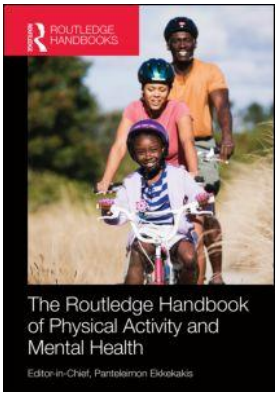


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# 38

# EXERCISE AS AN ADJUNCT TREATMENT FOR SCHIZOPHRENIA

*Guy Faulkner, Paul Gorczynski, and Kelly Arbour-Nicitopoulos*

Schizophrenia is the most disabling and persistent form of severe mental illness. It is generally considered a disease related to brain abnormalities caused by a range of specific genetic and/or environmental factors (Tandon, Keshavan, & Nasrallah, 2008a). Its annual incidence averages 15 per 100,000, and the risk of developing the illness over one's lifetime is approximately 0.7% (Tandon, Keshavan, & Nasrallah, 2008b). The usual presentation in late adolescence/early adulthood places incredible demands on individuals, their families, and society itself. The symptoms of schizophrenia can be divided into positive and negative symptoms because of their impact on diagnosis and treatment, although it is important to highlight that the range and nature of symptoms vary widely between individuals (USDHHS, 1999). Positive symptoms are those that appear to reflect an excess or distortion of normal functions and are manifested in symptoms such as delusions, hallucinations, and thought disorder. Negative symptoms are those that appear to reflect a reduction or loss of normal functions and reflect symptoms such as affective flattening, apathy, social withdrawal, and cognitive impairments.

Unfortunately, schizophrenia is considered as a chronic and relapsing disorder with incomplete remissions (Tandon, Nasrallah, & Keshavan, 2009). Antipsychotic medication is the front-line treatment for schizophrenia. While such medication can be efficacious for controlling the positive symptoms, it is typically less so in alleviating negative symptoms and cognitive deficits (Tandon, Moller, et al., 2008). Notably, some researchers have suggested that motivational deficits are the central link between negative symptoms and functional impairment in schizophrenia (Foussias, Mann, Zakzanis, van Reekum, & Remington, 2009) – an obvious challenge for developing and implementing psychosocial interventions in this population.

Recovery from schizophrenia and reintegration into the community is fundamentally threatened by ignoring the physical health needs of these patients. Excess mortality is at least twice that observed in the general population and this differential mortality gap has worsened in recent decades (Saha, Chant, & McGrath, 2007). Life expectancy is shorter by 15 years, primarily because of coronary artery disease (Hennekens, Hennekens, Hollar, & Casey, 2005; McGrath, Saha, Chant, & Welham, 2008). Individuals with schizophrenia also do not receive the same level of medical services as the general population. For example, despite the development of numerous guidelines, psychiatrists have not translated these recommendations for medical monitoring into clinical practice (Druss, 2007). In sum, schizophrenia is a lifelong, often debilitating illness that strikes individuals in their prime. Successful recovery is considered multi-factorial

and extends beyond symptomatic remission – quality of life for those with schizophrenia also includes physical and mental health (Ramon, Healy, & Renouf, 2007).

## The case for physical activity/exercise

### *Physical benefits*

A greater awareness of the scope and magnitude of obesity in schizophrenia has turned focus to developing strategies in managing this weight gain and assessing the impact of pharmacological and non-pharmacological interventions. While it is difficult to identify the relative contributions of disease-specific factors such as genetics, medication side-effects, or lifestyle factors such as diet, smoking, and inactivity, it is clear that helping individuals with schizophrenia become more physically active must be one component of such interventions for a number of reasons. First, current best practice guidelines in the management of obesity dictate that pharmacological interventions (e.g., sibutramine, orlistat) be used in conjunction with non-pharmacological strategies (Padwai, Li, & Lau, 2004). Second, such non-pharmacological therapy should involve physical activity and dietary counselling within a behavioural modification programme (Faulkner, Cohn, & Remington, 2007). Third, regardless of weight loss, physical inactivity is itself a major cause of morbidity and mortality, and merits the same level of concern as other cardiovascular disease risk factors (e.g., Wei et al., 1999). The majority of individuals with schizophrenia have lower cardiorespiratory fitness and physical functional capacity than population standards (Strassnig, Brar, & Ganguli, 2011).

### *Psychological benefits*

The physical benefits alone from regular physical activity in reducing morbidity and mortality in this population are sufficient justification for the inclusion of exercise in programmes of rehabilitation (Faulkner & Biddle, 1999). However, irrespective of weight and fitness outcomes, reviews have concluded that increased physical activity improves psychological health and social well-being in this population (Faulkner & Biddle, 1999; Faulkner, 2005). The aim of this chapter is to update these earlier systematic reviews of the research base (quasi-experimental and experimental designs) concerning the mental health benefits of physical activity for individuals with schizophrenia, and identify key research gaps that must be addressed in the future.

## Methods

A recent review of the effects of physical activity or exercise on the mental health of individuals with schizophrenia (Faulkner, 2005) included four quasi-experimental studies and two experimental studies. The review identified studies using Social Science Citation Index and Embase via BIDS, PsychLit, Medline, and Sport Discus. Keywords included exercise, physical activity, fitness, and schizophrenia. Three decades of literature, from 1974 to 2004, were searched with only English language studies selected. Using the same search strategy, an update to the review was conducted, searching the literature from 2004 to 2011 using Medline, PsychINFO, and Sport Discus. The search was supplemented by examining the references of the retrieved papers. Only quasi-experimental or experimental studies were included in this update, although we acknowledge the value of qualitative designs in highlighting the role of physical activity in the lives of people with serious mental illness (Faulkner & Sparkes, 1999). Studies were excluded if exercise/physical activity was not the specific intervention examined, if mental health outcomes

were not reported, and/or the sample used did not specifically consist of individuals with a diagnosis of schizophrenia. Overall, seven studies were added to the current review (Acil et al., 2008; Beebe et al., 2005; Behere et al., 2011; Dodd et al., 2011; Duraiswamy et al., 2007; Marzolini et al., 2009; Warren et al., 2010).

The results are presented in two sections and classified by means of Campbell and Stanley's (1963) quasi-experimental and experimental categories. Additionally, a number of other categories are included. "Participants" describes the general nature of participants involved; "Design" expands on the research design that was used; "Treatment" describes the content of the exercise programme offered; "Psychological instruments" refers to the dependent measures assessed at pre and post treatment; and "Outcome" describes the effects of exercise participation for the participants. Statistical significance criteria are presented where available.

## Results

### *Quasi-experimental research*

Six studies (n = 230) in this category were located that used control group comparisons, repeated measures, or cross-over designs. A summary can be found in Table 38.1. The participants were predominantly adult males representing both inpatient and outpatient populations. All had diagnoses of chronic schizophrenia. Standardised psychological instruments used included the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983), the Brief Psychiatric Rating Scale (BPRS; Overall & Gorham, 1962), the Clinical Global Impression severity of illness item (CGI; Guy, 1976), the Nurses' Observation Scale for In-Patient Evaluation (NOSIE; Honigfeld, Gillis, & Klett, 1965), the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971), the Physical Estimation and Attraction Scales (PEAS; Sonstroem, 1978), the Physical Self-Efficacy (PSE; Ryckman, Robbins, Thorton, & Cantrell, 1982) and Perceived Competence Scales (PCS; Harter, 1982), the Positive and Negative Symptom Scale (PANSS; Kay, Fiszbein & Opler, 1987), the Scale for the Assessment of Negative Symptoms (SANS; Derogatis, 1993), the Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1990), the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), the Symptoms Check List-90 (SCL-90; Derogatis, Lipman, Rickels, Uhlenhuth, & Covi, 1974), and the Visual Analogue Scale (VAS; Carlsson, 1983).

Exercise programmes lasted from 3 weeks to 24 weeks and consisted of 40-minute aerobic sessions three times a week, 30 minutes of aerobic exercises and 30 minutes of walking twice a week, 20-minute walking/jogging sessions three times a week, 45 minutes of moderate skills-based physical activity five times a week, or 30 to 50 minutes of light or moderate activity twice a week.

Outcome results indicated that most studies reported some improvement on the inventory measures used (components of BPRS, BSI, NOSIE, POMS, PSE, SCL-90, SANS, SAPS, and STAI) except for the PEAS scale, where no change was reported on perceived self-image scores. In contrast, Bergman and colleagues (1993) found no improvement in psychopathological characteristics among their adolescent sample.

### *Experimental research*

Seven further studies (n = 198) were identified that incorporated randomisation into their research design (Acil et al., 2008; Beebe et al., 2005; Behere et al., 2011; Duraiswamy et al., 2007; Lukoff, Wallace, Liberman, & Burke, 1986; Marzolini et al., 2009; Pelham et al., 1993) (see Table 38.2 for a summary).

*Table 38.1* Quasi-experimental research examining psychological effects of exercise for individuals with schizophrenia

| *Study* | *Participants* | *Design* | *Treatment* | *Psychological instruments* | *Outcome* |
|---|---|---|---|---|---|
| Bergman et al. (1993) | 15 adolescent inpatients (9 m; 6 f; M =19.13 yrs) | Quasi-experimental (cross-over) | 3 weeks, 5 days/wk, 45 mins' low-intensity activity. Alternative educational group activity | BSI, VAS; PSE, PCS | Significant improvements in physical self-efficacy only. |
| Chamove (1986) | 40 outpatients (21 m; 19 f; M = 51 yrs) | Quasi-experimental | Normal variations in participation in one of the following: swimming, gardening, keep fit, occupational therapy. Rated blindly by nurses on days of in/activity for ≥2 days of each | NOSIE | All patients rated better on all NOSIE measures on active days. Greatest benefits for less severely disturbed, sedentary, overweight & female subjects. |
| Dodd et al. (2011) | 8 inpatients (6 m, 2 f; M = 45.8 yrs +/- 10.1) | Single-group, pre-post pilot study; baseline familiarisation phase followed by a 24-week exercise and walking programme. | Small-group aerobic exercise programme for up to 30 min each session, twice/week and a 30-min weekly walking session | PANSS | No significant improvement in PANSS, cardio-respiratory fitness ($\dot{V}O_2$max) or walking endurance (6-min walk test). |
| Gimino & Levin (1984) | 80 inpatients | Quasi-experimental 40 in treatment 40 in wait-list control matched for sex, age, diagnosis | 10 weeks of 40 mins' jogging, 3/week | POMS, SCL-90, STAI, PEAS | Significant decrease on depression ($p<.05$) & tension ($p<.02$) of POMS for exercise group only; no difference in self-image scores. |
| Hatlova & Basny sen (1995) | 70 inpatients (45m; 25 f) | Quasi-experimental 3 groups: 1. warmup/ stretching exercises; 2. more active; sport games for men, aerobics for women; 3. no exercise | Groups 1 and 2, 6 months, 2/wk, 30–50 min | BPRS | Group 1 improved by 12.3% on BPRS, Group 2 by 8.8% with group 3 improving by 1.3%. Greater acceptance of programme by participants in Group 2. |

| | | | | | |
|---|---|---|---|---|---|
| Warren et al. (2010) | 17 outpatients and inpatients (11 m, 6 f; M = 39.9 yrs +/- 10.1) | Single-group, quasi-experimental | 10-week programme of 3 supervised walking/ jogging sessions per week progressing to completing a 5 km course | BPRS, SANS, CGI | No significant changes in any mental health measure. |

*Table 38.2* Experimental research examining psychological effects of exercise for individuals with schizophrenia

| *Study* | *Participants* | *Design* | *Treatment* | *Psychological instruments* | *Outcome* |
|---|---|---|---|---|---|
| Acil et al. (2008) | 30 outpatients (18 m; 12 f; M = 32.4 yrs) | RCT: Treatment (n =15) or control (n = 15) group | 10-week group-based aerobic exercise programme consisting of 40 min/day sessions, 3 days/wk | SANS; SAPS; BSI; WHOQOL-BREF-TR | Significant improvements ($p < .05$) on SANS, SAPS and BSI in exercise group. Significant improvements in physical and mental domains ($p<.05$) of the WHOQOL in the exercise group. |
| Beebe et al. (2005) | 10 outpatients (8 m, 2 f; M = 52 yrs) | RCT: Exercise (n = 4) or waitlist control (n = 6) group | 16-week, group-based treadmill exercise programme 3 days/wk (building to 30 min/session) | PANSS | Non-significant improvements on the PANSS and 6-Min Walking Distance (6MWD) in the exercise group. |
| Behere et al. (2011) | 66 outpatients (47 m, 19 f; M = 31.8 yrs) | RCT: Yoga (n = 27), exercise (n = 17) or waitlist control (n = 22) group | One month of instruction followed by 2 months of home-based practice of yoga or exercises (brisk walking, jogging, and aerobic and stretching exercises) | PANSS, SOFS, TRENDS, TRACS | Significant improvement in positive and negative symptoms, socio-occupational functioning and performance on TRENDS ($p<0.05$) in the yoga group only. |

*Table 38.2* Continued

| *Study* | *Participants* | *Design* | *Treatment* | *Psychological instruments* | *Outcome* |
|---|---|---|---|---|---|
| Duraiswamy et al. (2007) | 41 outpatients (28 m, 13 f; M = 30.4 yrs +/- 7.9) | RCT: Yoga (n = 21) or physical training (i.e., brisk walking, jogging, and stretching) (n = 10) group | Participants in both groups received 3 weeks of instruction and then asked to participate in a 3-month programme (5 days/wk for 1 hr/day) | PANSS, SOFS, SAS, AIMS, WHOQOL-BREF | Yoga group had significantly less psychopathology, and significantly greater social and occupational functioning and quality of life than those in the training group at the end of 4 months. |
| Lukoff et al. (1986) | 28 male inpatients | RCT: Social skills (n =14) or holistic treatment (n =14) intervention (including exercise and education in stress management) | Holistic intervention included 30 min of walking/running each weekday for 9 weeks | Symptom Checklist-90, PAS, NGI, TSC | Significant increase in fitness in holistic group. Significant improvement in both groups on psychopathology measures at the end of the 9-week intervention. No change for either group in self-concept. |
| Marzolini et al. (2009) | 13 outpatients (8 m, 5 f; M = 44.6 yrs +/- 2.6) | RCT: Exercise (n = 7) or standard care (n = 6) group | Supervised exercise group met for 90 mins 2/wk for 12 weeks. Each session included 20 minutes of resistance training and 60 minutes of walking and flexibility exercises | MHI | Significant improvement in total MHI score ($p < 0.03$) for the exercise group only. Non-significant increase on the 6- minute walk test among the exercise group only. |
| Pelham et al. (1993) | 10 outpatients (18–45 yrs) | RCT: Aerobic (n = 5) or non-aerobic (n = 5) condition | Aerobic: 30 minutes of bike ergometry, 65–75% HR reserve, 4 times/wk for 8 weeks. Non-aerobic: muscle tone/strengthening exercises, 30 min, 4 times/wk for 8 weeks | Predicted $\dot{V}O_2$ max, BDI | Significant increase in $\dot{V}O_2$max and reduction in BDI (ps<.05) from baseline to the end of week 12 for the aerobic condition only. |

As with the quasi-experimental studies, participants were predominantly adult males and recruited from outpatient settings. Common psychological instruments used included the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983), the Positive and Negative Symptom Scale (PANSS; Kay et al., 1987), the Scale for the Assessment of Negative Symptoms (SANS; Derogatis, 1993), the Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1990), the World Health Organization Quality of Life Scale – Turkish Version (WHOQOL-BREF-TR; Fidaner, Elbi, & Fidaner, 1999), and the Mental Health Inventory (MHI; Veit & Ware, 1983).

Exercise programmes lasted from 8 weeks to 16 weeks with a frequency ranging from 2 to 5 sessions per week and session duration of 30 minutes to 1 hour. After a 16-week group-based treadmill walking programme, PANSS scores decreased in the experimental group, but changes were not significant (Beebe et al., 2005). The 10-week study by Acil, Dogan, and Dogan (2008) demonstrated significant reductions in negative and positive symptoms as measured by the SANS, SAPS, and BSI. Additionally, self-reported ratings of physical and mental health quality of life improved significantly, but social and environmental ratings did not change.

After 2 months of home-based yoga and aerobic and stretching exercises, Behere et al. (2011) found ratings of PANSS and SOFS (Saraswat, Rao, Subbakrishna, & Gangadhar, 2006) decreased in both the yoga and aerobic and stretching exercise groups from baseline, but only in the yoga group were changes significant. Additionally, TRENDS (Behere et al., 2008) scores increased in both groups, but again, only in the yoga group were changes significant. This study was based on the work of Duraiswamy et al. (2007), which found similar positive effects of yoga after 3 months. In their study, PANSS scores and SOFS scores decreased significantly in the yoga and physical training groups, with greater decreases found in the yoga group. Results from the other psychological instruments varied, with two measures, the Simpson Angus Scale (Simpson & Angus, 1970) and the AIMS, indicating a decrease in symptom scores for both groups, with no significant difference between the two groups. Findings for the WHOQOL-BREF (Skevington, Lotfy, & O'Connell, 2004) were more favourable for the yoga group than the exercise group, with increases in the yoga group being significantly different than baseline measures.

In Pelham and colleagues' (1993) study, a time-series analysis showed that five chronic outpatients randomly assigned to a 12-week aerobic exercise group had significant reductions in depression scores (BDI), along with increases in aerobic fitness. Conversely, five clients assigned to a 12-week non-aerobic training group did not improve in aerobic fitness or BDI scores. No explanation was offered for the difference in BDI scores across the two conditions.

In Marzolini et al.'s (2009) study, the MHI showed improvements in ratings for depression, positive affect, behaviour, and anxiety for the combined aerobic and strength-training group, but changes were not significantly different from the control group. Similarly, there were fitness improvements for the exercise participants but no significant differences were found between the treatment and control conditions.

Lukoff and colleagues (1986) found that both a social skills group and an aerobic exercise group (which included education) showed similar but substantial and significant reductions in overall psychopathology over the course of their 9-week programme. There were no dropouts in the exercise group and an increase in fitness, as measured by the Cooper 12-minute aerobic fitness test, was reported. However, there was a high rate of relapse (79%) in the exercise group during the 2-year follow-up. The authors suggest that participants had difficulty transferring the skills obtained during the highly structured inpatient programme to the community. Given the multiple components within this intervention, it would be impossible to attribute any outcomes specifically to exercise.

## Discussion

Reaching firm conclusions regarding the role of exercise in improving the mental health of individuals with schizophrenia is difficult given the wide range of outcome measures used, the heterogeneous nature of exercise interventions and samples, and generally small sample sizes. At the very least, the existing research clearly demonstrates that physical activity interventions are possible with this population group. Adherence to supervised exercise programmes among individuals with schizophrenia appears comparable to that of the general population when it is reported. Furthermore, existing evidence also suggests that physical activity participation is associated with modest improvements in some measures of mental health – typically those associated with the negative symptoms of schizophrenia. Such findings are more consistent with studies reporting stronger research designs (i.e., RCTs). These improvements appear largely independent of changes in physical measures, including fitness or body weight.

No research has directly investigated the potential mechanisms underpinning the positive benefits reported. Qualitative case studies tend to infer that any benefit is largely related to hypothesised psycho-social mechanisms such as increased social interaction, physical self-esteem, and competence (Faulkner & Sparkes, 1999). Further research will be needed comparing different types of activity in order to identify which programme works best for this population and in what way. In the absence of a single generic mechanism, a range of exercise modes and intensities should be recommended based on the participants' previous exercise experiences, preferences, and goals. Current guidelines for lifestyle activity and exercise appear just as acceptable to individuals with schizophrenia in terms of potential mental health benefit. That is, accumulating at least 150 minutes of moderate- to heavy-intensity physical activity during the week should apply equally to this population, although modest short-term goals will be most appropriate for sedentary individuals. Richardson and colleagues (2005) have described examples of structured, supervised, facility-based exercise programmes as well as lifestyle physical activity interventions that encourage participants to incorporate walking into their everyday life, and discuss a range of practical issues related to physical activity promotion with this population.

## Implications for researchers

There is a range of limitations in the existing research that need to be tackled. Some of these limitations can be addressed by better reporting of study design and outcomes. The exact nature of the exercise programme must be clearly defined with the duration, frequency, and intensity of exercise reported. Adherence must also be clearly reported. Changes in fitness levels should also be documented, as well as the incorporation of follow-up measures in research designs. The participants should be clearly described in terms of their age, sex, diagnosis, duration of illness, and medication regimen. Outcome measures should include measures relevant to schizophrenia-related symptomatology, particularly the negative symptoms, and consider broader clinical outcomes such as use of health services, medication compliance, and rate of relapse (Faulkner, 2005).

Other limitations are related to the samples typically used and the nature of the exercise intervention. These do present some interesting opportunities. In terms of sample, efforts should be made to increase the representation of women in research studies. It may be that exercise programmes need to be specifically tailored to be more attractive and enjoyable for women. Increasing female participation is critical as the prevalence of metabolic syndrome is even higher in women than in men (McEvoy et al., 2005). Comparison of lifestyle and structured interventions to increase physical activity should also be conducted, as we do not know whether less structured interventions can work with this population. Their flexibility, lower cost, and easy integration into daily schedules might be particularly appealing to individuals with schizophrenia.

The most notable absence in reviewing these studies is any explicit theoretical framework being used to guide the intervention in helping participants initiate and maintain physical activity. That is, it is not known how best to get this population engaged in exercise programmes in order to derive mental health benefits. Although adherence is not always reported, this lack of theory may contribute to the relatively modest changes in mental health and certainly the generally insignificant changes in physical fitness reported. Accordingly, future studies should describe how their intervention is theoretically informed and measure changes in the theoretically proposed mediators of behaviour change. Recent work has started to address this gap. Although mental health outcomes are not reported, Beebe and colleagues (2010a, b) describe the development of an intervention informed by self-efficacy theory. Modest increases in walking and exercise self-efficacy were reported in the intervention group. We have also completed a pilot study of a behavioural intervention for women with schizophrenia (see case study; Arbour-Nicitopoulos et al., 2010).

## A 6-week weight management programme for women with schizophrenia: the need for women-centred, theory-based interventions

An example of a theory-based programme implemented among women with schizophrenia is the HEalthy Lifestyle Promotion Program (HELPP). This programme is a 6-week group-based weight management educational programme that was designed by an interdisciplinary team of health care professionals in the areas of psychiatry, exercise psychology, recreation therapy, and nutrition. A total of 23 women (5 inpatients, 18 outpatients; $M_{age}$ = 41.7 yrs; $M_{BMI}$ = 38.8 kg/m2) diagnosed with schizophrenia or schizoaffective disorder successfully completed the programme, and 10 participants returned for a 6-week follow-up session. Below is a description of the theoretical framework used to develop HELPP, as well as the implementation and evaluation of the programme.

### *Theoretical framework*

The underlining theoretical framework was Social Cognitive Theory (SCT; Bandura, 1977, 1997). The primary objective of the programme was to increase self-managed behaviour. The programme targeted the four sources of self-efficacy: mastery experience (i.e., engaging in group-based physical activity), vicarious experiences (e.g., discussing how to be physically active at home), verbal persuasion (e.g., positive reinforcement of healthy behaviours from interventionists), and physiological feedback (e.g., educating participants on normal heart rate response during physical activity). Participants were taught how to use self-regulatory skills (e.g., self-monitoring, planning) to facilitate self-managed physical activity and healthy eating. As per group dynamics theory (Cartwright, 1972), the group functioned as an agent of change to facilitate participants' learning and practising of these self-regulatory skills.

### *Programme implementation*

HELPP was offered twice per week for 90 minutes per session, and was facilitated by a recreation therapist and registered dietician. The focus of the programme was on individuals developing the self-regulatory skills necessary for participating in physical activity and maintaining healthy eating

habits (e.g., self-monitoring, relapse prevention). Each session consisted of two components: 60-minute education and skill-development and 30-minute lifestyle physical activity participation.

## *Programme evaluation*

### Pre- to post-programme changes

Primary outcomes: Overall, 19 of the 23 women (83%) completed the programme, and 10 (44%) returned for a follow-up booster session. Mean attendance was 64% (see Figure 38.1a). Improvements in daily servings of fruits and vegetables and fat, and weekly minutes of moderate physical activity were also found (Figure 38.1b).

Secondary outcomes: Improvements were also shown for body image and self-efficacy (*p*s < .05), as well as the quality of life domains pertaining to perceived general health ($p < .05$), and social and physical functioning (*p*s < .10). No changes in BMI or waist circumference were found.

### 6-week follow-up

Ten women completed a 6-week follow-up session. Among these women, we found:

- Post-programme improvements in physical activity, self-efficacy, body image, and quality of life were maintained at follow-up
- A significant decrease in physical functioning from post- to 6-week follow-up
- No change in BMI and waist circumference from post- to 6-week follow-up.

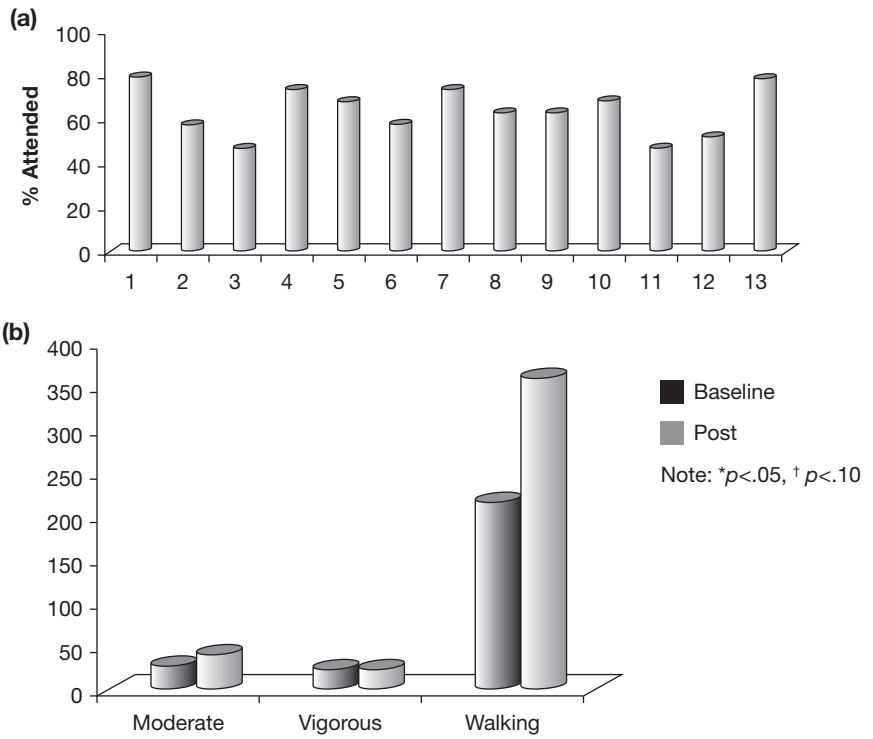


*Figure 38.1* Session attendance and weekly minutes of physical activity

### *Lessons learned*

Overall, HELPP was a feasible programme that was associated with short-term changes in physical and psychological health. While this was a pilot programme, the results suggest certain constructs (i.e., self-efficacy, body image, and quality of life) to target in future theory-informed intervention work within the schizophrenia population. This work also speaks to the potential of using a group-based format as an agent of change within the schizophrenia population, and the need for inter-disciplinary collaboration to deal with the increasing complexity of care in this population.

Research quality has improved if the increasing number of RCTs (n = 6) is taken as an overall indicator of quality. It is encouraging to see that since the first systematic review (Faulkner & Biddle, 1999), the number of RCTs has increased from one to seven. Clearly, exercise research with populations characterised by serious mental illness such as schizophrenia is relatively scarce in comparison to clinical depression. When conducted, sample sizes are small. This may not be helped. The overall burden of schizophrenia far outweighs the low prevalence of this condition. Researchers may be able to draw from only a relatively small pool of potential participants. Recruiting patients with schizophrenia can be time-consuming as many may be unable or unwilling to comply with study and intervention requirements. Multi-site trials will probably be required to run adequately powered randomised controlled trials examining the efficacy of exercise.

Speculatively, the small number of studies may be related to difficulties in accessing funding or institutional commitment to support such work. First, relative to the motivational and cognitive deficits characteristic of schizophrenia, health behaviour change among this population might be considered as too difficult. Describing this as therapeutic nihilism, Le Fevre (2001) suggests that this is a result of physical health in schizophrenia being largely ignored by the medical profession. Increasing obesity and diabetes prevalence among individuals with schizophrenia, particularly associated with atypical antipsychotic medication, is now recognised as a clinical concern (Allison et al., 2009). A focus on physical activity may be getting lost within broader intervention considerations targeting weight management either through medication switching, pharmacological adjuncts, or behavioural interventions that tend to largely target diet (Faulkner et al., 2007).

This might be changed by the investigation of therapeutic mechanisms that link the outcomes of physical activity with symptom reduction in schizophrenia. A novel and exciting line of research provides an example of such an approach. There are a range of neurobiological alterations in the domains of brain structure, physiology, and neurochemistry among individuals with schizophrenia (see Keshavan, Tandon, Boutros, & Nasrallah, 2008). The chronic and relapsing nature of schizophrenia might be explained by these deficits. For example, the hippocampus has been considered central to the neuropathology and pathophysiology of schizophrenia (Harrison, 2004). Meta-analysis findings demonstrate that whole-brain and hippocampal volume are reduced and that ventricular volume is increased relative to healthy controls (Steen, Mull, McClure, Hamer, & Lieberman, 2006). These deficits likely contribute to the neuropsychological impairments of schizophrenia rather than the positive symptoms (Harrison, 2004).

Given that adult neurogenesis in the hippocampus can be stimulated through exercise, Pajonk and colleagues (2010) investigated the effects of exercise on hipppocampal volume and vascular-isation in chronic schizophrenia patients. Patients and healthy controls were randomised to either

aerobic exercise (cycling ergometry) three times per week (30-minute sessions) for 12 weeks or a comparison condition where participants played table football matched for a similar frequency and duration. Following training, relative hippocampal volume increased significantly in both patients and healthy controls, with no change in the non-exercise patients. Patients in the exercise group had a 34% increase in a short-term memory measure while control subjects had a 17% lower score. Overall, this study suggests that hippocampal volume in individuals with schizophrenia is plastic in response to exercise. Future research replicating this finding, and linking exercise-associated improvements in hippocampal volume with meaningful clinical changes, is clearly warranted. This line of research may further legitimise exercise as an important component of treatment planning for individuals with schizophrenia.

## Conclusion

Good physical health is a realistic goal for people with mental illness (Le Fevre, 2001). It is a challenging population to work with, yet this review demonstrates that physical activity intervention is possible and qualitative research consistently suggests that patients want support in leading healthier lives (e.g., Soundy, Faulkner, & Taylor, 2007). Theoretically driven research is required to examine how to reliably assist individuals with schizophrenia adopt and maintain physical activity in the face of significant motivational and cognitive deficits that are inherent to schizophrenia. Such work will be needed if the potential mental health benefits of exercise are to be maximised for this population.

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