]	10
		Information sheet or booklet	<p>Poster of regular stretches used. [5:9]</p> <p>Booklet provided to each participant of the verbal content... Booklet identified ways of overcoming common barriers such as increased fatigue, muscular soreness, finding the time to exercise, loneliness while exercising and boredom while exercising. [5:9]</p> <p>Written guidance given to individual for what to expect each week, which helped orient them to the program. [8]</p> <p>Educational materials (including how to change diet, diabetes management, types of exercise and use of activity monitors) were adapted for older adults with schizophrenia. [14]</p> <p>leaflet-'What is a healthy lifestyle?' and group education on nutrition, exercise, warming up, cooling down and pedometer. [15]</p> <p>Written information on how to use the pedometer was provided. [16]</p> <p>Information sheet regarding study and benefits for participation [18]</p> <p>Parent or partner asked to supervise diet at home. [19]</p> <p>Information sheet provided. [22]</p> <p>Photocopy of each module [23]</p>	
	Contact Outside sessions	Phone call to identify session or adherence	<p>SP will provide phone call before each WALC group [5:9]</p> <p>Participants received twice-daily phone calls to remind them to wear the pedometer each morning and remove it each night. [16]</p>	3
		Exercise outside session	<p>Fitness evaluations given on how to exercise 3*30 minutes when at home. [7]</p> <p>Participants were advised to exercise at the same pace on their own as they did in the sessions. Barriers to home exercise and ways to overcome barriers were discussed. [18]</p>	2
		Enhanced ethical consideration and study detail	<p>Individual meetings undertaken pre consent in order to review records ensure diagnostic criteria, explain study in detail and answer questions.[8]</p> <p>Enhanced capacity for research consent undertaken. [9]</p> <p>Each participant given information regarding risks/benefits of study. [20]</p>	3
Esteem Support	Encouragement given during sessions	Verbal encouragement	<p>'strategies used by the exercise trainer...'-frequent encouragement [1]</p> <p>'strategies used by the exercise trainer...'-firm instructions [1]</p> <p>SP will provide verbal encouragement during each session... SP will verbally highlight positive physiological outcomes experienced by participants. [5:9]</p> <p>Individuals encouraged to follow food plan....Assistance given in each session to help individual adhere to the diet prescribed, help them improve choices and develop strategies to decrease over eating. [7]</p> <p>fitness coach present for exercise sessions-verbal encouragement. [17]</p> <p>we encouraged participants to complete 60 minutes but did not force them. [21]</p>	5
		Reinforcing behaviour change	<p>Positive reinforcement [11]</p> <p>verbal reinforcement from staff or 'experimenter' were provided on a regular basis. 'social approval' provided by staff. [12]</p> <p>each time an individual road on their bike they would inform staff who would note it down. [10]</p> <p>Weight was undertaken daily and recorded on a wall chart. If weight was loss from the previous day experimenter provided support and acceptance for individual. If weight was not loss experimenter would shake his head in a negative fashion, record weight and point out the difference. [12]</p> <p>Praised for weight loss. [13]</p> <p>weekly weight ins, pedometers, health food sampling and reinforcement based on attendance and behaviour change. [15]</p>	8



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			Exercise sessions monitored by at least one of the investigators. [19] Weekly diet and activity log was maintained. [20] keep a food and exercise diary was required motivation from discussion with professionals may have resulted. [22] When being weighed a research nurse would 'query' there exercise and dietary habits. [22] One token and a privilege was given for 3 lbs weight loss. With no weight gain no change was made, with weight increment individuals did not receive a token, were dropped a step on the privileges and did not receive verbal reinforcement. [13] Incremental reinforcement, within the first mile pedalled on the bike one token was given for every 1/10 of a mile, for the second mile pedalled on the bike one reinforcement was earned for every 2/10 of a mile and so on. [10]	
		Environmental encouragement	Music and dance were used to maintain enthusiasm for exercise sessions. [7]	1
		Role models	SP and other participants will serve as role models. [5:9] Sessions were undertaken in different forms to encourage participant including individual work, dyads, small groups and large groups. [22]	3
	Making changes within sessions	Changing equipment	Alternate equipment if they became bored or distracted [1]	1
		Change time	Exercising in the afternoon rather than the morning. [1]	1
	Encouragement outside the session	Interaction to help change behaviour	one session to discuss self-esteem and motivation with participants [2] Counselling sessions based on the transtheoretical model to promote interest in smoking reduction and increase confidence in their ability to change... Emphasis on the patients' self-efficacy to reduce smoking, to use process of change (cognitive and behavioural) and to engage in decisional balance. [4] Follow up calls if session missed participants will mark each session attended on their calendars. [5:9] SP will ask participants about exercise improvements experienced during each WALC. [5:9] SP will verbally highlight positive physiological outcomes experienced by participants. [5;9] Low fat choices at restaurants. [7] Individuals interviewed weekly about how to adhere to agreed exercise regime. [7] Individuals were encouraged to speak with the physician about diabetes management. [14] Motivational interviewing which focused on obesity and walking. Feedback from therapist re self-regulation principles and how to cope with lapse and relapse. ...Encouragement of participants to increase the minimum daily amount within 30 minutes to 5000 and 8000 per day from 3000 and 5000 if the goal was achieved. [15] motivational counselling techniques were utilised.... Participants were encouraged to keep a food and exercise diary. Participants were asked to undertake an additional 45 minutes of exercise 3 times a week at home. [17] [17] participants were encouraged to undertake an additional exercise session on their or during a home visit from a health care professional. [18]	9
		Other encouragement	pedometer given to participants [20]	1
Tangible Support	Transport	Transport to location	Participants transported to gym [1] Three individuals were provided with transport from a member of staff. [18]	2
		Tickets, vouchers or costs provided	Parking vouchers and bus tickets provided [3]	1
	Food	Removal	Removal of 'goodies' (food snacks) from family. [11]	1
		Reward	Individuals were notified that extra tea, coffee, cigarettes would be available if exercise was undertaken. [10] Participants given lunch vouchers after each training session. [20]	2

	Token/ticket system	For privileges	Paid 10 tokens for each pound loss. Tokens could be exchanged for privileges e.g., cigarettes, sweets. [11] Individuals were notified that extra tea, coffee, cigarettes would be available if exercise was undertaken. token economy program. Where tokens can be used to purchase two types of rewards: (a) meal privileges (hour at meal times to go to dining hall) (b) work privileges (two hours each morning and afternoon to attend a work assignment). Rewards could be partial (7am until 6.30 pm) or full (7am until 9.30 pm). [13] Tokens given weekly for weight loss, attendance to group meetings, participation in exercise, documentation provided by family/caregivers on adherence to exercise and diet-positive reinforcement. The tokens could be used to purchase gift items at an auction that was held on the final weight watchers week. [19]	3
		For prizes	Raffle ticket for small health related prizes given for attendance and behavioural change. [14]	1
	Rewards	Voucher/finance reward	Participants received \$20 gift card at the end of the study. [16]	1
		Other times	Participants given t-shirt and race number on race day. [20] Each received a medal. [20] Rewards were offered and included toilet paper, soap, and drinks which were sugar free. [21]	2

Key: 1 = Dodd (2010), 2 = Attux (2013), 3 = Archie (2003), 4 = Bernard (2013), 5 = Beebe (2010), 6 = Duraiswamy (2007), 7 = Centorrion (2006), 8 = Beebe (2005), 9 = Beebe (2011), 10 = Thyer (1984), 11 = Bernard (1968), 12 = Moore (1969), 13 = Upper (1971), 14 = McKibbin (2006), 15 = Methapatara (2011), 16 = Beebe (2013), 17 = Chen (2009), 18 = Marzolini (2009), 19 = Ball (2001), 20 = Warren (2011), 21 = Wu (2008), 22 = Kwon (2006), 23 = Littrell (2003).

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Table 4 The direct (d) or implied (i) benefits of physical activity from social support

Type of support	Implication (total studies [n] supporting statement, & total direct [d] and indirect [i] statements) In vivo unit from study	Implication statement & Proposed mechanism	Supporting evidence from existing reviews	Likelihood of impact (possibly, likely, or very likely)
Social support during session	<i>Increases attendance or adherence (n=10, d = 9, I = 4)</i> I: the value of social support is that it was able to enhance compliance with the program [1] D: for some (n=2/10) individuals having no support from others to attend the exercise intervention was a reason not to go. Meaning that emotional and esteem support are important. [3] D: social support valued by participants and likely improved adherence [7] I: being an inpatient with close supervision and social support enables compliance [21] D: attendance, adherence and compliance were related to the positive effects of peer support [9] D: social support including trust and relationship serve as a motivation to initiate and maintain activity as well as comply with the sessions. [18] D: adherence and compliance were related to the positive effects of ... emotional ... social support [9] D: authors call on future research to consider how motivation to exercise can be increased identifying that strategies could include....buddy system, groups and personal trainers (emotional and esteem support). [3] D: motivation for attending sessions was gained by having a training partner [4] I: groups sessions with other peers increased self-confidence [4] I: social support as part of the intervention may have help contribute to the changes in Yale total activity log were noted (F = 7.09, p < 0.01) through adherence. [14] D: attendance, adherence and compliance were related to the positive effects of ... informational social support [9] D: informational support in the form of reminder calls aided compliance to the intervention. [16]	Having someone to go with, someone (peer or health care professional) to engage with or be supervised at the session is likely essential for adherence, attendance and compliance.	Social support essential for physical activity initiation [B]. Group processes and a sense of belonging can help facilitate adherence [C] Emotional support provides empathy, warmth and companionship [C].	Very likely statistically and clinically significant impact on adherence, attendance and compliance.
		<i>Proposed mechanism:</i> trust and positive relationships help individual approach exercise with confidence, feeling safe and a sense of belonging.	Companionship and belonging as well as social control and an increased sense of identity [B:G]	
	<i>Responding to needs and comfort during the session is important (n = 1, d = 0, I = 1)</i> I: it is important to adjust the exercise intervention to increase compliance generally social support may have a role. [22]	A trainer/health care professional who is aware of how comfortable or uncomfortable (considering the individuals bio-psychosocial response) an individual is feeling and can respond to that and impact on adherence and continuation of exercise.	Wrong types of support can however increase resistance towards activity engagement, for instance, it is important not to place expectations on a patient, especially if unfit [B]	Possible (depending on individual variation, stage of mental illness) positive statistically significant and clinically meaningful impact on attendance and adherence

		<i>Proposed mechanism:</i> an awareness of and sensitivity to ambiguous or negative stimuli (bio-psychosocial or environmental) can have a catastrophic effect on the ability to continue participation		
	<p><i>No support, need for comfort and emotional support to initiate the session (n = 5, d = 4, l = 1)</i></p> <p>D: living with someone (family or carer) may help attendance then when compared to living alone (p= 0.032). [5]</p> <p>D: social support (group and peer) can influence ... attendance by eliminating some barriers to exercise include low motivation and perceived comfort at attending. [18]</p> <p>I: for some having a low comfort level (n=2/10) with attending could illustrate the importance of feeling comfortable in new setting and care needed within interventions [3]</p> <p>D: the community event provided positive experiences of social support and benefits the attendance and experience. [20]</p> <p>D: attendance ... were related to the positive effects of ... emotional ... social support [9]</p>	<p>Being able to feel confident and comfortable to attend a new initiative without support is unlikely. Support to allow attendance is needed.</p> <p><i>Proposed mechanism:</i> there can be such significant bio-psychosocial challenges, of which isolation is central, that to overcome without support is extremely hard to achieve. Encouraging others (health care professionals, peers, family or close others) can act as a 'bridge' for attendance. Making attendance possible</p>	<p>Isolation a barrier to physical activity [B] and is associated with lower physical activity level [A]</p> <p>Therapist who are sensitive and caring to patients, can create friendships which aids trust and adherence [B]</p> <p>Social cognitions (emotional perception and social knowledge) mediates a relationship between neurocognition and functional outcome [D] for instance social cue detection can significantly impact on social and work functioning [E]</p>	<p>Very likely negative statistically and clinically significant impact on initiation and attendance.</p>
<i>Motivational techniques</i>	<p><i>Encouragement (n=7, d = 7, l = 3)</i></p> <p>I: having low motivation (n=6/10) for exercise may require and benefit from esteem support.[3]</p> <p>I: motivation is required by individuals and social support helps an individual's motivation to initiate and maintain exercise [7]</p> <p>D: non responses to information support as a result of low motivation [5]</p> <p>D: for some (n=2/10) individuals having no support from others to attend the exercise intervention was a reason not to go. Meaning that...esteem support are important. [3]</p> <p>D: motivational techniques (esteem support) have resulted in high attendance (63% for 4 weeks) [5]</p> <p>D: to increase initiation of exercise and adherence health personnel need to provide esteem support and</p>	<p>Motivation can be a central barrier which prevents access and maintenance to physical activity, but also prevents patients wanting to change. Verbal encouragement and enthusiasm can challenge this. It may be that individuals can go from not contemplating change to taking action following encouragement.</p>	<p>Esteem support provides, courage, motivation and encouragement [C]. Therapists need to provide encouragement to benefit change [B]</p>	<p>Very likely positive statistically and clinically significant impact on initiation, compliance, adherence and attendance.</p>

	<p>information support as well as positive reinforcement. [8] D: attendance, adherence and compliance were related to the positive effects of esteem....social support [9] D: Social reinforcement praise and encouragement (esteem support) ....promotes adherence to program. [13] D: knowledge about health diabetes may benefit from one-to-one reinforcement (esteem support) [14] I: individuals motivated to lose weight may have been receptive to types of support notably esteem support for successful weight loss. Those less motivated will likely benefit less from esteem efforts [2]</p>	<p><i>Proposed mechanism:</i> encouragement is able to overcome the effect of a-motivation and individuals can be persuaded to attend and want to change behaviour.</p>	<p>Therapist who are sensitive and caring to patients, can create friendships which aids motivation[B]. Social control and an increased sense of identity [B:G]</p>	
	<p><i>Positive verbal reinforcement (n=1, d = 1, l = 1)</i> D: Approving weight loss through social reinforcement (esteem support) when participant loss weight (35lbs in 26weeks) at the weekly weigh in, negative support (head shaking when weight was not lost). [12] I: Approving weight loss through social reinforcement (esteem support) promotes adherence and contributed to the participant loss weight (35lbs in 26weeks) [12]</p>	<p>In early research social reinforcement identified change in case studies of individuals.</p>		<p>Possible (depending on individual variation, stage of mental illness) positive statistically significant and clinically meaningful impact on attendance and adherence</p>
		<p><i>Proposed mechanism:</i> patients may want to please others and gain praise for successfully completing a challenge.</p>	<p>Companionship and a want to please others through a changing identity [B:G]</p>	
<i>Informational support</i>	<p>Knowledge of benefits (n = 2, d = 3, l = 0) D: knowledge about health diabetes may benefit from .... information (informational support) [14] D: informational social support as part of the intervention may have help contribute to the increase in diabetes knowledge (F = 18.2, p &lt; 0.01) [14] D: informational support was valued from study personal. [4]</p>	<p>Understanding the multiple values and importance of exercise is essential to change attitudes and motivation to change behavior</p>	<p>Informational support can help facilitate changes in behaviour and lifestyle [C].</p>	<p>Possible positive statistically significant and clinically meaning change in behaviour</p>
		<p><i>Proposed mechanism:</i> information empowers the patient to want to change for the identified benefit or gain.</p>	<p>Participation enhanced by informing an individual; who is leading the sessions, what to expect in the session (environment, context, safety), and possible benefits of participation [B]. Mastery experiences generated as a result [G]</p>	

Tangible support or reinforcement	<p>Reward systems (n=6, d = 6, I = 0)</p> <p>D: A token system (tangible support) for privileges promotes adherence to program. [13]</p> <p>D: authors call on future research to consider how motivation to exercise can be increased identifying that strategies could include rewards (tangible support) [3]</p> <p>D: transport support (tangible support) e.g., city bus passes and information support (phone calls and written letters) supported the attendance. [5]</p> <p>D: Social support through reinforcement (tangible support) resulted in weight loss of 102 pound over 6 months (20%) [11]</p> <p>D: transport provided a significant barrier to attendance (when giving reasons for non attendance was represented by 60% of answers) – lack of tangible support may need addressing when considering transport needs. [5]</p> <p>D: transport (tangible support) acted as a barrier against participation (n= 14 or 22% of individuals who reported non-attendance) [9]</p>	<p>Tangible rewards can remove and impact on the transport barriers for those who have little disposable income. Rewards for exercising may motivate.</p> <p><i>Proposed mechanism:</i> The gain of tangible support may remove a barrier to attendance. The perceived value and gain of a reward may be greater than the cost of not exercising.</p>	<p>Tangible support can aid adherence and motivation and 'kick start' behaviour change [C]</p> <p>Acts against the financial and transport barriers [C]</p>	<p>Possible impact statistically and clinically on attendance as well as bio-psychosocial benefits</p>
Physiological Outcomes	<p><i>Body weight, BMI and percentage of fat (n = 12, d = 13, I = 5)</i></p> <p>D: social support valued by participants ...and impacted on results (significant decreases in body weight ≈6% [t = 4, P=0.001] and blood pressure ≈11% [t = 4, P=0.0008]). [7]</p> <p>D: social support may have explained small benefits (...decrease of percentage fat 0.02%) in control group, esteem and information support gained from peer interaction. [8]</p> <p>D: Social reinforcement praise and encouragement (esteem support) as well as a token system (tangible support) for privileges aided weight loss (63 lbs in 28 weeks and 61 lbs in 26 weeks) [13]</p> <p>I: social support as part of the intervention may have help contribute to the observed benefits reductions in weight (F = 15, p &lt; 0.01). [14]</p> <p>D: Behavior element of the program responsible for benefits in weight (t = -2.3, P = 0.03) reductions compared to control. Therefore social reinforcement, positive reinforcement or/and esteem and emotional support support may have a role in aiding weight loss. [15]</p> <p>D: motivational interviewing which included elements of social support (esteem support) aids success of the program e.g., benefits in weight (t = -2.3, P = 0.03) reductions compared to control. [15]</p> <p>D: esteem support is important for a weight control intervention and producing results: Significant weight reduction in all subjects (from 77.9 kg to 76.6 kg, t = 2.6, p = 0.014). [17]</p> <p>I: social support and group setting of program may aid benefits including weight loss e.g., median weight loss for 7 males was 7 pounds (F=5, P &lt; 0.05). [19]</p> <p>D: informational support will help provide individuals with strategies to manage the weight gain. [19]</p> <p>I: being an inpatient with close supervision and social support enables benefits e.g., significant decrease in weight (p&lt;0.001). [21]</p> <p>I: the value of social support is that it could have led ...weight reduction [1]</p> <p>D: informational support helps prevent significant weight gain [23]</p> <p>D: peer support can help transfer informational and aid weight maintenance [23]</p> <p>D: social support through verbal reinforcement (esteem support) produces changes in physical activity levels. [10]</p> <p>D: Social support through encouragement (esteem support) resulted in weight loss of 102 pound over 6 months (20%) [11]</p> <p>D: tangible support in the form of food incentives may not have worked to benefit weight loss (median difference at 0 and 10 weeks = -0.1kg, IQR: 2.5) and 3 gained over 7kg. [20]</p>	<p>An interactional effect of different forms of social support (see above) will likely impact on the success and ability to achieve weight loss</p> <p><i>Proposed mechanism:</i> combined effect of different types of functional and structural support combine to provide a positive impact on the patients weight (primary outcome used in many studies)</p>	<p>Mastery and a sense of control generated [C:G] increases likelihood of a positive outcome</p>	<p>Very likely positive impact statistically and clinically on weight</p>

	<i>Increases in fitness (n= 2, d = 1, l = 1)</i> I: the value of social support is that could have led do physiological improvements documents including increases in 6-minute walk test. [1] D: social support may have explained small benefits (6 minute walk distance, increase in 56 feet) [8]	An interactional effect of different forms of social support (see above) will possibly impact on the success and ability to achieve weight loss		Possible positive impact statistically and clinically on fitness based parameters
		<i>Proposed mechanism:</i> combined effect of different types of functional and structural support combine to provide a positive impact on the patients weight (primary outcome used in many studies)	Mastery and a sense of control generated [C;G] increases likelihood of a positive outcome	
Psychological improvements	<i>Psychological gain (n = 1, d = 0, l = 3)</i> I: social support as part of the intervention may have help contribute to the... increase in self-efficacy [14] I: social support as part of the intervention may have help contribute to... dis-satisfaction and change (F = 9.1, P < 0.01).[14] I: informational social support as part of the intervention may have help contribute to .... setting and achieving goals (F = 9.8, p < 0.001) [14]	Social support can impact on a patients satisfaction, self-belief and satisfaction with exercise. The impact can translate to other aspects of life	Social support can help increase social confidence [B,C]	Likely positive impact statistically and clinically on self-esteem and social confidence
		<i>Proposed mechanism:</i> successful experiences provide a source of self-confidence and self-belief for patients	Mastery and a sense of control generated [C;G] increases self-esteem and self-belief	
	<i>Acts against psychological barriers and enhances behavior change (n = 4, d = 2, l = 2)</i> I: social support as part of the intervention can be effective against psychosocial barriers [4] D: social support (group and peer) can influence participation ....by eliminating some barriers to exercise include low motivation and perceived comfort at attending. [18] I: social support as part of the intervention may have help contribute to ... managing psychosocial aspects (F = 9.6, p < 0.01) [14] D: informational support helps ... behavior change. [23]	Implication: Individuals are vulnerable to psychosocial barrier such as cognitions and negative meta-perceptions or perceived stigma.	Trust and relationships with peers [C] and health care professionals [B] can help overcome barriers. Peer support can provide access positive role models [F]	Very likely positive impact statistically and clinically on attendance, compliance and adherence
		<i>Proposed mechanism:</i> Social support acts to buffer and prevent negative self and interaction assessments and thoughts	Belongingness, distraction and companionship [B;G] help attendance, compliance and adherence	
	<i>Reduces symptoms (n=1, d= 1, l = 0)</i> D: simple informational support is effective in supporting the uptake and use of yoga, therefore contributes to the effectiveness of the intervention (reduction in positive and negative symptom scale, F = 5.0, P = 0.03) [6]	Social support can help decrease positive and negative symptoms		Possible positive impact statistically and clinically on positive and negative symptoms
		<i>Proposed mechanism:</i> social support may provide a distraction to the illness or simply access to more normal thoughts	Social control, belonging and developing an identity as well as distraction [B;G].	

			Sense of mastery and control [G]	
	<i>Quality of life (n=2, d = 1, l = 1)</i> D: social support generally could be responsible for improvements in quality of life: WHO brief quality of life scale (pre score 76±13 to 84±19, p = 0.003) observed. [17] I: weight management program and social support or interaction can improve quality of life [22]	Social support can improve quality of life through the varied types of functional and structural support  <i>Proposed mechanism:</i> Improved functioning promotes access to a more 'normalised' existence and positive experiences.		Possible positive impact statistically and clinically on quality of life

Key: Studies by Number: 1 = Dodd (2010), 2 = Attux (2013), 3 = Archie (2003), 4 = Bernard (2013), 5 = Beebe (2010), 6 = Duraiswamy (2007), 7 = Centorrion (2006), 8 = Beebe (2005), 9 = Beebe (2011), 10 = Thyer (1984), 11 = Bernard (1968), 12 = Moore (1969), 13 = Upper (1971), 14 = McKibbin (2006), 15 = Methapatara (2011), 16 = Beebe (2013), 17 = Chen (2009), 18 = Marzolini (2009), 19 = Ball (2001), 20 = Warren (2011), 21 = Wu (2008), 22 = Kwon (2006), 23 = Littrell (2003). Review support by letter = A = Vancampfort et al (2012), B = Soundy et al (2012), C = Soundy et al (2014), D = Schmidt et al (2011), E = Mancuso et al (2011), F = Davidson et al (2012), G = Thoits (2011).



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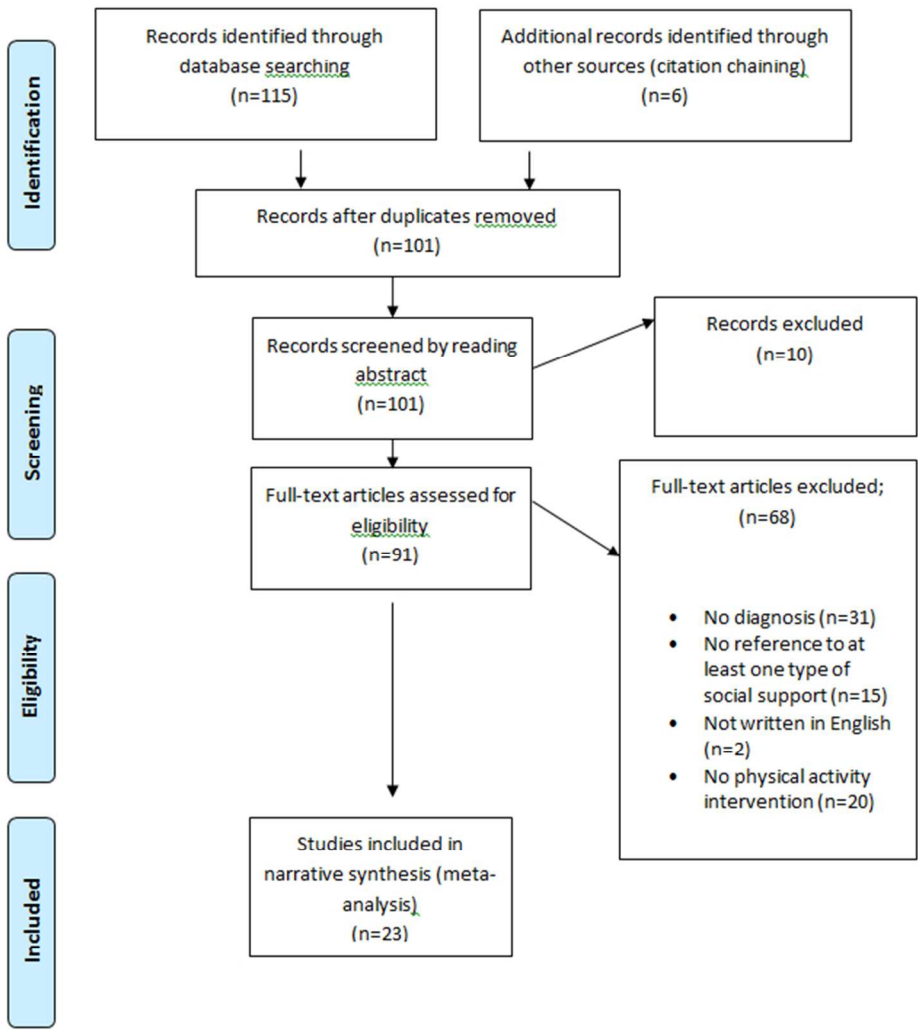
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Figure 1 Study Selection Flow Diagram (adapted from PRISMA, Moher et al. 2009)



182x215mm (96 x 96 DPI)

## Supplementary Data

Supplementary Table 1 Identifying the provider of social support within each study

Study	Support Provider	HCP staff	Family & care givers	Research personnel	Fitness or exercise clinician	Peer	Total	Notes
Dodd 2010	Qualified exercise physiologist Staff member from the residential unit	✓			✓		2	HCP member unclear
Attux (2013)	Nurses Occupational therapists Psychologists Dieticians DVD	✓					1	Trained with a manual and set of DVD's explaining the programme.
Archie (2003)	YMCA Physical activity coach prescribed an appropriate programme following assessment.				✓		1	
Bernard (2013)	Psychiatric nurse Exercise specialist Adapted physical activity educator	✓			✓		2	
Beebe (2010)	Study Personnel			✓			1	
Duraiswamy (2007)	One family member accompanied each subject Therapist	✓	✓				2	
Centorriori (2006)	Peer support Study staff			✓		✓	2	
Beebe (2005)	Nurse Trained RA Study personnel	✓		✓			2	
Beebe (2011)	Graduate students Study staff			✓			1	
Thyer (1984)	Paraprofessional psychiatric care workers Master's trained group-home manager	✓		✓			2	
Bernard (1968)	Family Writer/researcher Ward staff		✓	✓			2	
Moore (1969)	'E'...experimenter			✓			1	
Upper (1971)	Ward treatment team	✓					1	
McKibbin (2006)	Research group leaders Service providers Certified Diabetes Educators Registered Dieticians	✓		✓			2	
Methapatara (2011)	W.M-author Therapist	✓		✓			2	
Beebe (2013)	Researchers			✓			1	
Chen (2009)	Psychiatrist Psychiatric nurse Dietician Fitness coach	✓			✓		2	
Marzolini (2009)	Multi-disciplinary health professionals Mental health clinicians Clinical exercise specialists	✓			✓		2	Multi-disciplinary health professionals....not clearly stated individually

Ball (2001)	Research staff			✓			1	Not specified
Warren (2011)	Two or three clinical or research staff with each walking group Physician at the beginning of the study to determine participation	✓		✓			2	
Wu (2008)	Dietician Exercise physiologist	✓			✓		2	
Kwon (2006)	Dietician Exercise co-ordinator Psychiatrist	✓			✓		2	
Littrell (2003)	Nurse Masters level clinician conducted module sessions	✓		✓			2	



Supplementary Table 2 identifying the types of support utilised by each intervention

Study	EMS	TS	IS	ES	Details of the type of functional support used
Dodd 2010	✓	✓	✓	✓	<p><b>Frequency total (n/4): 4</b></p> <p><b>EMS</b>....Familiar member of staff from unit assisted individuals. Individuals were asked how they were feeling at the start and end of each session. 'strategies used by the exercise trainer...' -allowing a break if participants became upset,</p> <p><b>IS</b>...taught exercises...</p> <p><b>ES</b>...exercise physiologist kept a diary to record any behavioural problems and also amount of encouragement needed.</p> <p><b>ES</b>....'strategies used by the exercise trainer...' -frequent encouragement, firm instructions, alternate equipment if they became bored or distracted, for one participant, exercising in the afternoon rather than the morning.</p> <p><b>TS</b>...participants transported to gym</p>
Attux (2013)	✓		✓	✓	<p><b>Frequency total (n/4): 3</b></p> <p><b>IS</b>...information sessions....to discuss dietary choices (4 sessions, focused on the food pyramid)/physical activity (3 sessions for discussing its importance). Psycho-education sessions including awareness of dietary habits.</p> <p><b>ES</b>...one session to discuss self-esteem and motivation with participants</p> <p><b>EMS</b>... one session for the management of anxiety. Dairies and role play for dealing with distress. One session open to relatives and family. Patients had regular visits to the psychosis and attended sessions of other psychosocial interventions offered by the program.</p>
Archie (2003)		✓	✓		<p><b>Frequency total (n/4): 2</b></p> <p><b>IS</b>...all subjects given information on diet/exercise/health. Fitness assessment by coach</p> <p><b>TS</b>...parking vouchers and bus tickets provided</p>
Bernard (2013)	✓		✓	✓	<p><b>Frequency total (n/4): 2</b></p> <p><b>EMS</b>...Sessions to help patients cope with withdrawal symptoms (anxiety). Supervised exercise sessions were included.</p> <p><b>ES</b>...counselling sessions based on the transtheoretical model to promote interest in smoking reduction and increase confidence in their ability to change. Emphasis on the patients' self-efficacy to reduce smoking, to use process of change (cognitive and behavioural) and to engage in decisional balance.</p> <p><b>IS</b>...adapted physical activity educator supervised sessions and recorded perceived exertion.</p>
Beebe (2010)	✓		✓	✓	<p><b>Frequency total (n/4): 3</b></p> <p><b>IS</b>...Study personnel (SP) will provide calendars to cue exercise. Repetition of information. SP surveyed participants for any discomforts during basic stretches at WALC. Provided information on how and why to warm up the muscles, considered appropriate attire for exercise, importance of starting slowly and gradually increasing walking time and maintain adequate hydration. Poster of regular stretches used. SP assisted with individualised goal setting, included independent walking increasing days or minutes walked each week along with improvements in flexibility, energy level or psychiatric symptoms. Identified common discomforts experienced during exercise and suggested ways of reducing this e.g., heat or massage. Booklet provided to each participant. Individuals were told to notify participants if discomforts occurred. Booklet identified ways of overcoming common barriers such as increased fatigue, muscular soreness, finding the time to exercise, loneliness while exercising and boredom while exercising. Study personnel assisted participants to generate solutions to barriers if needed. Calendars provided to tract attendance</p> <p><b>EMS</b>...SP will provide phone call before each WALC group</p> <p><b>ES</b>...follow up calls if session missed participants will mark each session attended on their calendars. SP will provide verbal encouragement during each session, a booklet also highlighted this. SP will ask participants about exercise improvements experienced during each WALC. SP and other participants will serve as role models. SP will verbally highlight positive physiological outcomes experienced by participants. SP assisted with individualised goal setting. Study personnel assisted participants to generate solutions to barriers if needed.</p>
Duraiswamy (2007)	✓		✓		<p><b>Frequency total (n/4): 2</b></p> <p><b>EMS</b>... family member accompanied each individual to the consent sessions in order to help them understand form.</p>



					IS...therapist taught yoga and exercise....exercises and yoga adherence and correctness reviewed once a month. Yoga teaching included breathing practice and relaxation techniques
Centorrión (2006)	✓		✓	✓	<b>Frequency total (n/4): 3</b> <b>ES...</b> individuals encouraged to follow food plan. Assistance given in each session to help individual adhere to the diet prescribed, help them improve choices and develop strategies to decrease over eating. Low fat choices at restaurants. Music and dance were used to maintain enthusiasm for exercise sessions. Monthly fitness evaluations. Individuals interviewed weekly about how to adhere to agreed exercise regime. <b>EMS...</b> peer support. Dietary counselling and low calorie food plan – including a reduced-calorie nutritionally complete food plan individualised for each subject. Special attention given to subjects with medication related impaired balance and coordination. Monthly fitness evaluations. <b>IS...</b> individuals interviewed about their eating, activity exercise and sleeping patterns. Dietary counselling. Ratings of perceived exertion monitored. Fitness evaluations given on how to exercise 3*30 minutes when at home.
Beebe (2005)			✓		<b>Frequency total (n/4): 1</b> <b>IS...</b> individual meetings undertaken pre consent in order to review records ensure diagnostic criteria, explain study in detail and answer questions. Study personnel present at exercise sessions and demonstrated exercise and stretches. Written guidance given to individual for what to expect each week, which helped orient them to the program.
Beebe (2011) – as Beebe (2010)	✓		✓	✓	<b>Frequency total (n/4): 2</b> <b>IS...</b> Enhanced capacity for research consent undertaken. <b>IS...</b> Study personnel (SP) will provide calendars to cue exercise. Repetition of information. SP surveyed participants for any discomforts during basic stretches at WALC. Provided information on how and why to warm up the muscles, considered appropriate attire for exercise, importance of starting slowly and gradually increasing walking time and maintain adequate hydration. Poster of regular stretches used. SP assisted with individualised goal setting, included independent walking increasing days or minutes walked each week along with improvements in flexibility, energy level or psychiatric symptoms. Identified common discomforts experienced during exercise and suggested ways of reducing this e.g., heat or massage. Booklet provided to each participant. Individuals were told to notify participants if discomforts occurred. Booklet identified ways of overcoming common barriers such as increased fatigue, muscular soreness, finding the time to exercise, loneliness while exercising and boredom while exercising. Study personnel assisted participants to generate solutions to barriers if needed. Calendars provided to tract attendance <b>EMS...</b> SP will provide phone call before each WALC group <b>ES...</b> follow up calls if session missed participants will mark each session attended on their calendars. SP will provide verbal encouragement during each session, a booklet also highlighted this. SP will ask participants about exercise improvements experienced during each WALC. SP and other participants will serve as role models. SP will verbally highlight positive physiological outcomes experienced by participants. SP assisted with individualised goal setting. Study personnel assisted participants to generate solutions to barriers if needed.
Thyer (1984)	✓	✓	✓		<b>IS...</b> individuals were informed by staff that an exercise bike was purchased to benefit their health. <b>ES...</b> each time an individual road on their bike they would inform staff who would note it down. <b>TS...</b> individuals were notified that extra tea, coffee, cigarettes would be available if exercise was undertaken. Incremental reinforcement, within the first mile pedalled on the bike one reinforcement was given for every 1/10 of a mile, for the second mile pedalled on the bike one reinforcement was earned for every 2/10 of a mile and so on.
Bernard (1968)	✓	✓	✓	✓	<b>ES...</b> positive reinforcement with token system <b>EMS...</b> family support in terms of them not bringing sugary sweets/snacks <b>TS...</b> removal of 'goodies' (food snacks) from family. Paid 10 tokens for each pound loss. Tokens could be exchanged for privileges e.g., cigarettes, sweets.
Moore (1969)	✓		✓	✓	<b>IS...</b> Periodic weight checks. Weight was undertaken daily and recorded on a wall chart. <b>ES...</b> 'social approval' provided by staff. Weight was undertaken daily and recorded on a wall chart. If weight was loss from the previous day experiementer provided support and acceptance for individual. If weight was not loss experiementer would shake his head in a negative fashion, record

					weight and point out the difference. <b>EMS...</b> 'acceptance' provided by staff. Attention and verbal reinforcement from staff or 'experimenter' were provided on a regular basis. These methods of communication were used to help inhibit eating.
Upper (1971)	✓	✓		✓	<b>EMS...</b> provided with attention and verbal reinforcement. <b>ES...</b> Praised for weight loss. <b>TS...</b> token economy program. Where tokens can be used to purchase two types of rewards: (a) meal privileges (hour at meal times to go to dining hall) (b) work privileges (two hours each morning and afternoon to attend a work assignment). Rewards could be partial (7am until 6.30 pm) or full (7am until 9.30 pm). One token and a privilege was given for 3 lbs weight loss. With no weight gain no change was made, with weight increment individuals did not receive a token, were dropped a step on the privileges and did not receive verbal reinforcement.
McKibbin (2006)		✓	✓	✓	<b>IS...</b> educational materials (including how to change diet, diabetes management, types of exercise and use of activity monitors) were adapted for older adults with schizophrenia. weekly weight ins, pedometers, health food sampling. Personalised physical activity sessions were provided. <b>ES...</b> weekly weight ins, pedometers, health food sampling and reinforcement based on attendance and behaviour change. Individuals were encouraged to speak with the physician about diabetes management. <b>TS...</b> raffle ticket for small health related prizes given for attendance and behavioural change.
Methapata (2011)	✓		✓	✓	<b>IS...</b> leaflet-'What is a healthy lifestyle?' and group education on nutrition, exercise, warming up, cooling down and pedometer. Questions could be asked by participants about this. <b>ES...</b> Motivational interviewing which focused on obesity and walking. Feedback from therapist re self-regulation principles and how to cope with lapse and relapse. Goal setting using SMART goals (specific, measurable, acceptable, realistic, and timed). Encouragement of participants to increase the minimum daily amount within 30 minutes to 5000 and 8000 per day from 3000 and 5000 if the goal was achieved. <b>EMS...</b> call from therapist to check for difficulties with programme. Group practice for pedometer walking.
Beebe (2013)	✓	✓	✓		<b>IS...</b> Researchers set and instructed participants on use of pedometer. Questions from participants were answered and written information on how to use the pedometer was provided. <b>ES...</b> Participants received twice-daily phone calls to remind them to wear the pedometer each morning and remove it each night. <b>TS...</b> Participants received \$20 gift card at the end of the study.
Chen (2009)	✓		✓		<b>IS...</b> advice regarding lifestyle and healthy eating, relapse prevention, and drug adherence. Emphasis of program was on a healthy lifestyle and structured life schedule. <b>ES...</b> motivational counselling techniques were utilised. (Implied) fitness coach present for exercise sessions-verbal encouragement. Participants were encouraged to keep a food and exercise diary. Participants were asked to undertake an additional 45 minutes of exercise 3 times a week at home.
Marzolini (2009)	✓	✓	✓	✓	<b>IS...</b> information sheet regarding study and benefits for participation. Participants were advised to exercise at the same pace on their own as they did in the sessions. Barriers to home exercise and ways to overcome barriers were discussed. <b>ES...</b> participants were encouraged to undertake an additional exercise session on their or during a home visit from a health care professional. <b>EMS...</b> Reasons for missing session elicited by interview with clinician. <b>TS...</b> three individuals were provided with transport from a member of staff.
Ball (2001)	✓	✓	✓	✓	<b>IS...</b> weight watchers point system to evaluate food choices and introduce self-regulation. Amount of exercise recorded. <b>ES...</b> exercise sessions monitored by at least one of the investigators. Amount of exercise recorded for patient. Parent or partner asked to supervise diet at home. <b>TS...</b> tokens given weekly for weight loss, attendance to group meetings, participation in exercise, documentation provided by family/caregivers on adherence to exercise and diet-positive reinforcement. The tokens could be used to purchase gift items at an auction that was held on the final weight watchers week. <b>EMS...</b> parent/caregiver asked to supervise diet/exercise at home
Warren (2011)	✓	✓	✓	✓	<b>IS...</b> Each participant given information regarding risks/benefits of study. Participants taught how to take their own pulse. Each given a pedometer and water bottle. Weekly healthy behaviour sessions in hour long classes were provided. Information on how to stay hydrated and signs and

					<p>symptoms of over exertion.</p> <p><b>ES...</b>pedometer given to participants. Weekly diet and activity log was maintained.</p> <p><b>EMS...</b>training sessions for 5km event were supported. Family members encouraged to attend the race...‘Friendly’ atmosphere maintained during training rather than ‘boot-camp’.</p> <p><b>TS...</b>Participants given lunch vouchers after each training session. Participants given t-shirt and race number on race day. Each received a medal.</p>
Wu (2008)	✓	✓	✓		<p><b>IS...</b>Exercise sessions directed by exercise physiologist for first week. Dietary advice given by a registered dietician who ensured calorie intake worked. Assessment of food and caloric intake was undertaken.</p> <p><b>ES...</b>we encouraged participants to complete 60 minutes but did not force them.</p> <p><b>TS...</b>to motivate individuals rewards were offered and included toilet paper, soap, and drinks which were sugar free.</p>
Kwon (2006)	✓		✓	✓	<p><b>IS...</b>Exercise advice...Dietary advice...education about modifying lifestyle. Dietician discussed food diaries and exercise coordinator the exercise diaries. For diet the following concepts were considered; food exchange table, using food models, importance of regular meals, healthy snacking, food shopping and preparation and reading food labels. For exercise individuals were checked waist/hip ratio, educated on considering calorie consumption in activities, correct exercise performed. Chose suitable forms of exercise and correct misconceptions. Information sheet provided.</p> <p><b>ES...</b>keep a food and exercise diary was required motivation from discussion with professionals may have resulted.</p> <p><b>EMS...</b>QOL measurement although nothing reported re specific support.</p>
Littrell (2003)	✓		✓		<p><b>IS...</b>Photocopy of each module section available only during that session. All module information given at the end of the 16 weeks Psycho-education of solutions of well-ness class was provided. Content included living a healthy lifestyle, wellness, nutrition, fitness and exercise. Photocopy of sessions being taught were made available and all sessions made available at the end of 16 weeks.</p> <p><b>ES...</b>Participants weight each morning. When being weighed a research nurse would ‘query’ there exercise and dietary habits. Weekly reminder letters of their class and verbal encouragement from staff to attend. Sessions were undertaken in different forms to encourage participant including individual work, dyads, small groups and large groups. Reading aloud, completing written exercise and taking quizzes and test and playing education games.</p>
Total (n/23)	20/23	11/23	22/23	15/23	

**Note:** ES-esteem support EMS-Emotional support TS-Tangible support IS-Informational support

Supplementary Table 3 Identifying significant results from included studies and if those results were associated with the social support used

Study	Outcome measure	Significant Results	Comments about the benefit of social support for individuals	Implied (I) or actual (a) comments linking result to social support
Dodd 2013	<p>1. Adherence: exercise physiologist used training logbook to record: (a) attendance to exercise sessions. (b) behaviour problems (c) amount of encouragement required (d) perceived intensity with which exercise were completed</p> <p>2. Adverse events: logbook also used to record how participant felt at the end of the session and if injuries had occurred.</p> <p>3. Physiological variables: 6 min walk test (primary outcome), Weight, BMI, Vo2Max</p> <p>4. Mental health outcomes: The Positive and Negative Symptoms Scale (PANSS) utilised to assess symptoms of schizophrenia.</p>	<p>No dropouts</p> <p>No systematic effect on schizophrenic symptoms, cardio-respiratory fitness and physical endurance.</p> <p>Systematic increase in the 6-min walk distance from week 0 to week 5 of 6.2% (mean increase 25.4 m, 95% CI: 1.1, 49.8). (pg 1226).</p> <p>During the training period from week 5 to week 28, there was a 2.4% reduction in body weight (mean decrease: 1.8 kg, 95% CI: 0.5, 3.1) and a 2.2% reduction in body mass index (mean decrease 0.6 kg/m<sup>2</sup>, 95% CI: 0.2, 1.0). (pg 1226).</p>	<p>"Strategies used by the exercise trainer included frequent encouragement, using firm instructions, giving participants a chance to have a break when upset before recommencing exercises, starting exercise sessions on different equipment for a participant who became easily bored and distracted, and for one participant, exercising in the afternoon rather than the morning." (Page 1225)</p> <p>"For clinical practice, our finding suggests that structured group-based exercise programmes are feasible to implement even for participants with very severe and chronic symptoms of schizophrenia." (Page 1225)</p> <p>number of strategies were used that may have led to the relatively high participation and attendance rates observed in our trial. First, participants exercised in small groups because the support that can be gained from group members has been shown to contribute to the success and to the adherence of exercise programmes for people with serious mental illnesses...Second, adequate trained support was provided, as each group of two to three participants was supervised by a qualified exercise physiologist who had previous experience with developing and implementing exercise programmes for people with severe mental illnesses. In addition, a staff member from the residential unit who the participants were familiar with attended each session and assisted. Third, participants were transported by car the few minutes it took to get from their residential unit to the gymnasium. Fourth, to give participants an opportunity to overcome any apprehension about being involved we included a familiarization phase where participants could become used to the trainer, equipment and exercises before starting the programme at the required training intensity. Finally, residential staff led the walking programme to reinforce to participants that staff thought physical activity was a positive and beneficial activity. (pg 1227)</p> <p>A number of strategies were used to encourage participants to exercise consistently at the required intensity. First, the logbook and the heart rate monitor were used as motivational tools to help participants self-monitor their exercise progression. Second, each person received individualized support and feedback from the exercise physiologist or the staff member from the residential unit when they were exercising .... In their diary the exercise physiologist frequently documented giving participants' encouragement and also gave examples of individualised feedback such as using firm instructions with one participant. Third, the details of the programme were tailored to suit individuals. Examples of this included giving a participant the chance to have a break when upset before recommencing exercises, and for one participant exercising in the afternoon rather than the morning. Despite these strategies, it</p>	<p>I: the value of social support is that it was able to enhance compliance with the program which could have let do Physiological improvements documents including weight reduction and increases in 6-minute walk test.</p>

			<p>appears that it was challenging to get participants to consistently exercise at the required intensity for cardio-respiratory training. This finding of reduced adherence during training sessions is consistent with a previous study of 15 participants with serious mental illnesses (67% of who had schizophrenia) who completed a walking programme held twice a week for 12 weeks [19]. In that study it was reported that participants only walked within their target heart rate ranges for around 35% of the time early in the programme, reducing to around 22% of the time in the later weeks of the programme. Exercising at less than recommended intensities such as those provided by the American College of Sports Medicine guidelines [21] may help explain why no systematic improvements were observed in the participants' physical endurance or cardio-respiratory fitness." (Page 1228)</p> <p>The elements of the programme that may have helped feasibility included having a familiarization phase, and conducting the programme in a group with adequate trained staff support. (page 1229)</p>	
Attux (2013)	<p>Weight and BMI (primary outcomes) Blood pressure</p> <p>Further physiological measures: Fasting plasma glucose, insulin, total cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides levels</p> <p>Further instruments: Positive and Negative Syndrome Scale (PANSS), the Calgary Depression Scale, <i>Clinical Global Impression – Severity Scale</i> (CGI-S) and <i>Clinical Global Impression-Improvement Scale</i> (CGI-I). <i>Global Assessment of Functioning</i> (GAF) <i>Independent Living Skills Survey</i>-patient version (ILSS-BR/P) WHOQoL-BREF, Rosenberg self-esteem scale, Dietary Instrument for Nutrition Education (DINE), Fagerström tolerance questionnaire to evaluate tobacco dependence, and International Physical Activity Questionnaire-short version (IPAQ) primary outcome not identified.</p>	<p>"The mean of attending sessions was 9.1 (SD: 3.5), and 49 patients, i.e. 72.1% of participants attended eight or more meetings." (page 3)</p> <p>"Blood glucose decreased in both groups over time after three months (p=0.029)...Both groups presented an increase in walking as measured by IPAQ walking (p=0.002), as well as an increase in psychological domain of WHO-QoL quality of life scale (p=0.014). However the increase was not statistically different between the two groups on both scales." (page 4)</p> <p>"After six months the intervention group presented a decrease of 1.15 kg (CI 95% -2.11 to 0.19) and the standard care group presented an increase of 0.5kg (CI 95% -0.42 to 1.42), and this difference was statistically significant (p=0.017). ." (page 5)</p>	<p>"It is noteworthy that motivation for losing weight was part of the inclusion criteria for the study added to the fact that these patients were under care of programs directed by preminent academic departments in the country, where it is supposed to expect some sort of intervention for losing weight in the control group." (page 7)</p> <p>"As for the motivation factor it is worth noting that the intervention has a minor impact on weight change in the experimental group. Most of the studies did select motivated individuals to lose weight because this is an important factor of compliance. This intervention may not work for those who have no intention to change their lifestyle." (page 7)</p>	<p>I: individuals motivated to lose weight may have been receptive to types of support notably esteem support for successful weight loss. Those less motivated will likely benefit less from esteem efforts</p>

Archie (2003)	Weight BMI changes Adherence to exercise programme	40% drop out at 4 months, 70% dropout at 5 months, 90% dropout at 6 months "Of the 10 YMCA subjects, only 1 subject (subject 5) met criteria for full attendance for each of the 6 months. Subject 2 attended 3 of the 6 months. Of the 10 subjects, 2 did not attend at all." One subject who exercised regularly at the YMCA lost 15 kg." No statistical comparisons are made	Nothing reported in reference to results but author advises strategies for future studies to include 'rewards' or a 'buddy system'  Reason for poor attendance no one to go with (n=2/10, 20%), lack of motivation (n=6/10), low comfort level (n=2, 20%).  "In future studies, researchers should consider strategies to increase motivation for exercise. These strategies might include groups, personal trainers, rewards, or a buddy system. Future research should consider the role of treating the negative syndrome to enhance motivation for physical activity."	D: for some (n=2/10) individuals having no support from others to attend the exercise intervention was a reason not to go. Meaning that emotional and esteem support are important. I: for some having a low comfort level (n=2/10) with attending could illustrate the importance of feeling comfortable in new setting I: having low motivation (n=6/10) for exercise may require and benefit from esteem support. D: authors call on future research to consider how motivation to exercise can be increased identifying that strategies could include rewards (tangible support), buddy system, groups and personal trainers (emotional and esteem support).
Bernard (2013)	BMI, waist circumference, weight. Smoking behaviour the fagerström test for nicotine dependence, smoking self- efficacy questionnaire, the smoking cessation motivation questionnaire. Distribution across the trans- theoretical model stages of change was assessed Hospital Anxiety and Depression Scale. Attendance to exercise and counselling sessions. 7-day recall of the number of cigarettes smoked Open Questions; any information about experiences, what they like about the programme, could any	Participants attended an average of 81.3% of the total sessions scheduled in OG intervention (page 27) there were significant reductions in tobacco consumption and CO level expired compared to baseline. Indeed, using the past 7-day recall, five patients reduced by 50% or greater the number of cigarettes smoked post intervention. (page 27) Notably, there was a significant increase in smoking cessation motivation as measured by the Q-MAT (page 27)	"Overall, comments recorded by the feedback questionnaire were positive in describing perceived benefits of participating in the intervention— "Walking and group sessions have helped me in staying positive and increasing my self confidence." All individuals were interested in receiving specific advice from health professionals regarding reduction strategies as well as to facilitate exchanges with partner: "Training partner for support is an advantage for coming in session." Participants noted that they would be interested in receiving information about nicotine replacement therapy and having more frequent walk sessions." (Page 27)  "Participant's comments related positive impacts of exercise sessions regarding the three following characteristics: walking, group and supervised session." (page 27-28)  "These declarations confirmed the beneficial effects of OG intervention on physical activity barriers for schizophrenia patients" (page 28)	D: motivation for attending sessions was gained by having a training partner D: informational support was valued from study personal. I: groups sessions with other peers increased self- confidence I: social support as part of the intervention can be effective against psychosocial barriers

	improvements be proposed.			
Beebe (2010)	age, gender, living arrangement, educational level, diagnosis from chart. "Attendance at WALC-S groups was defined as the percentage of sessions attended out of the total sessions offered. Reasons for nonattendance were obtained during follow up telephone calls after each WALC-S group." (page 53)	Living arrangements 6 lived alone, 7 with family 4 with paid caregiver "Overall attendance for the 4 week intervention was 63.2% and attendance increased over time. Groups one and two were attended by 52.9% of participants (n = 9), group 3 attendance was 70.5% (n = 12) and attendance at the fourth and final group was 76.5% (n = 13)." (Page 53)	<p>"subset of participants attended every WALC-S group. They were mostly Caucasian males whose average age was 32 years. Most were living with family or caregivers (as opposed to alone), their average education was 11.2 years. This small group was younger and better educated by self-report than those who missed at least one session." (Page, 59)</p> <p>"We compared participants who attended more than half of groups (high attenders) with those attending less than half of groups (low attenders). There were no appreciable differences between high and low attenders based upon age, gender or race. Chi square analysis of attendance (high or low) and living arrangement (alone or with others) revealed a significant association of high attendance and living with others (P = .032)." (page 59)</p> <p>"It is possible although not certain, that non-responsiveness to the outreach calls following missed groups may itself be reflective of low motivation or non-engagement." (Page 60)</p> <p>"Our participants specifically reported considerable and ongoing transportation problems interfering with WALC-S attendance. Although the state provides bus service to the CMHC free of charge, transportation problems (not being picked up or missing the bus) were the single most often cited reason for missing a WALC-S group (60%), highlighting potential system related barriers to exercise offerings." (page 60)</p> <p>"Our finding of an association between living with others and high attendance may be related to housing stability, socioeconomic status, or the presence of a support system. For instance, family members in the home may have played a part in reminding participants of groups, encouraging attendance or providing transportation" (Page 60)</p> <p>"Nevertheless, our increasing attendance may also be attributable to the motivational techniques used" (page 60)</p> <p>"Future examinations of exercise motivation should include mechanisms for taking multiple influences into account, controlling if possible for factors such as transportation, finances, and social support along with diseaserelated deficits." (page 60)</p> <p>"Based on this feasibility study we incorporated the use of city bus passes to offset difficulties with the state bus system, and written mailings as reminders for participants without home telephone service." (page 60)</p>	<p>D: living with someone (family or carer) may help attendance then when compared to living alone (p= 0.032).</p> <p>D: non responses to information support as a result of low motivation</p> <p>D: transport provided a significant barrier to attendance (when giving reasons for non attendance was represented by 60% of answers) – lack of tangible support may need addressing when considering transport needs.</p> <p>D: transport support (tangible support) e.g., city bus passes and information support (phone calls and written letters) supported the attendance.</p> <p>D: motivational techniques (esteem support) have resulted in high attendance (63% for 4 weeks)</p>
Duraiswam Noy (2007)	The Positive and Negative Symptoms Scale (PANSS) Social and Occupational	Across time 0-4 months Significant reduction in PANSS and SOFS score for both groups.	"The trainer was qualified to train both forms of treatments. Furthermore, the exercises taught in the PT group were very simple. Having a separate physical therapist for the PT group would not have influenced the quality of training,	D: simple informational support is effective in supporting the uptake and



	Functioning Scale (SOFS). Simpson Angus Scale for Extrapyramidal symptoms Abnormal involuntary movement scale WHO Quality of Life Brief Version	WHO quality of life scores only significantly improved for the yoga group.	but would have introduced a confounding factor in the form of 'therapist' variable." (page 229)	use of yoga, therefore contributes to the effectiveness of the intervention (reduction in positive and negative symptom scale, $F = 5.0$ , $P = 0.03$ ).
Centorrino (2006)	Weight and BMI (primary outcome measures) Blood pressure (BP) and Pulse Clinical Global Impressions Brief Psychiatric Rating Scale Adverse events SF-36 health survey Udvalg for kliniske Unndersogelser Adverse effects scale Simpson angus extrapyramidal side effects Barnes Akathisia Rating Abnormal Involuntary Movement scale The Quality of life questionnaire : glucose, triglycerides, cholesterol, hepatic enzymes, creatinine, urea nitrogen electrocardiogram, resting heart rate	Of 22 enrolled subjects, five dropped out within the first 4 weeks due to hospitalization or difficulties with transportation or scheduling, and 17 continued in twice weekly sessions for X24 weeks (10 women, seven men; average age $40.5 \pm 8.5$ years). In all, 12 of the 17 continued for an additional, less intensive, 6- month extension phase.  Mean body weight decreased ( $P < 0.0008$ ) by $6.0 \pm 5.9$ kg (5.7%), and mean BMI decreased by $2.1 \pm 2.0$ kg/m <sup>2</sup> (5.7%) in the first 24 Weeks.  Significant ( $p < 0.001$ ) reduction (10.8% and 11.3%) in systolic and diastolic blood pressure noted.  Average weight loss at 24 weeks- 6kg, BMI decreased by 5.7%, BP improved by 11%	'Subjects benefitted socially from participation in the study and reported favouring the peer support and encouragement associated with the programme' (page 1013)  "The most common reasons reported for poor adherence to the exercise program included... low motivation." (page 1014)	D: social support valued by participants and likely improved adherence and impacted on results (significant decreases in body weight $\approx 6\%$ [ $t = 4$ , $P = 0.001$ ] and blood pressure $\approx 11\%$ [ $t = 4$ , $P = 0.0008$ ]). I: motivation is required by individuals and social support helps an individual's motivation to initiate and maintain exercise
Beebe (2005)	Primary Outcomes BMI 6 minute walk distance (6MWD) Secondary Outcomes Body fat % The Positive and Negative Symptoms Scale (PANSS)	Non significant difference between groups in 6MWD or BMI change. Significant difference in the change in body fat experimental individuals reduce 3.7% where as control reduce 0.02% ( $p < 0.03$ ). Experimental groups subjects had a 8 point drop in average total PANSS score, but not significantly different to control.	"Hearing others discussing the treadmill program and observing their progress may have prompted them to increase their activity level on their own." (Page 672) "Practitioners need to be consistent and persistent in encouraging patients to be physically active in a variety of settings, provide positive reinforcement for activities in which clients are willing to engage, and continue to highlight the benefits to physical as well as mental health." (page 674)	D: social support may have explained small benefits (6 minute walk distance, increase in 56 feet, and decrease of percentage fat 0.02%) in control group, esteem and information support gained from peer interaction. D: to increase initiation of exercise and adherence health personnel need to



				provide esteem support and information support as well as positive reinforcement.
Beebe (2011)	Attendance to walking groups, persistence to walking in the number of weeks past week 1 individuals attending Compliance to walking groups was the total number of minutes of walking	No differences identified between the two groups in any of the varies. There was a significant interaction for both groups over time with attendance, persistence and compliance to walking.	<p>“Percent of WALC-S or TAC groups attended was positively and significantly correlated with overall attendance and persistence, as well as number of minutes walked throughout the walking program” (Page 5)</p> <p>“Our attrition rate of 18.6% over four months... Our relatively low attrition may be the result of the study design, in which the pre-walking groups provided opportunities for the establishment of rapport in both experimental and control groups” (Page 6)</p> <p>“Our low attrition may be due to...living with a support persons...the use of telephone reminders regarding study activities.” (Page 6)</p> <p>“Our exercise attendance was 38.5% in experimental subjects, and 31.4% in controls over four months... Our next study will examine the effect of periodic boosters of the motivational intervention upon long-term exercise outcomes.” (Page 6)</p> <p>“insight over time, a better understanding of health benefits, greater experience accessing transportation options, or greater service engagement in older as compared to younger persons.” (Page 6)</p> <p>“Most common reasons for non-attendance.. nonattendance were transportation problems (n = 14, 22.2%)” (Page 7)</p> <p>“Archie subjects attended the exercise facility on their own and thus had the option of attending whenever their schedule allowed, whereas our subjects had to accommodate to the group walking schedule, and occasionally our walking schedule conflicted with their other appointments. Likewise, our study design ensured that all subjects had someone with which to exercise, in contrast to Archie's subjects who had to make their way to the facility and perform exercises on their own” (Page 7)</p>	D: attendance, adherence and compliance were related to the positive effects of peer support and esteem, emotional and informational social support D: transport (tangible support) acted as a barrier against participation (n= 14 or 22% of individuals who reported non-attendance)
Thyer (1984)	Total miles per day, recorded on odometer	Reinforcement phases associated with higher levels of pedalling	<p>Data ‘clearly demonstrates’ that reinforcement contingency correlated with increased exercise levels above baseline</p> <p>Re-enforcement phases associated with increased cycling e.g., participant 1 baseline riding 0.00-0.05 miles/day, reinforcement phase 1.1 – 6.0 miles/day.</p> <p>“The data for both subjects clearly demonstrate that the reinforcement contingency was accompanied by exercise levels above those of the baseline conditions. In addition, the subjects' increased pedaling was maintained at follow-up, during which time the reinforcement program was still in</p>	D: social support through verbal reinforcement (esteem support) produces changes in physical activity levels.

			operation.” (Page 423)	
Bernard (1968)	Weight	102 lbs lost over 6 month period equivalent to 20% of body weight	“The fact that this patient lost weight at a rate almost 4 times that of Ayllon's patient may be attributable in part to the fact that her initial weight was considerably higher, but it also suggests that a program including positive reinforcement for weight loss is more effective than one which only controls caloric intake.” (Page 666)	D: Social support through reinforcement (tangible support) and encouragement (esteem support) resulted in weight loss of 102 pound over 6 months (20%)
Moore (1969)	Weight	Participant managed to maintain weight loss over 5-month period without reinforcement.	<p>“that a total weight loss during the entire period amounted to 35 lb with a mean daily weight loss over the period of 0.20 lb.” (page 130)</p> <p>“This period permitted the Es to observe the effects of discontinuing the ward reinforcement schedule since the subject was placed in a different social environment. As seen in Fig. 1, there was a reversal effect in the 56-day trend of weight loss and the S demonstrated an approximate +1/2 lb per day weight increase” (page 130).</p> <p>“present work used a rather global social reinforcement which was limited to the actual daily weight recording sessions. This procedure was established so that the S might learn the ultimate consequences of both over and-appropriate eating and eventually gain control of her eating behavior through self-reinforcement. Support for the hypothesis that the S actually gained self-control is demonstrated in the seventeenth week on the weight chart when the S maintained the weight loss trend in the absence of reinforcement while she was unable to do so at the eighth week.” (page 131)</p>	<p>D: Approving weight loss through social reinforcement (esteem support) when participant loss weight (35lbs in 26weeks) at the weekly weigh in, negative support (head shaking when weight was not lost).</p> <p>I: D: Approving weight loss through social reinforcement (esteem support) promotes adherence and contributed to the participant loss weight (35lbs in 26weeks)</p>
Upper (1971)	Weight	One individual achieved weight loss of 63 lbs in 28 weeks and another individuals achieved a weight loss of 61 lbs in 26 weeks.	<p>“Apparently the reinforcement procedure as outlined above was an effective means of reducing the subjects' body weight within the context of a ward token economy program.” (page 114)</p> <p>“While it is true that they were on reduction diets during the reinforcement period, it is significant to note that both Ss had been on similar diets in the past without noticeable reductions in weight occurring.” (page 115)</p> <p>“It is felt that reinforcing subjects for weekly weight loss, rather than for emitting specific responses (e.g. picking up the special diet card prior to meals, avoiding snacks between meals), served to focus their attention on the primary goal of the procedure-reduction in body weight. The weekly monitoring of weight and the feedback they received weekly in rounds provided them with much more information about the success of their own weight-reduction efforts than they typically would have received in the course of more traditional hospital weight-reduction procedures.” (page 115)</p> <p>On the present program, adherence to the diet was presented as one means of achieving the desired goal, but if the subject chose to meet the weight-loss criterion by eating a lot on some days and only a little on others he was still reinforced for losing weight.” (page 115)</p>	<p>D: Social reinforcement praise and encouragement (esteem support) as well as a token system (tangible support) for privileges aided weight loss (63 lbs in 28 weeks and 61 lbs in 26 weeks)</p> <p>D: Social reinforcement praise and encouragement (esteem support) as well as a token system (tangible support) for privileges promotes adherence to program.</p>
McKibbin (2006)	BMI Weight	Significant reductions in weight (F = 15, p < 0.01) and BMI (F =	“Our findings suggest that among middle-aged and older patients with schizophrenia or schizoaffective disorder, a 24-week, group-based,	I: social support as part of the intervention may have

	Waist circumference Blood Pressure Yale Physical Activity Scale (YPAS) Accelerometer Hamilton Depression Scale (HDS) The Positive and Negative Symptoms Scale (PANSS) Metabolic-fasting plasma glucose (FPG), glycosylated haemoglobin (HbA <sub>1c</sub> ), total cholesterol (LDL and HDL) and triglycerides were obtained.	12.7, p < in intervention group and waist circumference (F = 10.7, p < 0.05), triglycerides (F = 8.10, p < 0.01), diabetes knowledge (F = 18.2, p < 0.01), self-efficacy; (a) managing psychosocial aspects (F = 9.6, p < 0.01) (b) setting and achieving goals (F = 9.8, p < 0.001), dis- satisfaction and change (F = 9.1, P < 0.01). finally changes in Yale total activity log were noted (F = 7.09, p < 0.01).  “Participants attended a mean of 16.2 (S.D.=8.7) sessions. Nearly 40% attended all 24 sessions, while 80% attended at least one half of all intervention sessions.” (page 40)	psychoeducational intervention focused on diabetes education, nutrition, and lifestyle exercise was feasible and produced reductions in BMI.” (page 41)  “It is possible that additional intervention with one-on-one reinforcement of skills and information may be needed to achieve optimal knowledge levels.” (page 42)	help contribute to the observed benefits reductions in weight (F = 15, p < 0.01), increase in diabetes knowledge (F = 18.2, p < 0.01), and increase in self- efficacy; (a) managing psychosocial aspects (F = 9.6, p < 0.01) (b) setting and achieving goals (F = 9.8, p < 0.001), dis-satisfaction and change (F = 9.1, P < 0.01). finally changes in Yale total activity log were noted (F = 7.09, p < 0.01). through adherence. D: knowledge about health diabetes may benefit from one-to-one reinforcement (esteem support) and information (informational support)
Methapata ra (2011)	Primary outcome-weight Secondary outcome-changed BMI and waist circumference	Weight (t = -2.3, P = 0.03) and BMI (t = -2.17, o = 0.03) of intervention group decreased significantly more than the control group at week 12 (mean difference of 2.21kg) Decreased waist circumference at all 3 assessment points 4 (t = - 2.79, p = 0.01), 8 (t = -3.84, p < 0.01), 12 (t = -3.35, p < 0.01) weeks in the intervention group.  “The percentage of intervention patients with successful weight reduction (68.75%) was significantly greater than that of control patients (31.25%) (P = 0.006)” (page 378)	“Second, this is a cognitive/behavioral program for obese/overweight schizophrenic patients that includes motivational interviewing for changing the patient’s behavior” (page 379) “Motivational interviewing that has been developed for people with alcohol problems is also applicable for schizophrenic patients. The motivational interviewing applied in the PWMI is modified from the original one in two respects. First, the contents of feedback mainly focus on consequences of obesity and overweight. Second, the target of changed behavior is the increase of physical activity, especially walking.” (p 379).	I: behavior element of the program responsible for benefits in weight (t = -2.3, P = 0.03) reductions compared to control. Therefore social support may have a role. D: motivational interviewing which included elements of social support (esteem support) aids success of the program e.g., benefits in weight (t = -2.3, P = 0.03) reductions compared to control.
Beebe (2013)	Steps and distance walked per day measured using a pedometer	“Experimental participants walked an average of 4,425 steps/day during the week, controls walked an average of 2,810 steps/day	“The twice-daily reminder calls (while designed only to remind participants to don the pedometer daily), may have impacted activity level; however all participants received reminder calls regardless of original group assignment.” (page 218)	D: informational support in the form of reminder calls aided compliance to the intervention.

		( $t=1.53$ , $df\ 20$ , $p=0.14$ ).” (page 217)		
Chen (2009)	Primary outcomes-Weight BMI Secondary- WHO Quality of Life Brief Version The Positive and Negative Symptoms Scale (PANSS) Beck Depression Inventory (BDI) Beck Anxiety Inventory (BAI) Epworth Sleepiness Scale (ESS)	Significant weight reduction in all subjects (from 77.9 kg to 76.6 kg, $t = 2.6$ , $p = 0.014$ ). Significant improvement in general health and quality of life measured by WHO brief quality of life scale (pre score $76\pm13$ to $84\pm19$ , $p = 0.003$ ). Positive and negative symptom score significantly ( $p < 0.001$ ) improved, Beck Depression Inventory significantly improved ( $p = 0.004$ ), Beck anxiety inventory significantly improve ( $p = 0.003$ ), Epworth sleepiness scale significantly improved ( $p = 0.003$ ).	“This may suggest that careful case selection or motivation enhancement for program completion is important in conducting such a weight control program.” (page 21).  “There is also a need to develop a better understanding of what factors in the weight control program lead to improvements in health related quality of life among obese patients with schizophrenia or schizoaffective disorder. It is possible that behavioral factors such as exercising, changing diet, or a structured life schedule can explain the improvement, and it is also possible that the social interaction or other support of this program was responsible for the improvements in health-related quality of life.” (page 21)	D: social support generally could be responsible for improvements in quality of life: WHO brief quality of life scale (pre score $76\pm13$ to $84\pm19$ , $p = 0.003$ ) observed. D: esteem support is important for a weight control intervention and producing results: Significant weight reduction in all subjects (from 77.9 kg to 76.6 kg, $t = 2.6$ , $p = 0.014$ ).
Marzolini (2009)	Functional Exercise Capacity-6 minute walk distance (6MWD) One rep max Anthropometric measurements (BMI, waist and hip circumference, blood pressure) Adherence Mental Health Inventory (MHI) Feedback questionnaire	Significant change in 1 repetition strength score in exercise group across time from $41\pm1$ kg to $51\pm1$ kg ( $p < 0.001$ ) Improvements in mental health inventory total score in exercise group across time from $56\pm11$ to $66\pm9$ ( $p = 0.03$ ).	“As hypothesized, the exercise program yielded significant improvements in overall mental health and muscular strength with attendance averaging 72% with no dropouts” “Completion of home-based exercise was significantly lower than attendance to group-based exercise sessions.” (page 34) “Mean attendance to the group-based supervised exercise sessions at the community centre (72%) was superior to the home-based exercise sessions (35%) and was consistent with other similarly structured exercise programs of populations with serious psychiatric disabilities.” (page 35) Collectively, results of this study and those cited above indicate that attendance to structured, supervised, group-based exercise programs...result in superior treatment adherence compared to the non-structured, non-group-based model. Group-based, supervised exercise sessions may eliminate many of the avoidable barriers to exercising. For example, the top three reasons for poor attendance in the non-group, facility-based exercise program conducted by Archie et al. (2003) were potentially modifiable reasons (lack of motivation (60%), low comfort level (20%) and no one to go with (20%). “Participants were supervised by mental health clinicians who had established long-term clinical relationships with the participants (mean of 4.9 years) and were sensitive to the challenges of psychiatric symptomatology”  “Much of the feedback from participants alluded to their appreciation of the routine meetings, location, social support within the group, and enhanced rapport with the staff while enjoying meaningful activity. For these reasons the potential barriers that were related to lack of motivation, poor exercise self-efficacy, exercising alone, fear of injury and lack of exercise knowledge cited in other studies may have been mitigated and resulted in superior adherence in	D: social support (group and peer) can influence participation and attendance by eliminating some barriers to exercise include low motivation and perceived comfort at attending. D: social support including trust and relationship serve as a motivation to initiate and maintain activity as well as comply with the sessions.

			group-based supervised exercise sessions and poor adherence to the home-based exercise sessions” (page 35)	
Ball (2001)	Weight Body fat % BMI BP Brief Psychiatric Rating Scale (BPRS) Scale for the Assessment of Negative Symptoms (SANS) Clinical Global Impression (CGI) Hamilton Depression Scale (HDS)	Walking distance increased from .1 mile to 1 mile at the end of the programme. “The mean±SD weight loss for the men was 7.31±5.87 pounds (median, 7.6 pounds) (F=4.88, df=1, 11, p<.05); weight loss ranged from one pound to 18 pounds.” (page 969) “The participants’ exercise sessions increased from a range of five to ten minutes, walking about .1 mile, at the start of the program to 25 minutes, walking about one mile, at the end of the program” (page 969)	“The results of this study indicate that weight loss strategies may be successful among patients with schizophrenia who have olanzapine-associated weight gain. The health risks of being overweight are an important consideration in evaluating medication choices for patients who have schizophrenia.” (page 969) “To control medication-induced weight gain, patients need to be educated about appropriate strategies for managing this side effect.” (page 969)	I: social support and group setting of program may aid benefits including weight loss e.g., median weight loss for 7 males was 7 pounds (F=5, P < 0.05). D: informational support will help provide individuals with strategies to manage the weight gain.
Warren (2011)	Brief Psychiatric Rating Scale (BPRS) Scale for the Assessment of Negative Symptoms (SANS) Clinical Global Impression (CGI)	65% participated in all exercise sessions. 82% participated in the 5k event “Of the 17 subjects, 11 (64.7%) participated in all training sessions, 14 (82%) participated in 50% or more of the sessions, and all subjects participated in 25% or more of the sessions. Additionally, three participants opted to jog, generally in 1- to 2-min bouts separated by 5-min walking intervals.” (page 386)  “As planned in the protocol, as the program progressed, participants successfully achieved an increased number of steps by pedometer rating and an increased duration of walking (average within-participant correlation between exercise session and number of steps, r ¼	“Adherence rate to the exercise program was high, possibly due to the motivational effect of the 5K event, though no systematic data were collected to evaluate the motivational role of the event.” (page 387) “Out of 17 participants, 3 gained over 7 kg during the duration of this study; these were inpatients who may have made more extensive use of cafe’ food vouchers than the outpatients who receive them regularly for study participation. The increase in weight may also have been due to measurement error.” (page 387) “Both the exercise sessions and the 5K involved both patients and staff and were a means for participants with schizophrenia to interact with others in a destigmatizing manner. Limitations of this study include the following. First, we did not systematically measure the effects of the exercise program on subject motivation to exercise or quality of life.” (page 387) “In conclusion, we found it possible to achieve a high rate of adherence in patients with schizophrenia to an exercise program conducted in preparation for a 5K event.” (page 388) “included an unintentional food incentive after exercise which may have increased caloric intake in some inpatients, as noted in the results.” (page 388)	D: tangible support in the form of food incentives may not have worked to benefit weight loss (median difference at 0 and 10 weeks = -0.1kg, IQR: 2.5) and 3 gained over 7kg. D: the community event provided positive experiences of social support and benefits the attendance and experience.

		.31, Mantel-Haenszel $X^2 = 38.24$ , $p < .001$ ; correlation between exercise session and walking duration, $r = 0.75$ , Mantel-Haenszel $X^2 = 163.08$ , $p < .001$ )” (page 287)		
Wu (2008)	BMI Waist circumference Insulin levels Insulin resistance index	Significant decrease over time ( $p < 0.001$ ) and between groups of BMI, body weight and waist circumference  ‘Metformin alone was more effective for weight loss than lifestyle intervention alone’  “All 28 patients in the study group completed the six-month diet control intervention and at least 90% of the physical activity program. The level of compliance and consequently our success rate may have been lower if participants had been outpatients rather than inpatients. However, the high success rate made it easier to interpret our results at the end of the program.” (page 547)	“The motivation for weight reduction (dietary restriction and physical activity) is very low for psychiatric patients if these patients are not under institutional supervision.” (page 549)	I: being an inpatient with close supervision and social support enables compliance and benefits e.g., significant decrease in weight ( $p < 0.001$ ).
Kwon (2006)	Weight BMI WHO Quality of Life Brief Version The Positive and Negative Symptoms Scale (PANSS) Abnormal Involuntary Movement Scale (AIMS)	Weight reduction ( $-4 \pm 4$ kg vs $-1 \pm 2$ kg, $p = 0.006$ ) and BMI ( $-1.5 \pm 1$ vs $-1 \pm 1$ , $p = 0.007$ ) were noted from baseline to end point and between groups. 22/33 participants completed the study and were over 80% compliant with diet management and 12 individual were over 80% compliant exercise management	“Weight management may improve quality of life for patients” (Page 547) “These results indicate that patients experienced more difficulty in exercise management than I diet management. Therefore it is necessary to adjust the exercise management program to increase compliance”(page 552)	I: weight management program and social support or interaction can improve quality of life I: it is important to adjust the exercise intervention to increase compliance generally social support may have a role.
Littrell (2003)	Weight BMI	Significant difference ( @ 4 months $p = 0.005$ , @ 6 months $p = 0.0007$ ) between intervention group and control group with	“This educational intervention was significantly associated with weight control in patients with schizophrenia. This effect occurred in the absence of pharmacologic intervention for weight gain. The differences between groups were maintained after the intervention was	D: informational support helps prevent significant weight gain and for behavior change.

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		<p>regard to weight gain. Intervention group experienced less weight gain. Control group experienced significant (<math>p = 0.0007</math>) increase in weight gain across time from 4 – 6 months.</p>	<p>completed for a period of 2 months to study endpoint at 6 months. Although the baseline BMIs of the intervention and standard care groups did not differ significantly, patients in the intervention group, with a lower average BMI, experienced less weight gain than did patients in the standard care group, with higher average BMIs.” (page 240)</p> <p>“Perhaps the educational intervention mediated the increased risk of weight gain in these lower-weight participants.” (page 241).</p> <p>“We attribute the differences in weight gain between the intervention and standard care groups to a difference in the level of knowledge about healthy habits and how to implement lifestyle changes. The modules helped patients understand what constitutes a healthy lifestyle.” (page 241)</p> <p>“As patients acquired this knowledge, they also had opportunities within the group to discuss and plan how to change their habits.” (page 241)</p> <p>Providing patients with practical, concrete suggestions to improve their diets and increase their fitness levels is important for behavior change. Social support in the intervention group may also have been a contributing factor.” (page 241)</p>	<p>D: peer support can help transfer informational and aid weight maintenance</p>
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