Exercise as an adjunct treatment for schizophrenia: a review of the literature
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Authors' objectives
To examine the literature investigating the use of exercise as a therapeutic adjunct treatment for schizophrenia.

Searching
The Social Sciences Citation Index and EMBASE via BIDS, PsycLIT, MEDLINE and SPORTDiscus were searched for studies published in the English language from 1978 to 1998.

Study selection
Study designs of evaluations included in the review
There were no exclusion criteria to the type of study reviewed. Study designs included in the review were pre-experimental (one group pre-test post-test design), quasi-experimental (non-randomised) and experimental (randomised); these were categorised according to Campbell and Stanley (see Other Publications of Related Interest).

Specific interventions included in the review
Exercise or physical activity as a therapeutic intervention. Specific interventions were exercise programmes that included cycle ergometer, walking, jogging, swimming, weight training, muscle strengthening, 'movement', active 'games', aerobics, gardening, 'keep-fit' and occupational therapy. Studies investigated one or more type of intervention with various session times, session frequency and overall duration of treatment. Controls, where used, were no activity or non-aerobic activity.

Participants included in the review
Adults with schizophrenia. All patients had diagnoses of chronic schizophrenia and included male and female out-patients, in-patients, and sheltered accommodation patients.

Outcomes assessed in the review
The authors did not specify any inclusion or exclusion criteria relating to outcomes. Standard psychological instruments used included the Beck Depression Inventory (BDI), the Mental Health Inventory (MHI), Brief Psychotic Rating Scale (BPRS), the Nurses' Observation Scale for In-Patient Evaluation (NOSIE), the Profile of Mood States (POMS), the State-Trait Anxiety Inventory (STAI), the Physical Estimation and Attraction Scales (PEAS) and the Symptoms Check List-90 (SCL-90). Qualitative measures ranged from more in depth ethnography, including participant observation, to standard interviewing techniques. Submaximal predicted oxygen uptake tests were also included.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
Studies were classified as pre-experimental, quasi-experimental and experimental according to Campbell and Stanley (see Other Publications of Related Interest). The authors do not state how the papers were assessed for validity, or how many of the reviewers performed the validity assessment.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction. The categories of data extracted from each study included author, year, participants, design, treatment, psychological instruments and outcome.
Methods of synthesis
How were the studies combined?
A narrative synthesis was undertaken and results were presented according to study design. Publication bias was not assessed.

How were differences between studies investigated?
Heterogeneity was not formally assessed, but results were presented by study design.

Results of the review
Twelve studies including 259 chronic schizophrenic patients were included: 8 were of a pre-experimental design (59 patients), 3 were quasi-experimental (190 patients) and 1 was experimental (10 patients).

Pre-experimental research: all studies reported some improvement on psychometric outcome variables, i.e. body image, mental health, depression, components of NOSIE and BPRS. Where measured, increased aerobic fitness was reported. One study also showed a significant negative correlation between predicted aerobic fitness and level of depression. The qualitative studies reported antidepressant, anxiety-reduction, mood-elevating effects, increased self-esteem and improved concentration. One study reported two individuals who found exercise useful in reducing auditory hallucinations. Improved behaviour and sleep patterns were also observed for these individuals. Overall, there were two individuals who did not benefit from exercise treatment.

Quasi-experimental research: all studies reported some improvement on the inventory measures used (components of NOSIE, POMS, SCLS-90, STAI and the BPRS) except for the PEAS scale, where no change was reported on perceived self-image scores.

Experimental research: in the only experimental study, a time-series analysis showed significant reductions in depression scores (BDI), along with increases in aerobic fitness in those individuals assigned to aerobic exercise (n=5). Conversely, clients assigned to a non-aerobic programme (n=5) did not improve in aerobic fitness or BDI scores.

Authors' conclusions
The existing research does not allow any firm conclusions to be made as to the psychological benefits of exercise in individuals with schizophrenia. It does, however, support the potential efficacy of exercise in alleviating the negative symptoms of schizophrenia and as a coping strategy for the positive symptoms. While methodological concerns are evident in the literature, there are difficulties in assessing traditional exercise interventions in schizophrenic individuals and there is a need for greater acceptance of methodological diversity.

CRD commentary
The review question is well stated and supported by the inclusion criteria, although the inclusion criteria for outcomes assessed and study design were not specified. The literature search did not specify any search terms and was not supplemented by examining references from retrieved papers, handsearching or contacting researchers. There was also no attempt to identify unpublished research and only English language papers were included. The studies were classified by study design, but a formal validity assessment of primary studies was absent. The data were appropriately summarised in a narrative synthesis. The authors' conclusions follow on from their findings. These conclusions are appropriately cautious, given the poor quality of the studies and extremely small sample sizes.

Implications of the review for practice and research
Practice: The authors state that attention must be given to the systemic barriers that stifle the delivery of exercise programming within institutional settings and the development of exercise opportunities in the community for this population.

Research: The authors state that further research of both a quantitative and qualitative nature is needed to examine the
efficacy of exercise as therapy, particularly in comparison with other treatments. Future research will need to take into account the methodological considerations advanced in this paper.

**Bibliographic details**

**Other publications of related interest**

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Subject indexing assigned by CRD

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**Record Status**
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.