

1            **Examining the effects of sport and exercise interventions on body image among**  
2    **adolescent girls: A systematic review**

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## 1 **Abstract**

2 Body image dissatisfaction among females is suggested to be so widespread, that is has been  
3 described as normative discontent. Consequently, there is great interest in the development of  
4 interventions that may enhance body image perceptions. The aim of the present systematic  
5 review was to investigate the effects of sport and exercise interventions on body image  
6 among adolescent females. Following preferred reporting items for systematic reviews and  
7 meta-analyses guidelines (Higgins & Green, 2009; Petticrew & Roberts, 2005), a search of  
8 six electronic databases produced 4,210 records of which six met the inclusion criteria. The  
9 methodological quality of included articles was assessed using the Standard Quality  
10 Assessment (Kmet, Lee, & Cook, 2004). This yielded a mean score for quality of .90 (SD =  
11 0.22), indicating poor quality of research. In two studies, significant and positive change was  
12 observed in body image following intervention (aerobics or self-selected sports activities) in  
13 comparison to a control condition. In four studies, no significant effect of intervention on  
14 body image was observed. We conclude that there is insufficient evidence to suggest that  
15 sport and exercise interventions can improve body image. Furthermore, due to the limitations  
16 of existing research highlighted within this review, findings suggesting positive influence  
17 should be interpreted with caution. Recommendations for improving the methodological  
18 quality of research examining the influence of sport and exercise interventions on body image  
19 are proposed. This includes considerations such as participant sampling, control  
20 conditions/groups, measurement of key variables, intervention features, and analysis of data.

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23 **Keywords:** gender; measurement; body attitude; body dissatisfaction; physical education.

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2 **adolescent girls: a systematic review**

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4         Body image has been described as a person's perceptions, thoughts, and feelings  
5 about their body (Grogan, 2016). Body image is a multifaceted construct consisting of a  
6 variety of measured dimensions (Thompson, 2004; Thompson, Heinberg, Altabe, & Tantleff-  
7 Dunn, 1999). This includes perceptual, cognitive, affective and behavioral components (Bane  
8 & McAuley, 1998). Body image dissatisfaction (BID), defined as a subjective negative  
9 evaluation of one's physical appearance (Presnell, Bearman, & Stice, 2004), has been the  
10 focus of much research to date. In Western societies, BID is suggested to be so widespread,  
11 particularly among females (Salk & Engeln-Maddox, 2012), that it has been described as  
12 normative discontent (Cash & Smolak 2011; Hardit & Hannum, 2012; Rodin, Silberstein, &  
13 Striegel-Moore, 1984; Tantleff-Dunn, Barnes, & Larose, 2011).

14         There is a wealth of research indicating that, across a lifespan, females are more likely  
15 to experience BID when compared to their male counterparts (Buchanan, Bluestein, Nappa,  
16 Woods, & Depatie, 2013; Elgin & Pritchard, 2006; Feingold & Mazzella, 1998; Sweeting &  
17 West, 2002). Indeed, girls as young as five years of age have been found to convey  
18 dissatisfaction with their body shape and (or) size (Davison, Markey, & Birch, 2000). As  
19 children transition from preadolescence into their next stage of maturity, adolescence  
20 becomes a significant phase in the development of body image (Fenton, Brooks, Spencer, &  
21 Morgan, 2010; Kostanski, Fisher, & Gullone, 2004). In the present study, we utilised the  
22 World Health Organisation (WHO) guidelines which describes adolescence as occurring  
23 between 10-19 years of age. Body image dissatisfaction has been reported to intensify during

1 adolescence, most notably amongst girls, due to the bodily changes that take place during  
2 puberty (Bucchianeri, Arikian, Hannan, Eisenberg, & Neumark-Sztainer, 2013; Calzo et al.,  
3 2012; Maxwell & Cole, 2012). Furthermore, an increasing regard for the opinions of others  
4 during adolescence exacerbates the potential for BID (Reber & Reber, 2001). Despite  
5 adolescence presenting a potentially volatile time for body image, previous research has  
6 typically focused on young adults, with studies of adolescents being less common (Mellor et  
7 al., 2013; Rubin, Gluck, Knoll, Lorence, & Geliebter, 2008; Williams, Ricciardelli, McCabe,  
8 Waqa, & Bavadra, 2006).

9         In looking to develop and deliver body image interventions, there is growing support  
10 for the notion that participation in sport and exercise can enhance body image perceptions  
11 (Abbott & Barber, 2011; Daniels & Leaper, 2006; Fox, 2000; Hausenblas, Cook, &  
12 Chittester, 2008; Langdon & Petracca, 2010; Slater & Tiggemann, 2011; Swami & Tovée,  
13 2009). Three meta-analyses demonstrated small (Campbell & Hausenblas, 2009; Hausenblas  
14 & Fallon, 2006) to moderate (Reel et al., 2007) effects of exercise on body image (based on  
15 57, 121 and 35 studies respectively), whereby an exercise intervention had the observed  
16 outcome of improved body image. However, the design of any sport and/or exercise  
17 intervention must account for the complex nature of the association between body image and  
18 motivation to exercise, which may vary according to demographics. The above meta-analysis  
19 included broad demographic samples (males and females across a broad age range), and thus  
20 it is difficult to inform interventions for female adolescence with confidence. Whilst a desire  
21 to improve body image can act as a motivator to exercise in certain individuals, for others, it  
22 may present an obstacle for exercise participation (Focht & Hausenblas, 2004; Schuler et al.,  
23 2004). For example, Slater and Tiggemann (2010) noted that females (aged 13 to 15 years)

1 frequently reported appearance-based concerns as a reason for ceasing participation in sport  
2 and exercise. In a follow up study, teasing and body image concerns appeared to contribute to  
3 reduced rates of participation in sports and other physical activities among adolescent girls  
4 (aged 12 to 16).

5         Within the present review, elucidating the outcomes of different sport and exercise  
6 interventions on body image may help identify effective strategies for enhancing body image.  
7 The aim of the present review is to provide a systematic evaluation of sport and (or) exercise  
8 interventions that seek to enhance body image among female adolescents. Specifically, this  
9 review will synthesize findings to address the following objectives:

10         (a) to examine the effects of sport and/or exercise interventions on female adolescent  
11 body image;

12         (b) to critique included studies highlighting the implications for future research  
13 practice.

#### 14 *Method*

15         To ensure methodological rigor, objectivity and replicability, the Preferred Reporting  
16 Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA; Higgins & Green,  
17 2009; Petticrew & Roberts, 2005) were applied. The review was registered on PROSPERO  
18 (CRD42016037225) and all aims, inclusion criteria, data extraction, and data quality  
19 evaluation were specified at the outset.

#### 20 *Procedure for Search Strategy and Study Inclusion*

21         A primary systematic search of six electronic databases through EBSCO was  
22 conducted (Medline, PsycINFO, SPORTDiscus, Child and Adolescent Studies, Education  
23 Research Complete, and Psychology and Behavioral Sciences) from inception up to and

1 including March 2016. Search terms included “body image”, “adolescence”, “sport and  
2 exercise”, and “intervention” (see Appendix for the complete search strategy). For inclusion,  
3 there had to be consensus that the following criteria were met:

- 4 (a) peer reviewed journal article published in the English language;
- 5 (b) data were reported from female adolescents;
- 6 (c) an exercise or sport intervention was delivered;
- 7 (d) intervention had a measured attempt to affect positive body image change;
- 8 (e) the outcomes were measured (quantitative or qualitative) with data at baseline and  
9 post-intervention;
- 10 (f) study sample should not include clinical populations or subpopulations with  
11 known differences that could obscure the direct examination of the effect of sport and  
12 exercise (e.g., illnesses or disease; physical disabilities, elite adolescent athletes, young  
13 offenders, or statemented adolescents with educational or behavioral and emotional needs).

14 Reference management software was used to organize citations (Endnote X7). The  
15 primary search yielded 4,210 records (see Figure 1), which following deduplication reduced  
16 to 3,073. These titles were independently screened by three reviewers to identify studies.  
17 Following title screening, 3,015 titles were excluded. Where there was disagreement, the full  
18 text manuscript was consulted, and for a paper to be included, there had to be consensus that  
19 the above inclusion criteria were met.

20 A full screen of the remaining 58 papers resulted in a further 52 exclusions as follows;

- 21 (a) sport and/or exercise was not delivered as a body image intervention ( $n = 28$ ); (b) non-  
22 target population (e.g., wrong age, clinical population, coaches;  $n = 17$ ); (c) results not

1 reported for females or male participants only ( $n = 4$ ); (d) technology or computer-based  
2 interventions ( $n = 2$ ) and, (e) a meta-analysis ( $n = 1$ : Campbell & Hausenblas, 2009).

3

4 [Insert Figure 1 about here]

5

### 6 *Data Extraction*

7 Data extraction parameters were established in line with the research questions and  
8 data extraction was processed using Microsoft Excel. This facilitated the capture of pertinent  
9 information including sample, measures, intervention characteristics, body image outcomes,  
10 research limitations, and implications for future practice (see Table 1).

### 11 *Data Quality*

12 The methodological quality of the included studies was scored and assessed using the  
13 standard quality assessment for evaluating primary research papers (for details see Kmet et  
14 al., 2004). Kmet et al. (2004) provides comprehensive guidelines (pp. 14-22) to ensure that  
15 the scoring of quality within and between systematic reviews is completed to a given  
16 standard. Synthesizing data quality scores “provides a systematic, reproducible and  
17 quantitative means of simultaneously assessing the quality of research encompassing a broad  
18 range of study designs” (Kmet et al., 2004, p. 11). Studies were evaluated on 20 criteria  
19 spanning design, sampling, methodology, analysis, results and conclusions. For each  
20 criterion, benchmark statements are provided to guide scoring. Papers scored 2 (good), 1  
21 (partial fulfilment), 0 (not fulfilled), or X (not relevant), possible score range was 0-2, with a  
22 higher score indicating better quality (Kmet et al., 2004). A mean score was calculated for  
23 each paper to give an overall rating of quality. In addition, a mean score for each of the sub-

1 criteria was used to indicate the relative strengths and limitations across included studies,  
2 with the mean scores (SD) for individual studies presented in Table 1.

### 3 ***Results***

#### 4 *Characteristics of the Included Studies*

5       Included studies (see Table 1) originated from the U.S.A. ( $n = 2$ ; Gehrman, Hovell,  
6 Sallis, & Keating, 2006; Waldron, 2007); U.K ( $n = 2$ ; Burgess et al., 2006; Daley &  
7 Buchanan, 1999); Canada ( $n = 1$ ; Boyd & Hrycaiko, 1997); and Sweden ( $n = 1$ ; Lindwall &  
8 Lindgren, 2005). One study included male and female participants but reported female data  
9 separately (Gehrman et al., 2006). The remaining studies had female only samples, with  
10 participant numbers ranging from 50 (Burgess et al., 2006) to 181 (Boyd & Hrycaiko, 1997).  
11 Mean age was reported in four studies, and ranged from 11.5 ( $SD = 0.96$ ; Gehrman et al.,  
12 2006) to 16.35 years ( $SD = 1.56$ ; Lindwall & Lindgren, 2005). Three studies failed to report  
13 ethnicity (Boyd & Hrycaiko, 1997; Daley & Buchanan, 1999; Lindwall & Lindgren, 2005),  
14 whilst two studies (Burgess et al., 2006; Waldron, 2007) simply reported ethnicity as  
15 predominately Caucasian. Gehrman et al. (2006) reported participants as 45% Caucasian,  
16 38% Hispanic, 8% African-American, and 8% as “other” ethnic backgrounds. Social and  
17 economic data were presented in two studies reporting participants to be of lower  
18 socioeconomic status (Burgess et al. 2006; Lindwall & Lindgren, 2005).

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[Insert Table 1 about here]

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Sport and exercise interventions were delivered within schools ( $n = 4$ ; Boyd &  
Hrycaiko, 1997; Burgess et al., 2006; Daley & Buchanan, 1999; Lindwall & Lindgren, 2005)



1 or the to the community ( $n = 2$ ; Gehrman et al., 2006; Waldron, 2007). Of these, five  
2 prescribed exercise, those being weight circuits (Boyd & Hrycaiko, 1997), non-competitive  
3 games and weight-bearing activities (Gehrman et al., 2006), aerobics (Burgess et al., 2006;  
4 Daley & Buchanan, 1999) and an established 5km running training programme (Waldron,  
5 2007). One study allowed self-selected exercise (Lindwall & Lindgren, 2005), with selected  
6 activities including: aerobics, water aerobics, step-up, spinning, dancing, yoga, badminton,  
7 kick-boxing, climbing, bowling, karate, jujitsu, and different ball-games. The duration of  
8 exercise and sport interventions ranged from five-weeks (Daley & Buchanan, 1999) to six-  
9 months (Lindwall & Lindgren, 2005). Five studies reported the session length, with  
10 interventions delivered through sessions varying from 40-minutes (Boyd & Hrycaiko, 1997)  
11 to 120-minutes (Gehrman et al., 2006), producing a mean of 72 minutes ( $SD = 32.71$ ). Three  
12 studies combined taught or discussion-based components alongside exercise components  
13 (Boyd & Hrycaiko, 1997; Gehrman et al., 2006; Lindwall & Lindgren, 2005).

14 Six different measures of body image were utilized across included studies. Only one  
15 measure (Physical self-perception profile; Fox & Corbin, 1989) was common to two studies  
16 (Daley & Buchanan, 1999; Lindwall & Lindgren, 2005) and no further consistency in  
17 measurement of body image was observed. Other variables measured included; physiology ( $n$   
18 = 3; Burgess et al., 2006; Gehrman et al., 2006; Lindwall & Lindgren, 2005), participation in  
19 exercise ( $n = 2$ ; Burgess et al., 2006; Daley & Buchanan, 1999), and eating behavior ( $n = 1$ ;  
20 Gehrman et al., 2006). Details of measures used are included in Table 1.

### 21 *Narrative Synthesis of Findings and Discussion*

22 Having first discussed data quality, the findings of this systematic evaluation are  
23 synthesized and discussed in accordance with the stated aims. These were (a) to examine the

1 effects of sport and/or exercise interventions on body image (b) to critique included studies  
2 highlighting the implications for future research practice.

### 3 *Data Quality*

4 The possible range of scores on the quality assessment was 0-2, with a higher score  
5 indicating better quality (Kmet et al., 2004). The mean scores (SD) for individual studies are  
6 presented in Table 1. The overall mean score for data quality was 0.90 (SD = 0.22), pointing  
7 to a poor quality of research on this topic. The range was 0.67 (SD = 0.69; Boyd & Hrycaiko,  
8 1997) to 1.16 (SD = 0.83; Lindwall & Lindgren, 2005). One of the included studies scored  
9 more than one standard deviation below the sample mean (Boyd & Hrycaiko, 1997). The  
10 mean scores (SD) for individual indicators of quality across all quantitative studies are  
11 presented in Table 2 ( $n = 6$ ). Of the indicators that were assessed, studies performed  
12 particularly poorly on experimental methodology. This was due to limitations such as failure  
13 to account for or control confounding factors, randomization not being performed rigorously,  
14 nor with the appropriate blinding of participants or investigators, and a failure by all included  
15 studies to collect long-term follow up data. Studies overall performed comparatively well on  
16 use of suitable and validated predictor and outcome measures, and specifying a clear  
17 hypothesis.

18 [Insert Table 2 about here]

### 19 *The effect of sport and exercise interventions body image*

20 Two studies revealed significant improvements in one or more sub measure of body  
21 image. Daley and Buchanan (1999) asked an experimental group to complete a one hour  
22 aerobics class, once a week, for five-weeks, in addition to compulsory physical education.  
23 The experimental group improved physical self-worth, sports competence, strength

1 competence, and body attractiveness over time when compared to a comparison group  
2 (partaking in compulsory physical education one-hour per week). Changes in exercise  
3 behaviors were not reported for either the experimental or comparison group. In a six-month  
4 intervention, Lindwall and Lindgren (2005) offered 45-minutes of self-selected exercise  
5 activities and 14-minutes of discussion on healthy lifestyles twice a week. A waiting-list  
6 control group had no organized activity. After the intervention, when conducting analysis that  
7 excluded participants with missing data, the intervention significantly reduced social  
8 physique anxiety and increased scores on three subscales from the physical self-perception  
9 profile (sport competence, physical conditioning and physical self-worth). However, when  
10 undertaking more conservative intent-to-treat analysis (i.e., including all participants that  
11 were originally allocated to conditions), no effect of intervention on the physical self-  
12 perception profile was observed, but effect of the intervention on social physique anxiety  
13 (over time and between groups) was still observed, with those in the intervention having an  
14 improved score post-intervention. These positive changes were not associated with changes  
15 in physiological variables.

16 No intervention effect on body image was found across four studies. Boyd and  
17 Hrycaiko (1997) found no significant main effect of a six-week intervention (comprised of  
18 physical activity (training, cardiovascular and agility), education (healthy lifestyle, weight  
19 management, healthy role models), and self-report (logbooks tracking own performance) on  
20 general self-esteem when compared with a control group doing regular PE lessons. Gehrman  
21 et al. (2006) delivered an eight-week intervention, providing sessions designed to teach the  
22 importance of physical activity in overall health and non-competitive games and weight-  
23 bearing activities designed to enhance bone health. The intervention did not have a significant

1 effect upon body dissatisfaction, drive for thinness, or weight concerns; with mean scores for  
2 body dissatisfaction following the same pattern for the intervention group when compared to  
3 the comparison group who completed training on injury prevention.

4 Burgess et al. (2006) utilized a cross-over design with two equivalent groups who  
5 participated in a comparison condition (conventional British physical education swimming  
6 program), and an experimental condition (aerobic dance). Both groups completed both  
7 conditions in a counterbalanced order. Within the inferential analysis, the differences  
8 between conditions were not reported, therefore for the purpose of comparing conditions, we  
9 report the means. No differences were found between the experimental and comparison  
10 condition in physical activity participation over time. Means show attractiveness was  
11 marginally higher, and disparagement and feeling fat marginally lower in the aerobic  
12 condition, when compared to the swimming condition. Waldron (2007) delivered a running  
13 intervention comprised of 90 minute sessions, twice a week for 8-12 weeks. There was no  
14 change in self-perception subscales observed post intervention. However, interviews  
15 indicated that following intervention, the girls expressed greater acceptance of the self,  
16 improved physical fitness, and enhanced knowledge of taking care of their body.

#### 17 *Critique of included studies and recommendations for future research practice*

18 Analysis of the data quality assessment highlighted that included studies were poor in  
19 their application of experimental method, which might have introduced bias or confounding  
20 factors. In particular, none of the included studies detailed whether the aims of the study were  
21 concealed from participants. This may mean that participants could guess the aims of the  
22 study and be unduly influenced. Likewise, investigators were not blinded as to the group's  
23 activities when analysis took place, and again this may introduce bias. In addition, key details

1 were omitted from reporting. For example, only one study reported the level of attendance at  
2 the intervention (Lindwall & Lindgren), at a rate of 56% (SD = 19%). Where no effect is  
3 observed, poor attendance or adherence with the intervention may be an explanatory factor.

4         Sampling strategies used in the included studies present limitations that require  
5 consideration. The predominant strategies used were convenience samples from schools  
6 (Boyd et al., 1997; Daley & Buchanan, 1999), or the community (Waldron, 2007), or  
7 selectively sampled participants for characteristics such as low physical activity levels  
8 (Burgess et al., 2006; Gehrman et al., 2006; Lindwall & Lindgren, 2005). Two studies  
9 (Gehrman et al., 2006; Lindwall & Lindgren, 2005) randomly assigned participants to  
10 conditions. Daley and Buchanan (1999) acknowledge that random sampling is preferable, but  
11 state that this was impractical in a school setting where girls were asked to voluntarily stay  
12 behind after school for intervention activities.

13         Studies comprised of volunteers (e.g., Daley & Buchanan, 1999), selective sampling  
14 of participants scoring low at baseline testing on a variable of interest (e.g., body attitudes,  
15 Burgess et al., 2006), or selective sampling from a population hypothesized to be less  
16 physically active (e.g., low socioeconomic status communities; Burgess et al., 2006; Lindwall  
17 & Lindgren, 2005). Volunteer-based recruitment strategies might result in biased samples  
18 because participants might have an increased desire to take part (Lubans & Sylva, 2006;  
19 Mauriello et al., 2010). Selective sampling of participants scoring low on a variable of  
20 interest increases the likelihood that improvements on this variable may be observed over  
21 time as compared to a sample scoring higher at baseline. This was illustrated by Walters and  
22 Martin (2000) who found no significant improvement in the self-concept of school children  
23 (male and female) following a 13-week aerobic exercise intervention. The authors suggested

1 that as pretest self-concept scores were generally high, this left limited scope for further  
2 increases (a ceiling effect). Similarly, Raglin (1990) found exercise did not decrease levels of  
3 depression in those whose initial scores fall within normal range, noting "exercise does not  
4 make normals more normal" (p. 325).

5         When evaluating control or comparison conditions, one study had a waiting list  
6 control group who were inactive (Lindwall & Lindgren, 2005), whilst one study employed a  
7 within subjects design (Waldron, 2007). Three studies included a comparison group  
8 participating in a different sport or exercise activity to the intervention group (Boyd &  
9 Hrycaiko, 1997; Burgess et al., 2006; Daley & Buchanan, 1999), whilst one study had a  
10 comparison group completing a non-sport activity (Gehrman et al., 2006). This presents a  
11 confounding factor, as if sport and exercise activities were to have an effect on body image,  
12 this effect should also be observed in any comparison group participating in a different sport  
13 or exercise activity to the intervention group. Comparison group activities are described in  
14 Table 1.

15         When choosing to utilize swimming as the comparison group activity, Burgess et al.  
16 (2006) rationalised that swimming has been reported to be one of the most disliked physical  
17 education activities for adolescent females, and may not benefit body image. Dislike for  
18 swimming is partially attributed to the tight, form-fitting, swimsuits that are associated with  
19 increases in self-consciousness and body image dissatisfaction (Reel, Petrie, SooHoo, &  
20 Anderson, 2013). Evidence for this contention was provided by Thøgersen-Ntoumani,  
21 Ntoumanis, Cumming, Bartholomew, and Pearce (2011) who demonstrated that wearing  
22 tight/revealing exercise attire heightened physically active female university students' levels  
23 of state self-objectification. Among individuals with low self-esteem, this heightened self-

1 objectification associated with low satisfaction with body shape and size. With regards, the  
2 findings of Burgess et al. (2006), they found that attractiveness was marginally higher, and  
3 disparagement and feeling fat marginally lower in the aerobic condition, when compared to  
4 the swimming condition.

5         There was little consistency in the physical activity offered as an intervention across  
6 included studies. An aerobics based intervention had a positive change on body image (Daley  
7 & Buchanan, 1999), with the authors noting that female participants may have greater  
8 confidence in their capacity to participate in gender typed ‘feminine’ activities (Clifton &  
9 Gill, 1994; Lirgg 1991). A second study delivering an aerobics intervention (Burgess et al.,  
10 2006) did not have a significant effect on body image, however, as previously noted, the poor  
11 methodology applied in this study, and the consequent lower data quality score mean that less  
12 emphasis should be placed on this study in the context of this review. Where a competitive  
13 element was implied in the intervention delivered (e.g., training for a 5k race, Waldron,  
14 2007), no significant effect of intervention on body image was observed. It has been  
15 suggested that for female adolescents in particular, competitive sports may increase  
16 unrealistic expectations and have a negative influence on self-concept, self-esteem and self-  
17 confidence (Cox, Schofield, & Kolt, 2010).

18         Three included studies provided multiple physical activities as interventions. Where  
19 this involved self-selected activities along with a discussion component (Lindwall &  
20 Lindgren, 2005), positive change in body image was found. By contrast, two studies  
21 providing multiple physical activities alongside a logbook and education (Boyd, 1997;  
22 Gehrman, et al., 2006) had no significant effect on body image. It may be that presenting the  
23 opportunity to partake in self-selected activities was the key factor in determining the positive

1 change in body image observed following the intervention delivered by Lindwall and  
2 Lindgren (2005). Arguably self-selecting exercise activities supports self-determined  
3 behaviors, and may therefore create more opportunity to have a positive effect on body image  
4 (Thøgersen-Ntoumani & Ntoumanis, 2007). In the study by Lindwall and Lindgren (2005),  
5 activities were designed to encourage self-control, pride in their body, and competence  
6 through promoting their abilities to meet their needs, and where necessary to engage other  
7 resources. Exercise enjoyment was a key aim of this study.

8         An important consideration when undertaking body image research is the selection of  
9 measures used, with assessment errors characterizing much of the work in this area  
10 (Thompson, 2004). Thompson (2004) notes that it is vitally important that researchers clearly  
11 identify the dimension of body image they wish to investigate, and then select a measure that  
12 assesses this specific dimension. Attention to such detail is necessary to help understand  
13 which, if any, aspect of body image is responsive to sport and exercise interventions. It is  
14 quite plausible that some components may not change (e.g., body image investment),  
15 whereas, other components (e.g., weight-specific dissatisfaction) may improve. Thus, clearly  
16 articulating and adhering to dimensions of body image underpins the evaluation and  
17 advancement of theories of body image (Thompson, 2004). Whilst the measures used (see  
18 Table 1), along with the titles of included studies, infer a focus on body image perceptions  
19 across the majority of included studies (Burgess et al., 2006; Daley & Buchanan, 1999;  
20 Lindwall & Lindgren, 2005; Waldron, 2007), none of the included studies sufficiently  
21 acknowledged the dimension of body image assessed, or justify the measure(s) of body image  
22 used.



1           Similarly, measuring physical activity can be a complicated endeavour, as all  
2 measures have known limitations (Baranoski, Thompson, Durant, Baranoski, & Puhl, 1993).  
3 Failing to sufficiently control basic exercise variables (frequency, duration, and intensity) in  
4 order to account for fitness improvements and heterogeneity of outcome measures was a  
5 limitation of the included studies (Campbell & Hausenblas, 2009). Physical activity  
6 (frequency, intensity and type) was commonly recorded via self-report (Boyd & Hrycaiko,  
7 1997; Burgess et al., 2006; Daley & Buchanan, 1999). This does not provide the most  
8 accurate form of recording information, particularly in both pediatric and adolescent  
9 populations, as this subjective technique may lead to inaccuracy, falsification, or over, or  
10 underestimation of actual physical activity levels (Godin, Jobin, & Bouillon, 1986; Sallis &  
11 Saelens, 2000; Shephard, 2003; Sirard & Pate, 2001; Welk et al., 2000). None of the included  
12 studies analyzed data pertaining to the intensity of the activity participants engaged with in  
13 the intervention. Exercise intensity is positively correlated with psychological benefits in  
14 adolescents (Biddle & Asare, 2011). This is therefore a variable to consider both in the design  
15 of the interventions, and as a covariate in assessing the effect of interventions on outcome  
16 measures that are salient. Usage of accelerometers in gathering data would enable physical  
17 activity to be measures with greater precision and confidence. In particular thigh-worn  
18 accelerometers support a more sensitive and specific evaluation of exercise frequency,  
19 duration, and intensity (Montoye, Pivarnik, Mudd, Biswas, & Pfeiffer, 2016).

20           With respect to the treatment of data, there were examples where the analysis  
21 undertaken was inappropriate, meaning that the findings could not sufficiently address the  
22 study aims. For example, Burgess et al. (2006) employed a counterbalanced design including  
23 two groups and two conditions across three time points. Whilst this was an example of good

1 study design, the analysis did not include a variable to describe ‘condition’. Therefore, the  
2 effect of the condition on the outcome variables could not be assessed. In a further example,  
3 Boyd and Hrycaiko (1997) substituted a ‘difference’ score into the ANOVA, instead of using  
4 the raw scores for pre and post-intervention. Consequently, the effect of the interaction  
5 between groups over time on body image could not be assessed, and the lack of descriptive  
6 statistics makes interpretation of their findings difficult. Similarly, Gehrman et al. (2006),  
7 included post-test scores as a co-variate, so again there was no clear analysis of the effect of  
8 the intervention on body image over time.

9         Included studies reported a large number of analyses. The reporting was unclear in  
10 some cases, and did not allow for the number of analyses conducted to be discerned (e.g.,  
11 Boyd & Hrycaiko, 1997). Conducting many analyses increases the possibility of a type one  
12 error, with only two studies controlling for this in their interpretation of findings (Daley &  
13 Buchanan, 1999; Waldron, 2007). In some cases, small sample sizes precluded the  
14 application of multivariate analysis, meaning that repeated paired t-tests (Waldron, 2007) or  
15 ANOVA (Boyd & Hrycaiko, 1997) were used. For other studies, it was unclear why some of  
16 the analyses were presented. For example, Gehrman et al. (2006) included gender as an  
17 independent variable, where it would have been more appropriate to their aims to include pre  
18 and post-intervention scores in the analyses as an independent variable, as their study aimed  
19 to examine the effect of the intervention on body image. Boyd and Hrycaiko (1997) applied a  
20 mean-split based on scores on self-concept, and used this as an independent variable in  
21 analyses, although the independent variables were described as the intervention condition  
22 versus control condition and the age of participants. Only one study reported a strategy for  
23 the imputation of missing variables (Lindwall & Lindgren, 2005). The same study also

1 reported intent-to-treat analyses, which include all participants who are randomized to a  
2 treatment (including drop-outs) and are therefore more conservative than analyses of only  
3 those who do not drop out.

#### 4 *Conclusion*

5         The present review evidences two interventions which had a positive effect on body  
6 image. These two studies indicate that the use of gender-aligned, or self-selected sport and  
7 exercise activities, undertaken in conjunction with careful discussion around empowering  
8 adolescent females, may have positive outcomes for body image. However, an ability to draw  
9 conclusions regarding the potential for sport and exercise interventions to help promote  
10 positive body image among female adolescents is presently limited by the overall poor  
11 quality of research in this area. There is a need to undertake future research with greater  
12 methodological rigor as detailed by the present systematic review. This includes more careful  
13 attention to considerations such as participant sampling, control conditions/groups,  
14 measurement of key variables, intervention features, and analysis of data.

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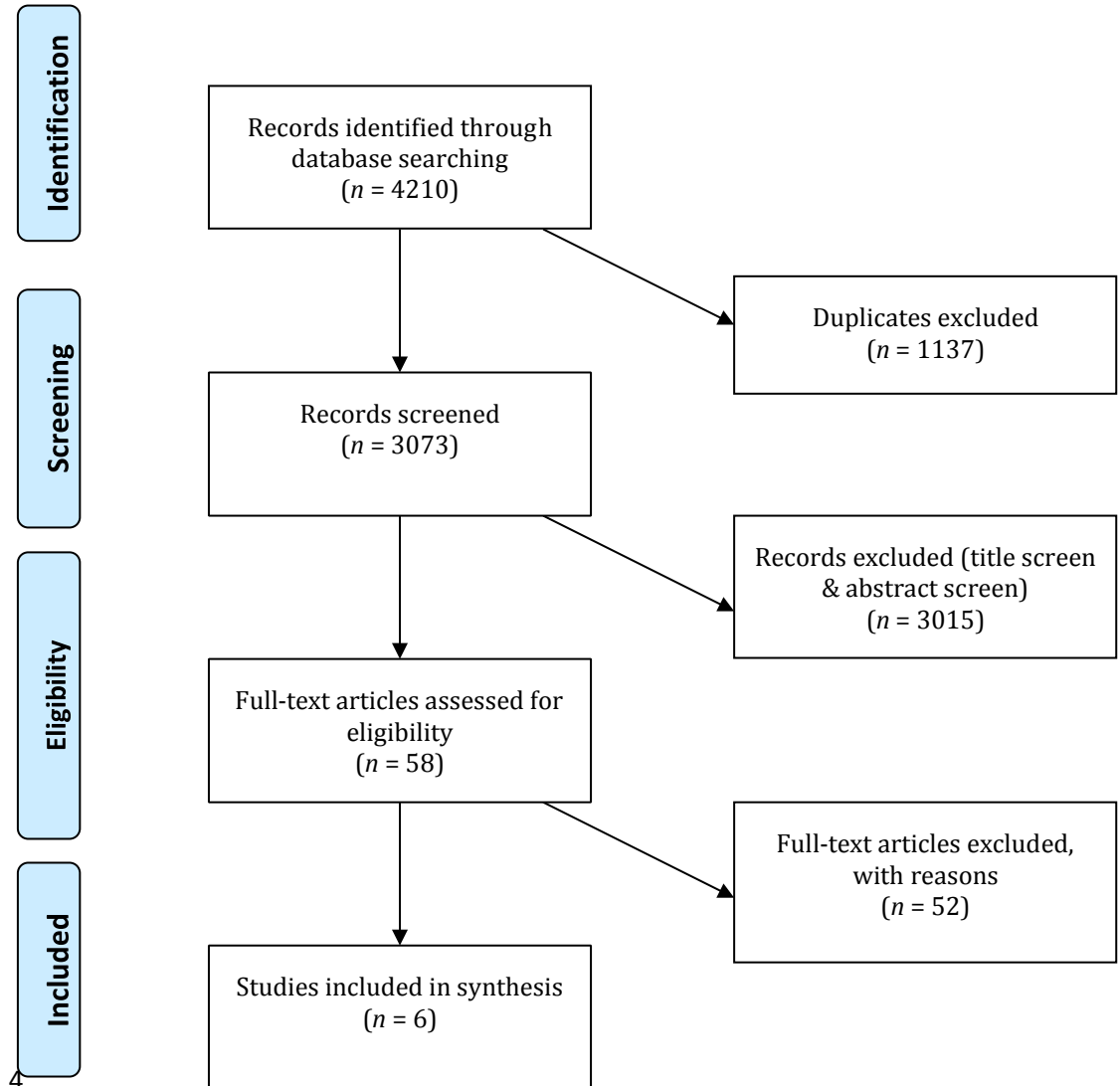
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5 Figure 1. Selection of Studies for Inclusion in Review

## 1 Table 1

2 *Characteristics of included studies*

Author	Year	Mean Age <sup>a</sup> (sd)	Design	Sample	Intervention-sport/ exercise type	Frequency and Duration	Measures	Main findings	Mean data quality (sd)
Boyd & Hrycaiko	1997	NR (range 9-16)	Experimental design Comparing age group (Pre, early, mid adolescence) and comparing intervention with a comparison condition <sup>c</sup> . Measures taken pre-and post intervention.	A non-random convenience sample of 181 school girls, described as pre, early, and mid adolescence. Subjects scoring in the 50th percentile or lower on the SDQ were assigned to the low self-esteem group.	Three components; (1) physical activity (strength training, CV and agility – precise activities were tailored to the group), (2) education (healthy life style, weight management, healthy role models), (3) self-report (log books tracking own performance).	40-minute sessions over six weeks. Pre-adolescent participants had nine sessions. Early and mid-adolescent groups had 12.	Self-Description Questionnaire I and II (Marsh, 1988) subscales; general self-esteem, physical self-concept, physical abilities, physical appearance.	No significant main effect of intervention on self-esteem (or the physical appearance subscale).	0.67 (0.69)



Burgess, Grogan, & Burwitz	2006	13.5 (0.3)	Experimental design comparing intervention and comparison groups. Counterbalanced intervention delivery. Measures pre, mid, post-intervention, and 12-week follow up.	50 British school girls from a specialist sports college; selective sampling of participants with low physical self-perception and high body image dissatisfaction.	Aerobic dance – warm up, dance workout, cool down & stretch. Control group partook in swimming lessons.	Fifty-minute classes, twice a week for six-weeks.	Body attitude questionnaire (Ben-Tovim & Walker 1991) Children and Youth Physical Self-perception profile (Fox & Corbin, 1989) Leisure time physical activity questionnaire (Aaron, Kriska, & Dearwater, 1995). Body Mass Index.	Means show attractiveness was marginally higher in the aerobic condition, and disparagement, feeling fat and were marginally lower when compared to the swimming group. No significant differences in pre-to-mid, mid-to-post or pre-to-post BMI scores for both groups.	1.12 (0.78)
Daley & Buchanan	1999	NR (range 15-16)	Experimental design comparing intervention ( $n = 43$ ) and comparison condition ( $n = 70$ ). Measures taken pre-and post-intervention.	113 British school girls (from a single-sex school)	Aerobics (warm up, aerobic workout, resistance, cool down and stretch).	One hour of physical education plus one hour of aerobics for five-weeks. Control group partook in one hour of physical education	Physical self-perception profile (Fox & Corbin, 1989) Participation in physical activity questionnaire (Daley & Parfitt, 1996).	The experimental group improved physical self-worth, sports competence, strength competence, and body attractiveness over time when compared to the comparison group.	0.72 (0.67)

						per week.			
Gehrman, Hovell, Sallis, & Keating	2006	11.5 (0.96) <sup>b</sup>	Experimental design. Random allocation to intervention ( $n = 49$ ) or comparison condition ( $n = 35$ ). Measures at pre-and post-intervention.	84 American children (females $n = 52$ , males $n = 32$ ). Participants were eligible if their BMI <32, and they were not currently participating in organized sports for three or more days per week	Parent groups taught behavior modification techniques to increase activity and change dietary habits in children. Children participated in fitness sessions and provided information regarding nutrition. Children completed activity logs. The comparison group completed family sessions on the subject of injury prevention.	An eight-week physical activity and nutrition intervention. Frequency and duration of sessions not reported. Control condition was two-hour family sessions, delivered weekly for eight-weeks.	Eating Disorders Inventory-2 (Garner, 1991) Weight concerns scale (Killen et al., 1994), physical maturity – Tanner Scale Drawings (Morris & Uldry, 1980), Body Mass Index, Parental Body Mass Index.	Mean scores for females on body dissatisfaction followed the same pattern for the intervention group when compared to the control group.	1 (0.77)
Lindwall & Lindgren	2005	16.35 (1.56)	Experimental design with random assignment to intervention group ( $n = 27$ , or waiting list control group ( $n = 35$ ). Measures at pre-and	Non-physically active Swedish adolescent girls recruited from schools. Eligible if they were active for less than 20 minutes per day, exercise less than once a	Self-selected exercise activities and discussion on healthy lifestyles. Control group had no organized activity.	45-min exercise sessions followed by 15-min healthy lifestyle discussion delivered twice a week for six-	Physical self-perception profile (Fox & Corbin, 1989). Social physique anxiety scale (Hart, Leary, & Rejeski 1989) Body mass	No significant difference in physical self-perception observed between groups, both groups improved significantly over time. Improvement in social physique	1.16 (0.83)

			post-intervention.	week, and medically healthy.		months.	index and submaximal oxygen uptake.	anxiety scale over time for intervention group compared to control group.	
Waldron	2007	11.51 (0.37)	Mixed design, with no control group. Measures at first and final week of the course.	An American community sample of 34 schoolgirls.	Structured coaching programme based on Harter's model of competence motivation culminating in a 5km running race.	Ninety minute Girls on Track running sessions, twice a week for eight-12 weeks.	Self-perception profile for adolescents (subscales; physical competence, physical appearance competence, self-worth; Harter, 1988). Semi-structured interviews.	No change in self-perception subscales observed at follow up. Interviews indicated that following intervention, the girls expressed greater self-acceptance, improved fitness, and enhanced knowledge of body care.	0.72 (0.57)

1 *Notes.*

2 <sup>a</sup>Where mean age is not reported, age range is provided.

3 <sup>b</sup>Mean age is reported from the whole sample, separate data were not available for females.

4 <sup>c</sup>Group sizes NR for each condition.

5

6

Table 2

*Quality review scores*

Item	Indicator of Quality	Mean	(SD)
13	Quality of measures	1.67	0.52
1	Hypothesis	1.67	0.52
3	Predictor and outcome measures	1.50	0.84
2	Study design	1.33	0.52
7	Describing those lost to follow up	1.20	0.84
6	Sample descriptions	1.17	0.98
14	Methods of analysis	1.17	0.41
5	Selection is unbiased	1.00	0.63
19	Description of findings	1.00	0.00
10	Description of trial	0.83	0.41
8	Sample size	0.83	0.41
20	Conclusions	0.67	0.52
15	Inclusion of effect sizes	0.50	0.55
11	Concealment of randomization from participants	0.67	1.03
4	Follow up	0.33	0.52
9	Randomization	0.50	0.84

16	Control for confounding variables	0.17	0.41
17	Concealment of randomization from investigators	0.00	0.00

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*Note.* Item 18 referred to adjustments in analysis made for the differences in timing of follow up data collection. Since none of the studies collected follow up data, this item has been omitted here. Item 12 was omitted as it was not relevant to the included studies.

## **Appendix A: Example search strategy**

1. Body?image
2. Self?image
3. Physical self?efficacy
4. Body?satisfaction
5. Body?shame
6. Physical self concept
7. Physical self-concept
8. Adolescen\*
9. Young?adult
10. Teen\*
11. Child\*
12. Physical activity
13. Sport\*
14. Exercis\*
15. Interv\*
16. Train\*
17. 1 or 2 or 3 or 4 or 5 or 6 or 7
18. 8 or 9 or 10 or 11
19. 12 or 13 or 14
20. 15 or 16
21. 17 and 18 and 19 and 20