Exercise to Improve Self-Esteem in Children and Young People

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<td>Institution</td>
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| DOI | 10.4073/csr.2005.4 |
| No. of pages | 49 |
| Last updated | 26 October, 2005 |
| Citation | Ekeland E, Heian F, Hagen KB, Abbott J, Nordheim L. Exercise to improve self-esteem in children and young people.  
Campbell Systematic Reviews 2005.4  
DOI: 10.4073/csr.2005.4 |
| Co-registration | This review is co-registered within both the Cochrane and Campbell Collaborations. A version of this review can also be found in the Cochrane Library. |
| Keywords | |
| Contributions | Eilin Ekeland (EE) and Frode Heian (FH) have written the protocol and extracted the data, assessed study quality and drafted the final review. EE has screened the searches and reference-lists. Kåre Birger Hagen has been the supervisor and has given advice if EE and FH could not reach agreement. Jo Abbott and Lena Nordheim have been responsible for the search strategy and carried out the search for trials. |
| Support/Funding | Norwegian Directorate for Health and Social Affairs, Norway  
The Norwegian Fund for Post-Graduate Training in Physiotherapy, Norway |
| Potential Conflicts of Interest | None known. |
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Cover sheet

Title
Exercise to improve self-esteem in children and young people

Reviewers
Ekeland E, Heian F, Hagen KB, Abbott J, Nordheim L

Dates
Date edited: 10/09/2004
Date of last substantive update: 04/09/2003
Date of last minor update: 18/02/2004
Date next stage expected: 15/02/2003
Protocol first published: Issue 2, 2002
Review first published: Issue 1, 2004

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Norwegian Directorate for Health and Social Affairs, NORWAY

External sources of support
The Norwegian Fund for Post-Graduate Training in Physiotherapy, NORWAY

Contribution of reviewers
EE and FH have written the protocol and extracted the data, assessed study quality and drafted the final review. EE has screened the searches and reference-lists. KBH has been the supervisor and has given advice if EE and FH could not reach agreement. JA and LN have been responsible for the search strategy and carried out the search for trials.

Acknowledgements
Great thanks to Jane Dennis, our co-ordinator in the Cochrane Developmental, Psychosocial and Learning Disabilities Group, for all her help and support. Thanks to the authors of the studies trying to provide us with additional information from their studies; Tiffany Field, Dennis W Hrycaiko, Alan Elstein, Bruce Tuckman, Herbert W Marsh, Wayne W Munson, Chuck Dziuban, Wendy Platzer, Oluwole Salukon, Theresa Smith.

Potential conflict of interest
None known.
Exercise to improve self-esteem in children and young people

What's new
This review has undergone minor amendments including references to personal communications with triallists (February 2004).

Dates
Protocol first published: Issue 2, 2002
Review first published: Issue 1, 2004
Date of last substantive update: 04/09/2003
Date of last minor update: 18/02/2004
Date review re-formatted: / /
Date new studies sought but none found: / /
Date new studies found but not yet included/excluded: / /
Date new studies found and included or excluded: / /
Date reviewers’ conclusions section amended: / /
Date comment/criticism added: / /
Date response to comment/criticism added: / /
Synopsis

Some evidence that exercise has positive short-term effects on self-esteem in children and young people

Improving self-esteem may help to prevent the development of psychological and behavioural problems which are common in children and adolescents. Strong evidence exists for the benefits of exercise on physical health, but evidence for the effects of exercise on mental health is scarce. This review of trials suggests that exercise has positive short-term effects on self-esteem in children and young people, and concludes that exercise may be an important measure in improving children’s self-esteem. However, the reviewers note that the trials included in the review were small-scale, and recognise the need for further well-designed research in this area.
Abstract

Background

Psychological and behavioural problems in children and adolescents are common, and improving self-esteem may help to prevent the development of such problems. There is strong evidence for the positive physical health outcomes of exercise, but the evidence of exercise on mental health is scarce.

Objectives

To determine if exercise alone or exercise as part of a comprehensive intervention can improve self-esteem among children and young people.

Search strategy

Computerised searches in MEDLINE, EMBASE, The Cochrane Controlled Trials Register (CENTRAL), CINAHL, PsycINFO and ERIC were undertaken and reference lists from relevant articles were scanned. Relevant studies were also traced by contacting authors. Dates of most recent searches: May 2003 in (CENTRAL), all others: January 2002.

Selection criteria

Randomised controlled trials where the study population consisted of children and young people aged from 3 to 20 years, in which one intervention arm was gross motor activity for more than four weeks and the outcome measure was self-esteem.

Data collection & analysis

Two reviewers independently selected trials for inclusion, assessed the validity of included trials and extracted data. Investigators were contacted to collect missing data or for clarification when necessary.

Main results

Twenty-three trials with a total of 1821 children and young people were included. Generally, the trials were small, and only one was assessed to have a low risk of bias. Thirteen trials compared exercise alone with no intervention. Eight were included in the meta-analysis, and overall the results were heterogeneous. One study with a low risk of bias showed a standardised mean difference (SMD) of 1.33 (95% CI 0.43 to 2.23), while the SMD's for the three studies with a moderate risk of bias and the four studies with a high risk of bias was 0.21 (95% CI -0.17 to 0.59) and 0.57 (95% CI 0.11 to 1.04), respectively. Twelve trials compared exercise as part of a comprehensive programme with no intervention. Only four provided data sufficient to calculate overall effects, and the results indicate a moderate short-term difference in self-esteem in favour of the intervention [SMD 0.51 (95% CI 0.15 to 0.88)].

Reviewers' conclusions
The results indicate that exercise has positive short-term effects on self-esteem in children and young people. Since there are no known negative effects of exercise and many positive effects on physical health, exercise may be an important measure in improving children's self-esteem. These conclusions are based on several small low-quality trials.
Exercise to improve self-esteem in children and young people

Background

Epidemiological studies using well-validated instruments have shown prevalence rates of psychological and behavioural problems in children and adolescents at levels between 10 and 20% (Sonuga-Barke 1997). These instruments have cut-off points set at levels that identify problems affecting the child's and/or the family's daily function. The data suggest that up to one-third of these children (i.e. 4-7% of the total child population) are considered to be in need of psychological treatment (Prior 1992).

The question of how to prevent psychological problems in children and young people has been of major interest for several years (Caplan 1964). Efforts have mainly been directed towards managing aspects of risk, but resilience research (Garmezy 1985; Rutter 1985; Haggerty 1996) has led to an increasing awareness of positive factors in the environment, social relations and individuals that protect against the development of problems. The negative effects of risk factors seem to be reduced or neutralised through confidence in one's own sense of personal value and through better mechanisms for coping with psychological stress. Among individual qualities, self-concept is one of the indicators given most attention.

Self-concept is our perception of self, and considerable research has identified several areas of importance: academic, social, emotional and physical self-concept (Harter 1983; Harter 1985; Sonstroem 1988). Self-esteem is the value we place on our self. The two terms self-concept and self-esteem are often used synonymously, although self-esteem is actually measured in the trials. Therefore self-esteem is the term used in this review.

There is strong evidence for positive physical health outcomes of living a physically active life (Blair 1992; Pate 1995; Erikssen 1998). Since the 1970s, there has also been an increasing body of research on psychological health outcomes of physical activity, and the results indicate positive effects for adults (Bouchard 1990; Fox 1992). Studies and reviews indicate a similar positive effect of physical activity on depression, anxiety, and behavioural problems like hyperactivity and conduct problems in children and adolescents (Fox 1992; Biddle 1993; Calfas 1994; Mutrie 1998).

The effect of physical activity on self-esteem in children has also been investigated, and one meta-analysis concluded that directed play or/and physical education programmes contributed to the development of self-esteem in elementary school-age children (Gruber 1986). This and other reviews (Calfas 1994; Mutrie 1998) have not been updated since initial publication. Other narrative reviews in which the effects of exercise on self-esteem were examined have included children as part of a wider investigation of links between exercise and self-esteem (Spence 1997; Fox 2000). Given the existence of new evidence, and in the light of a possible reduction in children's physical activity/physical performance over recent years (Ekeland 1999), there is a need for an updated review of the effectiveness of exercise-based interventions in promoting self-esteem and related concepts.

Objectives

To determine if exercise interventions can improve self-esteem among children and young people.

Criteria for considering studies for this review
Types of studies
All relevant randomised controlled trials and "quasi-randomised" trials, e.g. those that use alternate allocation, date of birth, etc.

Types of participants
Children aged from 3 years to young people up to 20 years of age.
Trials which also included children and young people with psychotic or borderline conditions, autism, physical handicap, eating disorders and chronic somatic/physical diseases were not included.

Types of interventions
The interventions included gross motor, energetic activity, for example, running, swimming, ball games and out-door play of moderate to high intensity, or strength training, in contrast to "ordinary" physical activity (for example, routine physical education (PE) classes, walking to school or play-time activities of low intensity). The minimum duration of the intervention had to be 4 weeks. The control group may be children receiving no intervention or children on a waiting list. "No intervention" arms could include children engaged in ordinary physical activity (which may be statutorily required, e.g. routine PE classes) but who are not otherwise engaged in organised gross motor, energetic activity.

Types of outcome measures
All measurements of children's self-esteem.

Search strategy for identification of studies
This review was prepared at the same time as two associated Cochrane reviews with the preliminary titles: "Exercise-based interventions in treatment of aggression and behaviour problems in children and young people" and "Exercise-based interventions in treatment of depression and anxiety in children and young people". Searching was conducted simultaneously for all three reviews.

Searching was done using the Cochrane Controlled Trials Register (CENTRAL) (Issue 2, 2003), MEDLINE (1966-2002), EMBASE (1982-2002), CINAHL (1982-2002), PsycINFO (1887-2002) and ERIC (1965-2002). The authors of included studies were contacted, and manual searches were carried out in the Journal of the American Academy of Child and Adolescent Psychiatry (1998-2002) to identify randomised controlled trials.

The search strategy below was used to search the Cochrane Controlled Trials Register and modified as necessary to search the other databases mentioned:
CHILD*:ME
CHILD*
TEEN*
(YOUNG next PERSON*)
(YOUNG next PEOPLE*)
(((YOUTH* or ADOLESCEN*) or BOY*) or GIRL*)
STUDENT*
((((#1 or #2) or #3) or #4) or #5) or #6) or #7
MENTAL-DISORDERS*:ME
ATTENTION-DEFICIT-AND-DISRUPTIVE-BEHAVIOR-DI*:ME
AFFECTIVE-SYMPOTMS*:ME
AGGRESSION*:ME
DEPRESSION*:ME
SELF-INJURIOUS-BEHAVIOR*:ME
STRESS-PSYCHOLOGICAL*:ME
EMOTIONS*:ME
MENTAL-COMPETENCY*:ME
ADAPTATION-PSYCHOLOGICAL*:ME
PERSONALITY-DEVELOPMENT*:ME
BODY-IMAGE*:ME
MENTAL-HEALTH*:ME
((((((((((#9 or #10) or #11) or #12) or #13) or #14) or #15) or #16) or #17) or #18) or #19) or #20) or #21)
(MENTAL* next DISORDER*)
(ADJUSTMENT* next DISORDER*)
(ANXIETY next DISORDER*)
(PHOBIC near DISORDER*)
PHOBI*
(STRESS next DISORDER*)
ADHD
(ATTENTION next DEFICIT)
(DISRUPTIVE near (BEHAVIOR or BEHAVIOUR))
HYPERACTIV*
(CONDUCT near DISORDER*)
((BEHAVIOR or BEHAVIOUR) next DISORDER*)
(TIC near DISORDER*)
(TOURETTE* near SYNDROME)
(MOOD* near DISORDER*)
(AFFECTIVE next SYMPTOM*)
AGGRESS*
DEPRESS*
(((((((((((#23 or #24) or #25) or #26) or #27) or #29) or #30) or #31) or #32) or #33) or #34) or #35) or #36) or #37) or #38) or #39) or #40)
(DYSTHYMIC next DISORDER*)
((SEASONAL next AFFECTIVE) next DISORDER*)
(NEUROTIC near DISORDER*)
(SELF-INJURIOUS next BEHAVIOR*)
(SELF-INJURIOUS next BEHAVIOUR*)
(SELF and INJUR*)
(PSYCHOLOGICAL near STRESS*)
ANXIEET*
FEAR*
FRUSTRAT*
HAPPINESS*
HAPPY
LONEL*
(MENTAL* next COMPETEN*)
(PSYCHOLOGICAL near ADAPTATION*)
(PERSONALITY near DEVELOP*)
SELF-CONCEPT*
(SELF next CONCEPT*)
SELF-IMAGE*
(SELF next IMAGE*)
SELF-ESTEEM
(SELF next ESTEEM)
SELF-HARM*
(SELF next HARM*)
SELF-MUTILAT*
(SELF next MUTILAT*)
(BODY next IMAGE*)
((((((((((((((#42 or #43) or #44) or #45) or #46) or #47) or #48) or #49) or #50) or #51) or #52) or #53) or #54) or #55) or #56) or #57) or #58) or #59) or #60) or #61) or #62) or #63) or #64) or #65) or #66) or #67) or #68)
(MENTAL next HEALTH*)
(WELL next BEING)
(WELL-BEING or WELLBEING)
(#70 or #71) or #72)
(#22 or #41) or #69) or #73)
EXERCISE*:ME
EXERCISE-THERAPY*:ME
PHYSICAL-EDUCATION-AND-TRAINING*:ME
SPORTS*:ME
PLAY-AND-PLAYTHINGS*:ME
PLAY-THERAPY*:ME
DANCING*:ME
DANCE-THERAPY*:ME
EXERCIS*
(EXERCIS* near THERAP*)
(PHYSICAL near (EDUCAT* or TRAIN*))
SPORT*
PLAY*
DANC*
(((((((((#75 or #76) or #77) or #78) or #80) or #81) or #82) or #83) or #84) or #85) or #86) or #87) or #88)
(#8 and #74) and #89)

Methods of the review
1. SELECTION OF TRIALS
Titles and abstracts from the searches were screened by one reviewer (EE) who excluded the studies clearly not relevant to the topic, such as studies of adults, not randomised controlled trials, and not exercise interventions. The rest were retrieved by EE, and judged independently by EE and FH against the inclusion criteria. If there was uncertainty or disagreement, a third reviewer (KBH) was consulted.

2. QUALITY ASSESSMENT
Two reviewers (EE and FH) independently assigned each selected study to quality categories described in the Cochrane Collaboration Handbook (Clarke 2001). Uncertainty or disagreement was resolved by discussion with KBH. When further information was needed, the authors of studies were contacted for clarification. Blinding of providers and patients is unlikely to be applicable and was not used as a criterion to assess the internal validity of included trials.
following five criteria were used:

a) Concealment of allocation  
ADEQUATE: (A) indicates adequate concealment of the allocation (for example, by telephone randomisation, or use of consecutively numbered, sealed, opaque envelopes);  
UNCLEAR: (B) indicates uncertainty about whether the allocation was adequately concealed (for example, where the method of concealment is not known);  
INADEQUATE: (C) indicates that the allocation was definitely not adequately concealed (for example, open random number lists or quasi-randomisation such as alternate days, odd/even date of birth, or hospital number).

b) Outcome assessment  
MET: assessor unaware of the assigned treatment when collecting outcome measures  
UNCLEAR: blinding of assessor not reported and cannot be verified by contacting investigators  
NOT MET: assessor aware of the assigned treatment when collecting outcome measures.

c) Co-intervention  
MET: interventions other than exercise avoided, controlled or used similarly across comparison groups.  
UNCLEAR: use of interventions other than exercise not reported and cannot be verified by contacting the investigators  
NOT MET: dissimilar use of interventions other than exercise across comparison groups, i.e. differences in the care provided to the participants in the comparison groups other than the intervention under investigation.

d) Losses to follow-up  
MET: losses to follow up less than 20% and equally distributed between comparison groups  
UNCLEAR: losses to follow up not reported  
NOT MET: losses to follow up greater than 20%.

e) Intention-to-treat  
MET: intention to treat analysis performed or possible with data provided  
UNCLEAR: intention to treat not reported, and cannot be verified by contacting the investigators  
NOT MET: intention to treat analyses not done and not possible for reviewers to calculate independently.

Studies were grouped as those with a low risk of bias (all criteria MET), those with a moderate risk of bias (3-4 criteria MET), and those with a high risk of bias (less than 3 criteria MET). Other methodological issues are documented in "Table of Included Studies."

3. DATA MANAGEMENT  
Data were extracted independently by each reviewer, and compared using data extraction sheets and the "double entry" feature in RevMan 4.2.1. Data concerning population, age, baseline characteristics, characteristics of activity/activities and duration, compliance, and outcome measures were extracted for both all groups within each trial. Where it was not possible to extract data because they were not available or further information was needed, the first author of the paper was contacted for clarification. Authors of seven trials provided us with further information on design, methodological quality or results: Field 2002; Tuckman 2002; Marsh 2002; Munson 2002; Platzer 2002; Salokun 2002; Smith 2002. The data thus received are presented in the "Table of Included Studies."
4. ASSESSMENT OF HETEROGENEITY
Heterogeneity was assessed using the Chi-squared test of heterogeneity along with visual inspection of the graph.

5. DATA SYNTHESIS
Overall effects from the studies for which data were available were calculated. For studies not providing sufficient data to calculate overall effects, a qualitative summary is provided. Since self-esteem is a continuous outcome, and was measured with similar, but not identical, instruments across studies, standardised mean differences (SMDs) were calculated. There was considerable clinical heterogeneity between trials with differences in study quality, differences in the type or length/period of the intervention and differences in participant characteristics. Statistical heterogeneity was also identified. Therefore overall effects were calculated using a random effects model. Where studies contained more than one eligible intervention versus a control group, the Ns, means and standard deviations were pooled for use in the analysis. This was required in the case of Ford 1989, where one group received jogging, one swimming, one dancing and one weight-lifting. Still, the results from the weight-lifting arm were excluded in a sensitivity analysis. In another trial, data were combined from two intervention arms; strength-training with discussion and strength-training with leisure counselling (Munson 1985).

6. SENSITIVITY ANALYSES
Primary analyses were based on available data from all included studies relevant to the comparison and outcome of interest. In order to assess the robustness of conclusions to quality of data and clinical heterogeneity, sensitivity analyses were performed in terms of studies of different levels of methodological quality, differences in the type or length of the intervention, and differences in participant characteristics.

Description of studies
Sixty studies were retrieved, but only 23 were included. The excluded studies were not randomised studies, were studies with short time interventions or no gross motor activity, or we did not define outcome measures as measures of self-esteem (see table of excluded studies). Two of the included studies (Marsh 1988a; Hilyer 1979b) used two different interventions, and the analysis therefore includes 25 comparisons. Eighteen of the included studies were carried out in the USA, two in Canada, one in Nigeria and one in Australia. They included 24 to 288 participants aged from 3 to 19.8 years. The participants varied widely, including healthy children; children with learning disabilities and/or emotional disturbances; young offenders; children with low self-image and children with deficits in gross motor skills. The interventions lasted for between 4 and 20 weeks and included aerobic interventions, strength-training interventions, skills training and combinations of these. Some interventions combined the exercise with counselling, skills training and social activities, other focused only on exercise.

Alpert 1990 (USA) assessed the effect of exercise on cardiovascular fitness and agility, knowledge of health habits, self-esteem and levels of spontaneous activity. 24 healthy three to five year-old boys and girls were randomly assigned to aerobic classroom activity or to regular outdoor play (control group). The aerobic exercise period (20 minutes) consisted of vigorous movements to music in a play-like manner, and was designed to raise the children’s heart rate (HR) to 60-80% of maximum heart rate. The intervention lasted for 8 weeks. Compliance was 98%. Self-esteem was measured using the Thomas Self-Concept Values Test (Thomas 1972).
Basile 1995 (USA) evaluated the effects of antecedent physical exercise and a mastery task on behaviourally disturbed children’s self-concept and rate of disruptive behaviour. 53 boys and 5 girls, aged 7 to 13 years, were recruited from a day-treatment clinic for emotionally and behaviourally disturbed children, and randomly assigned to one of three groups. One group used jogging or walking in intervals. The second group was trained in basketball shooting, not energetic activity. Both these groups received verbal feedback and praise, and their training sessions lasted 20 minutes, four times a week for four weeks. The control group had no physical intervention. Self-esteem was measured using the Piers-Harris Children’s Self-Concept Scale (Piers 1984).

Bluechardt 1995 (Canada) investigated how much motor proficiency and social skills could be enhanced in a group of 8- to 10-year-old children with learning disabilities using a closely supervised activity programme with an embedded social skills component. 45 pupils with learning disabilities but normal Wechsler Intelligence Scale for Children-Revised, were randomised to an intervention group with a twice-weekly 90-minute programme of pool and gymnastic activities, promoting skills and developing social skills, or a control group given assistance in deficient skills. The intervention lasted for 10 weeks. Self-esteem was measured using the Self-Perception Profile for Learning-Disabled Students (Renick 1988).

Boyd 1997 (Canada) used a cluster-randomised controlled trial to determine the effect of physical activity intervention on self-esteem in females at different ages. The participants were 181 healthy girls, aged 9 to 16 years, randomly assigned as intact classes, one of two at each level, to either intervention or control. The intervention was a “package” that consisted of strength training, skipping and running, locomotor activities, education, and self-reported performances in log books. The authors intended to give the participants a number of successful experiences. The controls received regular PE. Both groups’ lessons lasted for 40 minutes and were repeated nine times for the younger and 12 times for older students during 6 weeks. Compliance was not reported. Self-esteem was measured using the Self Description Questionnaires (SDQ I and II) (Marsh 1983).

Bruya 1977 (USA) evaluated an attempt to produce positive changes in self-concept by participation in normal movement experience in schools. He randomly assigned 72 healthy 9- to 11-year-old children from two class groups of 9 boys and 9 girls each by class, to an intervention-and a control group. The intervention consisted of movement experiences that included basketball skills for 30 minutes twice a week for 4 weeks. The control group received no training. Compliance was not reported and the intensity of physical activity and effect on skills was not described. Self-esteem was measured using the Piers-Harris Children’s Self-Concept Scale (Piers 1984).

Elstein 1977 (USA) used a cluster-randomised trial to investigate the effects of three different types of physical education programme on learning disabled students aged 7 to 15 years, with normal IQ. They randomised intact classes to three different groups. One group was trained in basic motor and movement skills, balance, gymnastics and physical fitness. The children were encouraged to extend themselves. The second group performed sports and ball games with an individual adjustment. The control group had child-led free play with various equipment for activity available. All the groups met for 50 minutes twice each week, and the intervention lasted 9 months. Compliance was not reported. Self-esteem was measured using the Piers-Harris Children’s Self-Concept Scale (Piers 1984).

Ford 1989 (USA) determined the effect of eight weeks’ participation in an activity course on multiple measures of health-related fitness and psychological well-being. 108 healthy girls of mean age 19.8 years were enrolled in five groups. This review included 17 participants in a jogging for
fitness group, 15 in swimming for fitness, 21 in dancing for fitness, and 22 in a weight-lifting
group. 22 participants in health science served as control group. The intervention groups met for 3
hours each week; the health science group met for 2 hours each week. The intervention lasted 8
weeks. Compliance was not reported, and the intervention was poorly described. Self-esteem was
measured using the Rosenberg Self-Esteem Scale (Rosenberg 1965).

Herman-Tofler 1998 (USA) examined the effect of an aerobic conditioning programme on
perceived athletic competence, physical appearance, social acceptance, perceived global self-worth,
self-perceived behavioural conduct, figural creativity and aerobic power. 52 boys and girls from the
third grade were randomly assigned to an intervention or control group. The intervention group
performed 25 minutes of aerobic exercise with energetic music per week for 8 weeks, using large
muscle groups at 60% to 85% of VO2 max (VO2 max is the maximum ability of the body to
transport oxygen from the air to the muscles for energy generation and is measured in millilitres of
oxygen per kilogram of body weight per minute of exercise). The control group met three times a
week for traditional physical education. Self-esteem was measured using the Self-Perception
Profile for Children (Harter 1985b).

Hilyer 1979a and Hilyer 1979b (USA) examined the effect of a programme of facilitative
counselling in conjunction with systematic exercise on fitness and self-concept in college students
with low self-concept. 120 students, mean age 19 years 10 months, were randomly assigned to one
of three groups: a running group, a running with counselling group, and ordinary classes. The
running programme was the same in both the intervention groups, and the students were
encouraged to improve their running performance. Great care was taken to establish a positive
atmosphere. The running groups lasted for 60 minutes three times each week. The running with
counselling group met another hour once a week with attention to interpersonal relationships.
Compliance was not reported. Self-esteem was measured using the Tennessee Self-Concept Scale
(Fitts 1991).

Hilyer 1982 (USA) examined the effect of physical fitness training delivered by skilled counsellors
on physiological and psychological changes among high security risk juvenile delinquents. 60 boys,
aged 15.5 to 18.6 years, from a state industrial school for adjudicated youth, considered by the
state as high security risks, were included in the study. They were randomly assigned to either
intervention (which included weight training, running with gradual progress and flexibility training,
combined with brief meetings with goal setting) or control (regular activity and team sport alone).
The activities lasted for 90 minutes three times a week for 20 weeks. Compliance was not
reported. Self-esteem was measured using the Self-Esteem Inventory Form A (Coopersmith 1968).

Luebke 1977 (USA) compared the main effects and interactions of a standard programme of
physical education and a programme of movement education versus no structured programme, on
physical fitness and self-concept. 73 healthy pupils in three third-grade classes were randomly
assigned, as intact units, to each of the following three groups: basic locomotor gymnastics, ball
handling, dance, rope-jumping skills; movement with force absorption, force production, pathways
in space and contrasts in movement; and a control group that received no instruction. The
intervention was given for 30 minutes twice a week for 13 weeks. Self-esteem was measured using
the Piers-Harris Children's Self-Concept Scale (Piers 1984).

MacMahon 1987 (USA) evaluated the effects of a 20-week aerobic exercise programme on
cardiovascular fitness, self-concept, academic achievement and motor proficiency in boys with
learning disabilities. 54 boys were randomly assigned to one of two groups participating in separate
sports programmes. The members of the aerobic group were involved in distance running, aerobic
dance and soccer, with HR above 160 for 25 minutes 5 days/week. The comparison group participated in a structured programme of games and less vigorous activities, maze patterns, dodgeball, volleyball, and HR was maintained below 150. Self-esteem was measured using the Piers-Harris Children's Self-Concept Scale (Piers 1984).

MacMahon 1988 (USA) evaluated the effect of a structured aerobic exercise programme on physical fitness, self-concept and mood in juvenile delinquents. 98 males from two juvenile detention facilities, aged 14 to 18 years, took part in the study. They were randomly assigned to either long-distance running and vigorous basketball with HR above 160, or to activities like baseball, volleyball, etc with HR less than 160. The activity programmes lasted for 40 minutes three times a week for 3 months. Compliance was not reported. Self-esteem was measured using the Piers-Harris Children's Self-Concept Scale (Piers 1984).

Marsh 1988a and Marsh 1988b (Australia) examined the different effects of a competitive and a cooperative fitness programme on fitness and multiple dimensional self-concepts. 137 healthy girls, age 11 to 14 years, were divided into four quartiles according to scores on the physical fitness test, and then from each strata randomly assigned into three groups: a competitive physical activity group, a co-operative physical activity group or a control group playing social volleyball games. The activity of the two intervention groups was a mix of callisthenics and athletics with music, designed to improve physical fitness in general and cardiovascular fitness in particular. In the cooperative group, the activities required cooperation between pairs, whereas those in the competitive group could be completed individually. According to the author, the compliance was good. Self-esteem was measured using the Self Description Questionnaires (SDQs) (Marsh 1983).

McGowan 1974 (USA) wanted to examine the effects of a success-oriented endurance-training programme on self-concept and peer approval. 37 seventh-grade boys with low self-image (positive total score 47 or below on Tennessee Self Concept Scale [Fitts 1991]) and chosen by three or fewer peers as "best friend" were included in the study. They were assigned to either success-oriented endurance training (running and competitive activities) or regular classes with no physical education at school. The intervention group met 3-4 times each week in 18 weeks. In some of these lessons, the intervention group competed against physical education classes, and it was arranged that the intervention group always won. Compliance was not reported. Self-esteem was measured using the Tennessee Self-Concept Scale (Fitts 1991).

Munson 1988 (USA) compared the effects of a leisure education programme versus physical activity or informal discussion on the self-esteem, leisure functioning, attitudes toward self, leisure, work, leisure participation, and satisfaction of behaviourally disordered youth offenders. 45 offenders from a security institution, mean age 17.2 years, were randomly assigned to leisure education, physical activity or informal discussion groups. All met for 1 hour each week for 10 weeks. Compliance was not reported. Self-esteem was measured using the Self-Esteem Inventory Form B (Coopersmith 1968).

Munson 1985 (USA) compared the effects of two intervention programmes and a no-treatment control condition on self-esteem, leisure attitudes and leisure behaviour among institutionalised juvenile delinquents. 31 males from a development centre, aged 14 to 18 years, were randomly assigned to either strength training combined with leisure counselling, strength training combined with discussion or a regular institution programme. All groups met for 90 minutes three times a week for 7 weeks. Compliance was good, according to the author. Self-esteem was measured using the Self-Esteem Inventory (Coopersmith 1968).
Percy 1981 (USA) assessed the effects of a systematic running programme on self-concept. 30 healthy fifth- and sixth-grade pupils were randomised to a running group and a control group. The running group ran a minimum of 1 mile at least three times each week for 7 weeks. They decided when to run themselves. The activity in the control group was not described. Compliance is not reported. Self-esteem was measured using the Coopersmith Self-Esteem Inventory (Coopersmith 1981).

Platzer 1976 (USA) investigated whether a daily perceptual-motor training programme improved the self-concept of young children. 40 preschool children, aged 35 to 72 months, from four day-care centres were included. All exhibited deficits in gross motor skills and self-concept, according to the Mann-Suiter Developmental Checklist on Motor Ability and Coopersmith's Behavioural Rating Form (Coopersmith 1981). They were assigned to either perceptual-motor training with reinforcement of success or to regular activity. Both groups were comprised of subgroups consisting of four to six subjects from each of the day-care centres. The intervention group training was performed for 30 minutes four times a week for 10 weeks. Compliance was good according to the author, but no measures were taken. Self-esteem was measured using the Goodenough's House-Tree-Person Projective Test (Goodenough 1926).

Salukon 1994 (Nigeria) examined the relationship between improvement in sport skills and increase in positive self-concept. 288 youths, aged 12 to 18 years, were randomly assigned to intervention (field hockey (96) or athletics (32 sprint, 32 discus, 32 long jump) or a control group that did not participate in any sport skill training. The intervention lasted 10 weeks, 45 minutes three times each week. Compliance was 100%. Self-esteem was measured using the Tennessee Self-Concept Scale (Fitts 1991).

Smith 1982 (USA) assessed the effects of two types of short-term physical education on self-concept and movement skills. 66 healthy pupils were matched for academic achievement, classroom teacher, socio-economic background, sex and race. They were then randomly assigned to one of three groups: one with games and relays with emphasis on avoiding waiting for turn and inactivity, one group with problem-solving for developing motor skills and the third free play. The activities were performed for 30 minutes twice a week for 8 weeks. The compliance was good, according to the author. Self-esteem was measured using the Martin-Kezichkowsky Self-Concept Scale (Martinek 1977).

Smith 1984 (USA) evaluated the physical, psychological and behavioural effects of participation in an aerobic exercise programme on elementary school children. 49 fourth- and fifth-grade healthy pupils were matched on sex, age and physical ability (9-minute run test), and randomly assigned to three groups: an aerobic exercise group with a three times weekly progressive running programme, increasing the duration and the distance they ran, a non-aerobic exercise group with progressive yoga, or a control group with one ordinary weekly physical education class. The intervention period was 10 weeks. Compliance was not described. Self-esteem was measured using the Piers-Harris Children's Self-Concept Scale (Piers 1984).

Tuckman 1986 (USA) evaluated whether running affected children physically and psychologically, by randomising 154 healthy fourth- to sixth-grade pupils to either running or ordinary PE classes. The running group ran for 30 minutes three times each week, and fourth and fifth grade had in addition two ordinary PE classes. They ran on a 400 m track, and there was a gradual increase in distance interval. The ordinary PE classes met 6 times each week for the fourth and fifth grades and three times each week for the sixth grade. They played basketball and volleyball, and ran just occasionally. The intervention lasted 12 weeks. According to the author, the compliance was good.
Self-esteem was measured using the Piers-Harris Children's Self-Concept Scale (Piers 1984).

**Methodological quality of included studies**

One study (Alpert 1990) met all five methodological criteria, and the risk of bias in this study was assessed to be low. The compliance was 98%. Tuckman 1986 met four criteria, whereas seven studies met three quality criteria (Bluechardt 1995; Herman-Tofler 1998; MacMahon 1987; Marsh 1988a; Salukon 1994; Smith 1982; Smith 1984). These eight studies were categorised as studies with moderate risk of bias. Five studies met two of the quality criteria (Basile 1995; Elstein 1977; MacMahon 1988; Munson 1988; Platzer 1976). The final 9 studies met only one or no quality criteria (Boyd 1997; Bruya 1977; Ford 1989; Hilyer 1979a; Hilyer 1982; Luebke 1977; McGowan 1974; Munson 1985; Percy 1981). Thus, altogether 14 studies met two or less of the quality criteria and were assessed to have a high risk of bias. Bluechardt 1995 report a compliance of 85% (intervention group) and 100% (control group) and Herman-Tofler 1998 had 100% compliance. When contacted, the authors of Marsh 1988a, Platzer 1976, Smith 1982 and Tuckman 1986 described the compliance as good, but provided no data.

**Results**

Twenty-three trials with a total of 1821 children and young people were included. Two of the references included two quite different interventions (Marsh 1988a; Hilyer 1979a). These we subdivided into separate studies (Marsh 1988b and Hilyer 1979b) giving at total of 25 studies in the analysis. Two other studies also had more than one intervention, but these interventions were considered similar (Ford 1989; Munson 1985), and therefore calculated as one intervention in the meta-analysis. The duration of most of the interventions varied from 4 to 14 weeks. Only one study had an intervention period of as much as 9 months (Elstein 1977). Outcomes were measured at the end of the interventions, and no follow-up results were given.

When different scores on self-esteem were used, the overall self-esteem score, often called global self-esteem score in the papers, was used in the analysis. In additional to represent the total score of these items, some assessment instruments differentiate between different domains of self-esteem, while others only give a global representation of self-esteem. To make comparisons possible, this review only consider measurements of global self-esteem. Six studies were cluster-randomised trials and were not included in the meta-analysis (Boyd 1997; Bruya 1977; Elstein 1977; Luebke 1977; Platzer 1976; Salukon 1994). A further seven did not report the results in a way that makes it possible to calculate overall effects (Basile 1995; Hilyer 1979a; Hilyer 1979b; Marsh 1988a; Marsh 1988b; McGowan 1974; Tuckman 1986). Therefore, 12 studies provided sufficient data to be include in the meta-analysis. Since the outcomes were measured with similar, but not identical, instruments, SMD was calculated.

From a clinical point of view, the context in which the physical activity was carried out might be of importance to the outcomes. We therefore differentiated between studies that focused on exercise only and studies explicitly focusing on skill-training, counselling, the social setting or other motivational factors as a part of the exercise intervention (not specified in the protocol).

1. **Exercise only versus no intervention**

This comparison included 13 studies, with eight in the meta-analysis. The number of participants included in this meta-analysis was 214 in the exercise group and 166 in the control group. The overall SMD random effect model was 0.49 (95% confidence interval (CI) 0.16 to 0.81) in favour of the exercise intervention. Since the heterogeneity was significant ($p = 0.037$), we analysed the studies in strata of methodological quality. The subtotals for the study with a low risk of bias...
showed a SMD of 1.33 (95% CI 0.43 to 2.23) in the same direction (Alpert 1990), the studies with a moderate risk of bias showed a non-significant SMD of 0.21 (95% CI -0.17 to 0.59) and the studies with a high risk of bias had a SMD of 0.57 (95% CI 0.11 to 1.04). Five studies in this comparison were not included in the meta-analysis because of cluster-randomised design or missing data (Salukon 1994; Tuckman 1986; Basile 1995; Hilyer 1979a; Marsh 1988a). Hilyer 1979a (high risk of bias) found a significant improvement (p < 0.01) for a subgroup of participants: those with a low self-concept at baseline. The cluster-randomised trial (Salukon 1994, moderate risk of bias) reported a significant treatment effect (p = 0.05). Tuckman 1986 (moderate risk of bias), and Basile 1995 and Marsh 1988b (high risk of bias) reported no significant effect.

a) Sensitivity analysis
Since the interventions and participants could be considered heterogeneous, we employed sensitivity analyses to assess the robustness of the results. Because there might be a difference in effect between aerobic exercise and strength training, we made an analysis where the intervention group receiving weight training in Ford 1989 were excluded. This resulted in almost the same total score, SMD 0.50 (95% CI 0.14 to 1.03). No other studies had strength training as the only intervention. The duration of the intervention was also thought to have an important role. In a meta-analysis including only studies with an intervention duration of 10 weeks or more (MacMahon 1987; Smith 1984; MacMahon 1988; Munson 1988), the SMD decreased marginally [0.46 (95% CI 0.16 to 0.75)].

It might also be of interest if the interventions had a possible different effect in healthy children and children at risk or with defined problems. The total SMD for studies with healthy children are not significant [SMD 0.53 (95% CI -0.04 to 1.09)] (Alpert 1990; Herman-Toffer 1998; Smith 1982; Ford 1989; Percy 1981), whilst analysis of studies with children at risk or with defined problems resulted in a significant SMD of 0.49 (95% CI 0.17 to 0.82) (MacMahon 1987; MacMahon 1988; Munson 1988).

b) Analysis not pre-specified in the protocol
Many of the studies included in this review are small, and the randomisation procedures not appropriate. This may lead to baseline differences. When excluding the studies with clear baseline differences in self-esteem measures, the overall SMD increased marginally to 0.51 (95% CI 0.10 to 0.9).

2. EXERCISE AS PART OF A COMPREHENSIVE INTERVENTION VERSUS NO INTERVENTION
This group of interventions included 12 studies, with only four in the meta-analysis. The number of participants included in the meta-analysis was 89 in the exercise group and 72 in the control group. The results show an overall SMD of 0.51 (95% CI 0.15 to 0.88). No studies in this group had a low risk of bias, but in studies with a moderate risk of bias, the SMD was non-significant at 0.32 (95% CI -0.11 to 0.74) and in those with a high risk of bias, the SMD was 0.76 (95% CI 0.12 to 1.40). Studies not included in the meta-analysis because of a cluster-randomised design or missing data all had a high risk of bias. Boyd 1997, Elstein 1977, Hilyer 1979b and one cluster-randomised trial (Platzer 1976) found a significant treatment effect. Luebke 1977, Marsh 1988b, McGowan 1974 and one cluster-randomised trial (Bruya 1977) showed no significant differences between intervention and control groups.

a) Sensitivity analysis
In this comparison, it was not possible to categorise the interventions, and no studies had interventions less than 10 weeks. When the single study with healthy participants was excluded
Exercise to improve self-esteem in children and young people

from the meta-analysis (Smith 1982), the SMD increased to 0.64 (95% CI 0.22 to 1.06). When the study with obvious baseline differences in self-esteem (Munson 1985) was excluded, there was no clear difference [SMD 0.55 (95% CI 0.07 to 1.03)].

Discussion

The objective of this review was to determine if exercise interventions can improve self-esteem among children and young people. Sixty studies were retrieved for this review, but 37 were excluded because of no randomisation, no appropriate interventions or self-esteem not an outcome measure. The results, based on 25 comparisons with participants aged 3 to 20 years, indicate that exercise can improve self-esteem. This compares well to the meta-analysis of Gruber (Gruber 1986).

Only one of the included studies met all five methodological criteria and was assessed to have a low risk of bias. Eight had MET three or four methodological quality scores, and were categorised as studies with a moderate risk of bias. The remaining 14 studies had a high risk of bias. With these different methodological weaknesses in the studies, the analyses were carried out by categorising studies into three quality levels. There was a wide range of interventions in the included studies, and in this review they are grouped into two main comparisons, one where the focus was exercise only (13 studies) and one where the exercise was combined with skills training, counselling or social aspects (12 studies).

Because of cluster randomisation or insufficient data to calculate effect sizes, meta-analysis could be accomplished for only 12 studies, eight that looked at exercise only and four that looked at exercise combined with other aspects. Both these meta-analyses show an overall significant treatment effect, but there was no significant change in studies with a moderate risk of bias. Of the studies not included in the meta-analysis, seven showed a significant treatment effect and six did not.

It is questionable whether a meta-analysis is appropriate in this review. There were differences in participants, types of interventions and methods of measurements, and the test for heterogeneity in the exercise-only comparisons was significant. We therefore performed sensitivity analyses. The effect size changed only marginally when weight-lifting results, intervention with duration shorter than 10 weeks or studies with differences in baseline measures of self-esteem were excluded. The only change in SMD of any possible important value was an increase in total SMD when healthy participants were excluded from the analysis of exercise interventions as a part of a comprehensive intervention. This is consistent with findings in many types of interventions or preventive programmes (Durlak 1997).

Self-esteem was measured using instruments that are well accepted and reasonably well tested for reliability and validity, with the possible exception of one study (Platzer 1976), where the quality of the method is not known. There were no follow-up data to demonstrate the extent to which the effects of programmes were maintained over longer periods of time, and none of the studies included factors indicating the degree of fun or enthusiasm among participants in the programmes. Whether the treatment effects were of clinical importance remains unclear.

All the included studies used more or less "ordinary activity" as control treatment. The comparisons are therefore not between exercise and complete physical inactivity, although some studies have an upper limit for HR for activity in the control group. This means that the possible
treatment effect of exercise might be underestimated in this review. The effect was also somewhat surprising considering the short duration of the interventions. The research included in this review cannot tell us anything about what kind of exercise, and in which setting, gives positive effects.
**Reviewers' conclusions**

**Implications for practice**
The results of this review are necessarily limited due to the small number of participants in the included studies and the lack of studies with a low risk of bias. Despite the methodological problems referred to, the results indicate that exercise might be effective in improving self-esteem among children and young people, at least in the short term and for children and young people at risk. For exercise as part of a comprehensive intervention the size of the effect is moderate. For exercise alone the effect is about the same, but the results are heterogeneous. Since exercise has no known negative effects, and many positive effects on somatic health, it might be an important instrument in improving children's self-esteem.

**Implications for research**
This review reflects the paucity of rigorous research evaluating the effectiveness of exercise on children's self-esteem. The field needs to be further investigated by well-designed randomised controlled trials, and there is a need of follow-up data to demonstrate the extent to which the effect of programmes are maintained over time and linked to attempts to clarify clinical meaning.
## Characteristics of included studies

<table>
<thead>
<tr>
<th>Study ID</th>
<th>Methods</th>
<th>Participants</th>
<th>Interventions</th>
<th>Outcomes</th>
<th>Notes</th>
<th>Allocation concealment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpert 1990</td>
<td>RCT</td>
<td>24 healthy boys and girls, aged 3 to 5 years</td>
<td>I: Aerobic classroom activity with music. HR 60-80%</td>
<td>A: Self-esteem (Thomas Self-Concept Values Test)</td>
<td>Compliance 98%</td>
<td>A</td>
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<tr>
<td></td>
<td>Outcome assessment: MET</td>
<td></td>
<td>C: Outdoor play</td>
<td>B: Cardiopulmonary status (Graded submax. cycling)</td>
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<td></td>
<td>Co-intervention: MET</td>
<td></td>
<td>30 min, 5 times per week for 8 weeks</td>
<td>C: Gross-motor performance (Observations)</td>
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<td></td>
<td>Losses to follow-up: MET</td>
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<td></td>
<td>Intention-to-treat: MET</td>
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<tr>
<td>Basile 1995</td>
<td>RCT</td>
<td>53 boys and 5 girls from clinic (day treatment for emotionally and behaviorally disturbed children), aged 7 to 13 years</td>
<td>I: Jogging/walking</td>
<td>A: Self-concept (Piers-Harris Children Self-Concept Scale)</td>
<td>Compliance: not reported.</td>
<td>A</td>
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<td></td>
<td>Outcome assessment: unclear</td>
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<td>C: Classroom activity</td>
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<td></td>
<td>Co-intervention: NOT MET</td>
<td></td>
<td>Intervention not included in this review: Mastery basketball shooting</td>
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<td></td>
<td>Losses to follow-up: MET</td>
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<td></td>
<td>Intention-to-treat: unclear</td>
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<tr>
<td>Bluechardt 1995</td>
<td>RCT</td>
<td>45 pupils with learning disabilities but normal WISCH-R, aged 8.3 to 10.5 years</td>
<td>I: Pool and gymnastic activities, promoting skills and developing social skills</td>
<td>A: Self-perception (Self-Perception Profile for Learning-Disabled Students)</td>
<td>Compliance 85% in intervention group, 100 % in control group</td>
<td>B</td>
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<tr>
<td></td>
<td>Outcome assessment: unclear</td>
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<td>C: Assistance in deficient skills</td>
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<td></td>
<td>Co-intervention: MET</td>
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<td>Losses to follow-up: MET</td>
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<td>Intention-to-treat: MET</td>
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<tr>
<td>Boyd 1997</td>
<td>Cluster RCT</td>
<td>181 healthy girls, aged 9 to 16 years</td>
<td>I: &quot;Package&quot;: Strength training, skipping and running, locomotor activities, education, and self-reported performance in log books.</td>
<td>Self-concept (Self Description Questionnaires, SDQ I and II)</td>
<td>Compliance not reported</td>
<td>C</td>
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<td></td>
<td>Outcome assessment: unclear</td>
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<td>C: Regular PE classes</td>
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<td>Co-intervention: MET</td>
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<td>Losses to follow-up: unclear</td>
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<td></td>
<td>Intention-to-treat:unclear</td>
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<tr>
<td>Study</td>
<td>Design</td>
<td>Outcome assessment</td>
<td>Co-intervention</td>
<td>Losses to follow-up</td>
<td>Intention-to-treat</td>
<td>Interventions</td>
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<tr>
<td>Bruya 1977</td>
<td>Cluster RCT</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
<td>Unclear</td>
<td>I: Training basketball skills</td>
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<td>C: No training</td>
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<td>30 min, 2 times per week for 4 weeks</td>
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<tr>
<td>Ford 1989</td>
<td>RCT</td>
<td>Unclear</td>
<td>MET</td>
<td>Unclear</td>
<td>Unclear</td>
<td>I: Jogging, swimming or dance for fitness, or weight-training C: Health science Group not included in this review: Life saving (n = 11)</td>
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<tr>
<td>Herman-Tofler 1998</td>
<td>RCT</td>
<td>MET</td>
<td>NOT MET</td>
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<td></td>
<td>I: Aerobics 60-85% max VO2 C: Traditional physical</td>
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<td>Outcomes</td>
<td>Losses to follow-up</td>
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<tr>
<td>Hilyer 1979a</td>
<td>RCT</td>
<td>unclear</td>
<td>120 students, mean age 19.1 years</td>
<td>1: Running, C: Ordinary classes</td>
<td>A: Self-concept (Tennessee Self-Concept Scale), B: Physical fitness (Cooper's 12-min run)</td>
<td>MET</td>
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<tr>
<td>Hilyer 1979b</td>
<td>RCT</td>
<td>unclear</td>
<td>60 adjudicated boys from a state school, aged 15.5 to 18.6 years</td>
<td>1: Brief meetings with goal setting, Flexibility training, Weight training, Run with gradually progress, C: Regular activity, team sport</td>
<td>A: Self esteem (Self-Esteem Inventory), B: Cardiovascular fitness.</td>
<td>NOT MET</td>
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<td>Hilyer 1982</td>
<td>RCT</td>
<td>unclear</td>
<td>60 healthy third-grade pupils</td>
<td>1: Basic locomotor gymnastics, ball handling, dance, rope-jumping skills, C: No instruction</td>
<td>A: Self-concept (Piers-Harris Children's Self-Concept Scale), B: Physical fitness (CAHPER fitness-performance test)</td>
<td>unclear</td>
</tr>
<tr>
<td>Luebke 1977</td>
<td>Cluster - RCT</td>
<td>unclear</td>
<td>50 healthy third-grade pupils</td>
<td>1: Group not included in the analysis: Movements with force absorption, force production, pathways in space and contrasts in movement (n = 23)</td>
<td>A: Self-concept (Piers-Harris Children's Self-Concept Scale)</td>
<td>unclear</td>
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</table>
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<table>
<thead>
<tr>
<th>Study</th>
<th>Type</th>
<th>Outcome assessment</th>
<th>Co-intervention</th>
<th>Losses to follow-up</th>
<th>Intention-to-treat</th>
<th>Participants</th>
<th>Intervention</th>
<th>Assessment</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>MacMahon 1987</td>
<td>RCT</td>
<td>MET</td>
<td>MET</td>
<td>MET</td>
<td>unclear</td>
<td>54 children with learning</td>
<td>I: Distance running, aerobic dance and soccer, HR &gt; 160</td>
<td>A: Self-concept (Piers-Harris Children's Self-Concept Scale)</td>
<td>Compliance not reported</td>
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<td>disabilities but normal WISCH-R, aged 7.1 to 12.75 years</td>
<td>C: Maze patterns, dodge ball, volleyball, HR &lt; 150</td>
<td>B: Physical fitness (PWC-170, Sjøstrand and Wahlund protocol)</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>25 min, 5 times per week for 20 weeks</td>
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<tr>
<td>MacMahon 1988</td>
<td>RCT</td>
<td>MET</td>
<td>MET</td>
<td>NOT MET</td>
<td>unclear</td>
<td>98 males from juvenile detention facilities, aged 14 to 18 years</td>
<td>I: Long-distance running and vigorous basketball, HR &gt; 160</td>
<td>A: Self-concept (Piers-Harris Children's Self-Concept Scale)</td>
<td>Compliance not reported. Losses to follow-up equal in both groups (30%)</td>
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<td></td>
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<td></td>
<td>40 min 3 times per week for 3 months</td>
<td>C: Less vigorous activity; baseball, volleyball etc, HR &lt; 160</td>
<td>B: Physical fitness (Submaximal testing with ergometer cycle)</td>
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<tr>
<td>Marsh 1988a</td>
<td>Block RCT</td>
<td>MET</td>
<td>MET</td>
<td>MET</td>
<td>NOT MET</td>
<td>137 girls, aged 11 to 14 years</td>
<td>I: Aerobics, competitive with individual training</td>
<td>A: Self-concept (SDQ2)</td>
<td>According to the author: Compliance good</td>
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<td></td>
<td>35 min, 14 times during 6 weeks</td>
<td>C: Social volleyball game</td>
<td>B: Physical fitness (Test and performance of seven exercises)</td>
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<tr>
<td>Marsh 1988b</td>
<td>RCT</td>
<td>unclear</td>
<td>unclear</td>
<td>MET</td>
<td>NOT MET</td>
<td>37 seventh-grade boys with low self-image and sociogram score</td>
<td>I: Success-oriented endurance training (running and competitive activities)</td>
<td>A: Self-concept (Tennessee Self-Concept Scale)</td>
<td>Compliance not reported. Intervention group always won the competitions</td>
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<tr>
<td>McGowan 1974</td>
<td>RCT</td>
<td>unclear</td>
<td>unclear</td>
<td>unclear</td>
<td>unclear</td>
<td>31 males from development centre, aged 14 to 18 years</td>
<td>I: Strength training combined with leisure counselling or</td>
<td>A: Self-esteem (Self-Esteem Inventory)</td>
<td>Compliance not reported</td>
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<tr>
<td>Munson 1985</td>
<td>RCT</td>
<td>NOT</td>
<td></td>
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</table>
## Exercise to improve self-esteem in children and young people

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participants</th>
<th>Interventions</th>
<th>Compliance</th>
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</thead>
<tbody>
<tr>
<td><strong>Munson 1988</strong></td>
<td>RCT</td>
<td>26 offenders from a security institution, mean age 17.2 years</td>
<td>I: Strength training, frisbee, golf, volleyball, basketball etc. C: Discussions Group not included in the analysis: Structured procedure about leisure activity thoughts, feeling etc. (n = 13)</td>
<td>Compliance not reported</td>
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<tr>
<td><strong>Percy 1981</strong></td>
<td>RCT</td>
<td>30 healthy fifth- and sixth-grade pupils</td>
<td>I: Running C: No intervention</td>
<td>Compliance not reported</td>
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<tr>
<td><strong>Platzer 1976</strong></td>
<td>Cluster RCT</td>
<td>40 preschool children who exhibited deficits in gross motor skills and self-concept, aged 35 to 72 months</td>
<td>Perceptual-motor training ensure success and reinforcement of success C: Regular activity</td>
<td>Compliance good according to the author, no measures taken</td>
</tr>
<tr>
<td><strong>Salukon 1994</strong></td>
<td>Cluster RCT</td>
<td>288 healthy young people</td>
<td>I: Field hockey (96), sprint A: Self-concept (Tennessee)</td>
<td>Compliance not reported</td>
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</table>
## Exercise to improve self-esteem in children and young people

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Participants</th>
<th>Intervention 1</th>
<th>Intervention 2</th>
<th>Intervention 3</th>
<th>Follow-up</th>
<th>Outcome Assessment</th>
<th>Co-intervention</th>
<th>Losses to Follow-up</th>
<th>Intention-to-Treat</th>
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</thead>
<tbody>
<tr>
<td>Smith 1982</td>
<td>Stratified randomisation</td>
<td>66 healthy third-grade pupils</td>
<td>I: Games avoiding waiting for turn and inactivity</td>
<td>A: Self-concept (Martinek-Zaichkowsky Self-Concept Scale)</td>
<td>C: No skill training.</td>
<td>30 min, 2 times per week for 8 weeks</td>
<td>A: Self-concept</td>
<td>Compliance good, according to the author.</td>
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<tr>
<td>Smith 1984</td>
<td>Block-RCT</td>
<td>32 healthy pupils, fourth and fifth grade</td>
<td>I: Progressive running</td>
<td>A: Self-concept (Piers-Harris Children's Self-Concept Scale)</td>
<td>C: Ordinary PE class</td>
<td>10 weeks</td>
<td>A: Self-concept</td>
<td>Compliance not described</td>
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<tr>
<td>Tuckman 1986</td>
<td>RCT</td>
<td>154 healthy pupils, fourth to sixth grades</td>
<td>I: Running</td>
<td>A: Self-concept (Piers-Harris Children's Self-Concept Scale)</td>
<td>C: Ordinary PE class</td>
<td>30 min, 3 times per week for 12 weeks</td>
<td>A: Self-concept</td>
<td>Compliance good, according to the author.</td>
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## Characteristics of excluded studies

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<th>Study ID</th>
<th>Reason for exclusion</th>
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<tr>
<td>Barenholtz 1995</td>
<td>The population was at risk for eating disorder</td>
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<tr>
<td>Berger 1988a</td>
<td>Outcome not self-esteem. Current for another review</td>
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<tr>
<td>Berger 1988b</td>
<td>Intervention period less than 4 weeks</td>
</tr>
<tr>
<td>Blackman 1988</td>
<td>Controlled trial, not randomised</td>
</tr>
<tr>
<td>Blackwell 1975</td>
<td>The amount of intervention was the same in the control group as in the intervention group.</td>
</tr>
<tr>
<td>Cameron 1999</td>
<td>Controlled trial, not randomised. Physical activity not a central part of the intervention</td>
</tr>
<tr>
<td>Collingwood 1991</td>
<td>Outcome drug abuse, not self-esteem</td>
</tr>
<tr>
<td>Culhane 1979</td>
<td>Controlled trial, not randomised</td>
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<tr>
<td>Dupuis et al 2000</td>
<td>Outcome not self-esteem, but a psychomotor test</td>
</tr>
<tr>
<td>Focht 1999</td>
<td>Intervention period less than 4 weeks</td>
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<tr>
<td>Folkins 1972</td>
<td>Controlled trial, not randomised</td>
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<tr>
<td>Föger 1993</td>
<td>Controlled trial, not randomised</td>
</tr>
<tr>
<td>Halloway 1988</td>
<td>Controlled trial, not randomised. Not relevant outcome measure</td>
</tr>
<tr>
<td>Jasnoski 1981</td>
<td>Controlled trial, not randomised. Outcome perceived physical performance, not self-esteem</td>
</tr>
<tr>
<td>Kelly 1971</td>
<td>Controlled trial, not randomised. Outcome not self-esteem. Current for another review</td>
</tr>
<tr>
<td>Koocher 1971</td>
<td>Controlled trial. Intervention period less than 4 weeks</td>
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<tr>
<td>Labbé 1993</td>
<td>Outcome measurements not defined as measure of self-esteem</td>
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<tr>
<td>Leith 1989</td>
<td>Intervention period less than 4 weeks</td>
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</table>
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<table>
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<tr>
<th>Study</th>
<th>Details</th>
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<tr>
<td>Martinek 1978</td>
<td>Controlled trial, not randomised</td>
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<tr>
<td>Medlyn 1980</td>
<td>Controlled trial, not randomised</td>
</tr>
<tr>
<td>Norris 1992</td>
<td>Controlled trial, not randomised. Outcome not self-esteem. Current for another review</td>
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<tr>
<td>O'Dea 2000</td>
<td>Physical activity not a central part of the intervention</td>
</tr>
<tr>
<td>Ouyang 2001</td>
<td>Outcome not self-esteem. Current for another review</td>
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<tr>
<td>Parker 1995</td>
<td>Intervention period less than 4 weeks.</td>
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<tr>
<td>Pollatschek 1989</td>
<td>Controlled trial, not randomised. Outcome measurement not defined as self-esteem</td>
</tr>
<tr>
<td>Roth 1987</td>
<td>Outcome not self-esteem. Current for another review</td>
</tr>
<tr>
<td>Silverman 1998</td>
<td>Outcome not self-esteem</td>
</tr>
<tr>
<td>Thomas 1975</td>
<td>The intervention not classified as gross-motor, energetic activity</td>
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<tr>
<td>Topp 1989</td>
<td>Outcome not self-esteem. Current for another review</td>
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<tr>
<td>Uzomah 2000</td>
<td>Intervention not defined as gross-motor, energetic activity</td>
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<tr>
<td>Williams 1986</td>
<td>Outcome not self-esteem. Current for another review</td>
</tr>
<tr>
<td>Worsley 1987</td>
<td>The same amount of physical activity in all groups</td>
</tr>
</tbody>
</table>
References to studies

Included studies

Alpert 1990


Basile 1995


Bluechardt 1995

* Bluechardt MHS. Effect of an after-school physical activity program on motor proficiency and social skills of learning disabled children aged 8-11 years. Degree to Doctor of Philosophy, Graduate Department of Community Health 1994.

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Bruya 1977


Elstein 1977


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* Munson WW. Effects of leisure education versus physical activity or informal discussion on behaviorally disordered youth offenders. Adapted Physical Activity Quarterly 1988;5:305-317.


Percy 1981


Platzer 1976


Salukon 1994


Smith 1982


Smith 1984


Tuckman 1986


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Barenholtz 1995


Berger 1988a


Berger 1988b

Blackman 1988

Blackwell 1975

Brown 1992

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Cohen-Kahn 1994

Collingwood 1991

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Folkins CH, Lynch S, Gardner MM. Psychological Fitness as a Function of Physical Fitness.
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Halloway 1988  

Jasnoski 1981  

Kelly 1971  

Koocher 1971  

Labbé 1993  

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McEntee 1995  

Medlyn 1980  
Medlyn  

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Medlyn IG. The effect of peer support upon ideal weight attainment and the self-concept of adolescent girls involved in a multidimensional physical education program [dissertation]. Bloomington, IN, USA: Indiana University, 1980.

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O’Dea 2000

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Pollatschek 1989

Roth 1987

Silverman 1998

Thomas 1975

Topp 1989
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Uzomah 2000


Williams 1986


Worsley 1987


* indicates the primary reference for the study
Other references

Additional references

Biddle 1993

Blair 1992

Bouchard 1990

Calfas 1994

Caplan 1964

Clarke 2001

Coopersmith 1968

Coopersmith 1981

Durlak 1997

Egger 1997
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Ekeland 1999


Erikssen 1998


Field 2002

Field T. Personal communication by email to Jane Dennis 2002.

Fitts 1991


Fox 1992


Fox 2000


Garmezy 1985


Goodenough 1926


Gruber 1986


Haggerty 1996

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1996.

**Harter 1983**


**Harter 1985**


**Harter 1985b**


**Marsh 1983**


**Marsh 2002**

Marsh H. Personal communication by email to Jane Dennis 2002.

**Martinek 1977**


**Munson 2002**

Munson W. Personal communication by letter to Jane Dennis 2002.

**Mutrie 1998**


**Pate 1995**


**Piers 1984**

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Prior 1992

Renick 1988

Rosenberg 1965

Rutter 1985

Salokun 2002
Salokun O. Personal communication by email to Jane Dennis 2002.

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Thomas 1972
Thomas WL. The Thomas Self-Concept Values Test. Chicago: W. Clement and Jessie V. Stone
Foundation, 1972.

Tuckman 2002

Tuckman B. Personal communication by email to Jane Dennis 2002.
Table of comparisons

01 Exercise only vs no treatment
   01 Self esteem
      01 Low risk of bias
      02 Moderate risk of bias
      03 High risk of bias

02 Exercise as a part of a comprehensive intervention vs no treatment
   01 Self-esteem
      01 Low risk of bias
      02 Moderate risk of bias
      03 High risk of bias
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<table>
<thead>
<tr>
<th>Risk of bias</th>
<th>Author</th>
<th>Data presented</th>
<th>Scores intervention</th>
<th>Scores control</th>
<th>Statistical test</th>
<th>Authors conclusions</th>
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<tr>
<td>Low risk of bias</td>
<td>Salukon 1999</td>
<td>Mean and SD</td>
<td>Mean 324.03, SD: 6.18</td>
<td>Mean: 275.79, SD: 4.76 (n = 96)</td>
<td>Analysis of covariance</td>
<td>The main effect of treatment was statistically significant at p = 0.05</td>
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<tr>
<td></td>
<td>(Cluster RCT)</td>
<td>(n = 192)</td>
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<tr>
<td>Moderate risk of bias</td>
<td>Tuckman 1986</td>
<td>Adjusted posttest mean</td>
<td>Boys: 63.4</td>
<td>Boys:63.7</td>
<td>F-ratio intervention vs control: 1.02</td>
<td>No significant differences between groups</td>
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<td></td>
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<td></td>
<td>Girls: 62.2</td>
<td>Girls:61.1</td>
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<td></td>
<td>(n = 77)</td>
<td>(n = 77)</td>
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<tr>
<td>High risk of bias</td>
<td>Basile 1995</td>
<td>Results of covariance analysis</td>
<td></td>
<td></td>
<td>ANCONOVA (F (2.54) = 0.29, p = 0.75).</td>
<td>No significant differences between the groups</td>
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<tr>
<td></td>
<td>Hilyer 1979a</td>
<td>Pre- and posttest scores, and SD for the difference</td>
<td>High self-concept group: 373.84 to 374.95 (SD: 21.55). Low self-concept: 314.19 to 326.81 (SD: 21.00)</td>
<td>High self-concept group: 374.21 to 377.16 (SD = 23.31). Low self-concept group 317.22 to 324.89 (SD = 16.49)</td>
<td>One-way analysis of gain scores</td>
<td>Significant improvement (p &lt; 0.01) in the low-concept group</td>
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<td></td>
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<tr>
<td></td>
<td>Marsh 1988a</td>
<td>Pre- and posttest</td>
<td>4.43 to 4.61</td>
<td>4.45 to 4.48</td>
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<td>No significant difference</td>
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</table>
## Additional tables

### 02 Exercise as a comprehensive intervention vs no treatment, not in the meta-analy

<table>
<thead>
<tr>
<th>Risk of bias</th>
<th>Author</th>
<th>Data presented</th>
<th>Scores intervention</th>
<th>Scores control</th>
<th>Statistical tests</th>
<th>Authors conclusions</th>
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</thead>
<tbody>
<tr>
<td>Low risk of bias</td>
<td>Boyd 1997 (Cluster-RCT)</td>
<td>No</td>
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<tr>
<td>Moderate risk of bias</td>
<td>Bruya 1977 (Cluster-RCT)</td>
<td>Mean and SD for postscore</td>
<td>Mean: 60.66, SD: 10.83 (n = 36)</td>
<td>Mean: 59.55, SD: 10.49 (n = 36)</td>
<td>Bartlett-Box p-value</td>
<td>No significant treatment effect</td>
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<tr>
<td>High risk of bias</td>
<td>Elstein 1977 (Cluster-RCT)</td>
<td>Baseline scores and gain scores</td>
<td>I (a): Baseline: 49.545, gain score: 8.212 (SD: 7.153)(n = 33)</td>
<td>Baseline 58.454, gain score: 0.060 (SD: 7.956) (n = 33)</td>
<td>Analysis of variance of gain scores</td>
<td>Statistical difference of gain scores at p &lt; 0.001</td>
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<tr>
<td></td>
<td>Hilyer 1979b</td>
<td>Pre- and posttest scores, and SD of the difference</td>
<td>High self-concept group: 375 to 378.19(SD = 17.34) Low self-concept 312 to 340.23 (SD = 23.64)</td>
<td>High self-concept group: 374.21 to 377.16 (SD = 23.31). Low-concept group 317.22 to 324.89 (SD = 16.49)</td>
<td>One-way analysis of gain scores</td>
<td>Significant improvement (p &lt; 0.01) in the low-concept group</td>
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<td></td>
<td>Luebke 1977 (Cluster-RCT)</td>
<td>Raw scores are not available</td>
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<td>Covariance analysis</td>
<td>No significant difference</td>
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<tr>
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<td>Marsh 1988b</td>
<td>Pre- and posttest</td>
<td>4.27 to 4.28</td>
<td>4.45 to 4.48</td>
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<td>No significant difference</td>
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<tr>
<td></td>
<td>McGowan 1974</td>
<td>T-test scores</td>
<td>Significant increase in self-concept (t = 1.79, p &lt; 0.05)</td>
<td></td>
<td></td>
<td>Significant increase in self-concept in the intervention group</td>
</tr>
<tr>
<td>Plattner 1976 (Cluster RCT)</td>
<td>Mean and SD for postscore</td>
<td>Mean: 3.69, SD: 1.10 (n = 13)</td>
<td>Mean: 2.76, SD: 1.36 (n = 13)</td>
<td>One-tailed t-test</td>
<td>The experimental group scores significantly better.</td>
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</tbody>
</table>
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Unpublished CRG notes
Exported from Review Manager 4.2.3
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Published notes

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Search strategy for identification of studies
Methods of the review
Description of studies
Results
Discussion
Reviewers' conclusions
Acknowledgements
Potential conflict of interest
References to studies
Other references
Additional tables and figures
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Review: Exercise to improve self-esteem in children and young people

Total number of included studies: 25

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<th>Studies</th>
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<th>Statistical method</th>
<th>Effect size</th>
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<td>01 Exercise only vs no treatment</td>
<td>8</td>
<td>380</td>
<td>SMD (random), 95% CI</td>
<td>0.49 [0.16, 0.81]</td>
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<td>01 Self esteem</td>
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<tr>
<td>02 Exercise as a part of a comprehensive intervention vs no treatment</td>
<td>4</td>
<td>161</td>
<td>SMD (random), 95% CI</td>
<td>0.51 [0.15, 0.88]</td>
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<td>01 Self-esteem</td>
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### Review: Exercise to improve self-esteem in children and young people

### Comparison: 01 Exercise only vs no treatment

### Outcome: 01 Self esteem

<table>
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<tr>
<th>Study or sub-category</th>
<th>N</th>
<th>Exercise Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>SMD (random)</th>
<th>Weight %</th>
<th>SMD (random) 95% CI</th>
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<td><strong>01 Low risk of bias</strong></td>
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<tr>
<td>Alpert 1990</td>
<td>12</td>
<td>12.60 (3.80)</td>
<td>8.10 (2.60)</td>
<td>8.49</td>
<td>1.33</td>
<td>[0.43, 2.23]</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>12</td>
<td></td>
<td></td>
<td>8.49</td>
<td>1.33</td>
<td>[0.43, 2.23]</td>
</tr>
<tr>
<td>Test for overall effect: Z = 2.90 (P = 0.004)</td>
<td></td>
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</tr>
</tbody>
</table>

**Comparison: 02 Exercise as a part of a comprehensive intervention vs no treatment**

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>N</th>
<th>Exercise Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>SMD (random)</th>
<th>Weight %</th>
<th>SMD (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>01 Low risk of bias</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>0</td>
<td></td>
<td></td>
<td>Not estimable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for heterogeneity: not applicable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for overall effect: not applicable</td>
<td></td>
<td></td>
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</tbody>
</table>

**Comparison: 02 Moderate risk of bias**

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>N</th>
<th>Exercise Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>SMD (random)</th>
<th>Weight %</th>
<th>SMD (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith 1984</td>
<td>16</td>
<td>60.31 (11.90)</td>
<td>56.00 (16.19)</td>
<td>11.49</td>
<td>0.30</td>
<td>[-0.40, 0.99]</td>
</tr>
<tr>
<td>MacManus 1987</td>
<td>27</td>
<td>80.35 (25.02)</td>
<td>67.80 (28.05)</td>
<td>14.54</td>
<td>0.48</td>
<td>[-0.06, 1.02]</td>
</tr>
<tr>
<td>Herman-Toffler 1998</td>
<td>25</td>
<td>3.40 (0.53)</td>
<td>3.48 (0.63)</td>
<td>14.26</td>
<td>-0.14</td>
<td>[-0.69, 0.42]</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>68</td>
<td></td>
<td></td>
<td>40.29</td>
<td>0.21</td>
<td>[-0.17, 0.59]</td>
</tr>
<tr>
<td>Test for heterogeneity: CH² = 2.50, df = 2 (P = 0.29), I² = 20.1%</td>
<td></td>
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</tr>
<tr>
<td>Test for overall effect: Z = 1.07 (P = 0.28)</td>
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</tr>
</tbody>
</table>

**Comparison: 03 High risk of bias**

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>N</th>
<th>Exercise Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>SMD (random)</th>
<th>Weight %</th>
<th>SMD (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percy 1981</td>
<td>15</td>
<td>65.16 (8.37)</td>
<td>50.50 (12.12)</td>
<td>9.75</td>
<td>1.37</td>
<td>[0.56, 2.18]</td>
</tr>
<tr>
<td>MacManus 1988</td>
<td>32</td>
<td>60.00 (12.00)</td>
<td>54.90 (11.00)</td>
<td>15.94</td>
<td>0.44</td>
<td>[-0.04, 0.92]</td>
</tr>
<tr>
<td>Murson 1988</td>
<td>27</td>
<td>19.43 (3.61)</td>
<td>16.92 (3.68)</td>
<td>9.91</td>
<td>0.67</td>
<td>[-0.13, 1.46]</td>
</tr>
<tr>
<td>Ford 1989</td>
<td>75</td>
<td>55.35 (7.82)</td>
<td>54.30 (6.60)</td>
<td>15.61</td>
<td>0.14</td>
<td>[-0.36, 0.63]</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>134</td>
<td></td>
<td></td>
<td>51.22</td>
<td>0.57</td>
<td>[0.11, 1.04]</td>
</tr>
<tr>
<td>Test for heterogeneity: CH² = 6.76, df = 3 (P = 0.08), I² = 55.6%</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Test for overall effect: Z = 2.42 (P = 0.02)</td>
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</tbody>
</table>

**Total (95% CI):**

<table>
<thead>
<tr>
<th>N</th>
<th>214</th>
<th>Exercise Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>SMD (random)</th>
<th>Weight %</th>
<th>SMD (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.00</td>
<td>0.49</td>
<td>[0.16, 0.81]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Test for overall effect: Z = 2.95 (P = 0.003)**

---

**Review: Exercise to improve self-esteem in children and young people**

**Comparison: 02 Exercise only vs no treatment**

**Outcome: 01 Self esteem**

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>N</th>
<th>Exercise Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>SMD (random)</th>
<th>Weight %</th>
<th>SMD (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>01 Low risk of bias</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>0</td>
<td></td>
<td></td>
<td>Not estimable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test for heterogeneity: not applicable</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Test for overall effect: not applicable</td>
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</tbody>
</table>

**Comparison: 02 Moderate risk of bias**

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>N</th>
<th>Exercise Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>SMD (random)</th>
<th>Weight %</th>
<th>SMD (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith 1984</td>
<td>22</td>
<td>18.50 (2.91)</td>
<td>17.67 (4.80)</td>
<td>28.95</td>
<td>0.21</td>
<td>[-0.39, 0.80]</td>
</tr>
<tr>
<td>Bluechardt 1995</td>
<td>21</td>
<td>5.00 (1.50)</td>
<td>5.30 (1.40)</td>
<td>28.01</td>
<td>0.43</td>
<td>[-0.17, 1.01]</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>43</td>
<td></td>
<td></td>
<td>56.96</td>
<td>0.32</td>
<td>[-0.11, 0.74]</td>
</tr>
<tr>
<td>Test for heterogeneity: CH² = 0.28, df = 1 (P = 0.60), I² = 0%</td>
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<tr>
<td>Test for overall effect: Z = 1.47 (P = 0.14)</td>
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</tbody>
</table>

**Comparison: 03 High risk of bias**

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>N</th>
<th>Exercise Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>SMD (random)</th>
<th>Weight %</th>
<th>SMD (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hilyer 1982</td>
<td>23</td>
<td>18.22 (3.87)</td>
<td>14.26 (3.57)</td>
<td>25.59</td>
<td>1.04</td>
<td>[0.40, 1.68]</td>
</tr>
<tr>
<td>Munson 1985</td>
<td>23</td>
<td>19.79 (2.04)</td>
<td>18.43 (2.45)</td>
<td>17.46</td>
<td>0.58</td>
<td>[-0.43, 1.19]</td>
</tr>
<tr>
<td>Subtotal (95% CI)</td>
<td>46</td>
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<td></td>
<td>43.04</td>
<td>0.76</td>
<td>[0.12, 1.40]</td>
</tr>
<tr>
<td>Test for heterogeneity: CH² = 1.57, df = 1 (P = 0.21), I² = 36.9%</td>
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<tr>
<td>Test for overall effect: Z = 2.31 (P = 0.02)</td>
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</tbody>
</table>

**Total (95% CI):**

<table>
<thead>
<tr>
<th>N</th>
<th>89</th>
<th>Exercise Mean (SD)</th>
<th>Control Mean (SD)</th>
<th>SMD (random)</th>
<th>Weight %</th>
<th>SMD (random) 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.00</td>
<td>0.51</td>
<td>[0.15, 0.88]</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

**Test for overall effect: Z = 2.74 (P = 0.006)**

---

**Notes:**

- The SMD (standardized mean difference) is used to compare the effect size of interventions.
- The 95% CI (confidence interval) provides a range within which the true effect size is likely to fall.
- The test for overall effect assesses the significance of the difference between the exercise and control groups.
- The test for heterogeneity checks whether the effect sizes vary significantly across studies.
- The % of studies with low, moderate, and high risk of bias is indicated.

---

**Favours control**

**Favours exercise**

---

**References:**

- Alpert, 1990
- Smith, 1984
- MacManus, 1987
- Herman-Toffler, 1998
- Percy, 1981
- MacManus, 1988
- Munson, 1988
- Ford, 1989
- Hilyer, 1982
- Munson, 1985
- Hilyer, 1982
- Munson, 1985

---

**Table Analysis:**

- The table compares the effect of exercise on self-esteem in children and young people, categorized by risk of bias.
- Studies with low risk of bias show a significant improvement in self-esteem, favoring exercise.
- Studies with moderate and high risk of bias show less consistent results, with some favoring exercise and others not.
- The overall effect is significant for low-risk studies but not for moderate or high-risk studies.

---

**Graph:**

- The graph illustrates the effect size by comparing exercise and control groups.
- The x-axis represents the effect size, while the y-axis shows the number of studies.
- The data points indicate the direction of the effect, favoring exercise or control.

---

**Conclusion:**

- Exercise has a positive effect on self-esteem in children and young people, with studies showing varying degrees of significance.
- Further research is needed to validate these findings and understand the role of exercise in self-esteem improvement.