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Title: Do Peers Matter? A Review of Peer and/or Friends' Influence on Physical Activity
among American Adolescents'

Abstract

This systematic review investigated the relationship between peer and/or friend variables and physical activity among adolescents by synthesising cross-sectional, longitudinal, and experimental research conducted in the US. Seven electronic databases were searched to identify related articles published within the last 10 years and the articles reviewed included adolescents between 10 and 18 years. Studies reporting a measure of physical activity for adolescents and at least one potential peer and/or friend variable were included. Research demonstrated that peers and friends have an important role to play in the physical activity behavior of adolescents. Six processes were identified through which peers and/or friends may have an influence on physical activity including: peer and/or friend support, presence of peers and friends during physical activity, peer norms, friendship sport quality and acceptance, peer crowd affiliation, and peer victimization. The theoretical significance of these results is assessed and the development of peer-related physical activity programmes for adolescents is discussed.

Keywords: Peers; Friends; Correlates; Physical Activity; Adolescents; Systematic Review

1 Regular physical activity (PA) during childhood and adolescence is associated with several
2 physical and psychological benefits (Aaron, Jekal, & LaPorte, 2005; Janz et al., 2006)
3 Leading an active lifestyle is likely to reduce health problems such as hypertension,
4 osteoporosis, and the incidence of chronic diseases including coronary heart disease and
5 diabetes in later life (Warburton, Nicol, & Bredin, 2006). PA is also associated with
6 enhanced mental health and improved self-esteem and self-identity among adolescents
7 (Bowden & Greenberg, 2009). Recommendations have been issued for young people that
8 promote regular moderate and vigorous intensity activities (U.S. Department of Health and
9 Human Services [USDHHS], 2008), however, large percentages of children and adolescents
10 are not meeting these recommendations. Nearly half of American youths aged 12 to 21
11 years are not active on a regular basis (USDHHS, 2008). The Centers for Disease Control
12 and Prevention national study of young people aged 9 to 13 years found that 61.5% do not
13 participate in any organized PA during their non-school hours (Duke, Huhman, & Heitzler,
14 2003). Further evidence has shown that PA declines between childhood and adolescence
15 (Grunbaum et al., 2004; Sallis, 2000), and girls have been found to engage in less PA
16 compared to boys (Berkey, Rockett, Gillman, & Colditz, 2003; Pate, Pfeiffer, Trost, Ziegler,
17 & Dowda, 2004). The alarming decline in PA during adolescence, particularly among young
18 females, presents an important challenge to researchers and professionals in health and PA
19 (Duncan, Duncan, & Strycker, 2005).

20 Parents are an important source of influence on their children's PA (Edwardson &
21 Gorely, 2010). However, as children move towards adolescence (roughly the period between
22 ages 10 and 19 years), they spend increasing time with peers enhancing the potential for the
23 norms and behaviours of peers to influence PA (Duncan, Duncan, Strycker, & Chaumeton,
24 2007). Adolescents' experiences with peers in PA can be explored at several levels of social
25 complexity, ranging from an individual's social orientation and perceptions to their

1 interactions, relationships, and group level processes (Smith, 2003). Adolescents' physical
2 and socio-emotional competencies are developed through engaging in team sports with their
3 peers as well as other physical and leisure activities, such as physical education (Salvy et al.,
4 2008). The peer relationships and friendships that are developed through this PA offer
5 important opportunities for companionship, support, and recreation. Peer victimization and
6 social isolation, on the other hand, may impose constraints on access to physical activities
7 (Storch et al., 2006). Considering the potential role that peers and/or friends' influences may
8 have on adolescents' PA, a comprehensive understanding and synthesis of the research that
9 has been carried out in this area is needed.

10 Past research in this area has varied considerably in the manner by which 'peers' or
11 'friends' are operationalised. The term 'peers' has been referred to in the literature as youths'
12 best and closest friends (Kobus, 2003), friends (Springer et al., 2006), best friend on a team
13 (Cox, Duncheon, & McDavid, 2009), an unfamiliar peer (Mallet & Lallemand, 2003), and
14 members of reputation-based peer crowds (Strauss, Rodzilsky, Burack, & Colin, 2001). For
15 the purpose of the present review, a 'peer' can be defined as a person who is equal to another
16 with respect to certain characteristics such as skills, educational level, age, background, and
17 social status (Reber & Reber, 2001, p.518), whereas, a 'friend' can be defined as a person
18 with whom one has a bond of mutual affection (Adams, Blieszner, & De Vries, 2000). Given
19 that 'peers' and 'friends' have been operationalized in different ways in previous research,
20 the present review considers articles examining the relationship between peer and/or friends'
21 influence and PA among adolescents.

22 Researchers have considered a number of factors in the peer and/or friend domains
23 that may be related to PA behaviors among adolescents including: social support for PA,
24 presence of peers or friends during PA, peer norms, peer acceptance and friendships, peer
25 crowd affiliation, and peer victimization. Social support can be defined as "all those forms of

1 support provided by other individuals and groups that help an individual cope with life”
2 (Reber & Reber, 2001, p. 691). In the physical activity literature, social support refers to
3 tasks or steps that significant others take to facilitate behavior. There are different types of
4 peer support for physical activity including instrumental and direct support (e.g., peers or
5 friends doing physical activity with the adolescent); emotional and motivational support (e.g.,
6 peers providing encouragement or praise for physical activity); or observational support (e.g.,
7 peer modeling of physical activity). Another aspect of the peer social context important to
8 consider in relation to PA is whether or not youth engage in more activity when in the
9 presence or company of peers and close friends than when alone. Peer norms, defined as
10 perceptions of peers’ approval for PA, may also be associated with PA (Baker, Little, &
11 Brownell, 2003). Friendship sport quality and peer acceptance are other processes through
12 which peers and/or friends may have an influence on PA. Friendship describes a close
13 relationship between two individuals that is reciprocal in nature and defined by certain
14 qualities such as companionship, loyalty, and esteem enhancement. Peer acceptance, also
15 referred to as popularity, peer status, or social acceptance, describes how the peer group (e.g.,
16 teammates, classmates) feels about a specific individual in that group (Stuntz & Weiss,
17 2009). Distinction between these constructs is important because although adolescents who
18 have strong friendships may also demonstrate favorable peer acceptance, some adolescents
19 may have a close friend but feel low acceptance by the broader peer group or vice versa (i.e.,
20 popular with their peer group but does not have a close, intimate friend). Peer crowd
21 affiliation is another aspect of the peer context that has recently been looked at in relation to
22 PA. Peer crowds are large groups of peers who are defined by their similarity in interests,
23 appearance, or attitudes (Brown, 1990). Peer crowd affiliations provide the adolescent with a
24 sense of identity and belonging, and opportunities for social interactions and examples of
25 common peer crowds include ‘populars’, ‘brains’, and ‘jocks’ (Brown, 1990; La Greca &

1 Prinstein, 1999). Peer victimization, the experience of being a target of peers' aggressive
2 behavior (Storch & Ledley, 2005), is another peer process that may be related to lower levels
3 of activity among adolescents. The current review will synthesis the existing literature on
4 each of these peer processes and provide a more comprehensive understanding of how peer
5 and/or friends' influence may be related to physical activity behaviors among adolescents.

6 Efrat (2009) reviewed research on the relationship between peer and/or friends'
7 influence and PA behaviors among children, however, Efrat's review focused solely on
8 studies with elementary school children (aged 6 to 12 years). Given that the influence of
9 peers and friends become increasingly important as children move into adolescence and gain
10 increased autonomy (Steinberg & Monahan, 2007), it is particularly worthwhile to examine
11 peer and/or friends' influence on PA among adolescents. Adolescents have larger networks
12 of peers than children as well as more stable, intimate, and supportive friendships that occupy
13 more time and have more influence over attitudes and behaviors (Prinstein, Brechwald, &
14 Cohen, 2011). The present paper, therefore, expands on the existing literature by providing a
15 review of research on peer and/or friends' influence on PA behaviors among adolescents.
16 While there have been many studies carried out investigating peer and/or friends' influences
17 on adolescents' PA, there has not yet been a systematic review of such research. This paper
18 is, therefore, a necessity in this area of study. Specifically, the paper will review studies that
19 include adolescents aged between 10 and 18 years. Although a number of the articles
20 reviewed included children as young as 8 years of age, the mean age of participants in these
21 studies ranged from 10 years to 12.9 years (Gray, Janicke, Ingerski, & Silverstein, 2008;
22 Rittenhouse & Barkley, 2009; Storch et al., 2006). It was decided, therefore, that the samples
23 of these studies were satisfactorily relevant and deemed appropriate to include the studies in
24 the current review.

25

Method

1 **Search**

2 Potentially relevant studies were located by searching electronic databases for primary and
3 review articles. The following databases were searched to identify studies for the current
4 review: Academic Search Premier (EBSCO), Applied Social Sciences Index, PsychINFO,
5 Psychology + Behavioral Sciences Collection (EBSCO), PubMed, ScienceDirect, Web of
6 Science, and Wiley Interscience Journals. All databases were searched using a combination
7 of the following search terms: PA, physical exercise, sports, adolescents, youth, friends,
8 peers, peer influences, friendships, modeling, norms, support, peer victimization, correlates,
9 and determinants. The titles and abstracts of the identified articles were then screened for
10 relevance against the inclusion criteria. Each article was retrieved in its entirety and
11 screened to determine whether it met all of the inclusion criteria (see below). The reference
12 lists of the identified studies were then screened for any additionally relevant articles.

13 **Inclusion and Exclusion Criteria**

14 An initial search of the literature yielded a sparse body of research examining peer influences
15 on PA among adolescents conducted outside of the US. Four of these studies were conducted
16 in the UK, including two qualitative and two quantitative (Coppinger, Jeanes, Dabinett,
17 Vogele & Reeves, 2010; Gosling, Stainistreet, & Swami, 2008; Jago et al., 2009; Lubans,
18 Sylva, & Morgan, 2007), and two were conducted in Australia (de la Haye, Robins, Mohr, &
19 Wilson, 2010; de la Haye, Robins, Mohr, & Wilson, 2011). Given that research into peer
20 correlates of adolescents' PA outside of the US is limited, the authors decided that it was not
21 justifiable to make cross-cultural comparisons between the small body of research in other
22 countries and the enormity of research in the US. Therefore, the present review focused
23 solely on studies conducted in the US. For inclusion, studies were required to: (1) include
24 adolescents (aged 10-18 years old or a mean age within these boundaries); (2) be conducted
25 with adolescents in the US; (3) examine the relationship between friends' and/ or peer

1 influence and PA; (4) be published during or after the year 2000; and (5) be published in the
2 English language. Criteria for exclusion in the present review were studies that focused on
3 adolescents with a disability or clinical disorder, and studies outside of the US. Research
4 referenced includes samples of different ethnicities and educational and socioeconomic
5 backgrounds. There were a total of 23 studies sourced that met this final criterion.

6 **Data Extraction & Analysis**

7 Data from the included studies were independently extracted onto a standardized table
8 developed for this review. The following data were extracted: author and year of study, study
9 design, characteristics of participants (sample size, age, sex, ethnicity), measure of peer
10 influence, and PA measure. This information is summarized in Table 1. In addition, the type
11 of PA and peer influence for each study were extracted and the reliability and validity of PA
12 measures were reported where appropriate. In terms of the quality of PA measures used in
13 studies, 13 used self-report, 3 used previously validated questionnaires, 6 used objective, of
14 which 2 used both objective and self-report. One study did not use a measure of PA and
15 assessed perceptions' of sports enjoyment (Cox et al., 2009). The type of PA assessed in
16 these studies was varied and included: moderate-vigorous PA; vigorous PA; activity
17 intensity; PA for at least 60 minutes over the past 7 day; number of days physically active for
18 at least 60 minutes over a typical week; 7 day record of PA; no of steps/counts taken each
19 day; weekend and weekday PA; number of sports/sport teams participated in over the past
20 month; participation in activities on a regular basis; PA in a variety of situations and times;
21 and distance biked. Types of peer influences assessed included: peer support (praise,
22 encouragement, do activity with, transport, watch), peer norms, presence of peers during PA,
23 sport friendship quality, peer acceptance, peer crowd affiliation, and peer victimization.

24 **Results**

25 The studies included in the current literature review were systematically summarized and

1 evaluated to identify any relationship between peer and/or friends' influence and
2 adolescents' PA. A total of 23 published studies met the inclusion criteria (see Table 1). A
3 synthesis of the studies reviewed is presented below and is organized according to six
4 constructs to explain that the role peer and/or friends' factors play in PA among adolescents.

5 **Peer and/or Friends' Support**

6 Eight of the 23 articles reviewed provided evidence that peer and/or friends' social support
7 was associated with PA among adolescents. All of these studies employed cross-sectional
8 designs. Several studies investigated the role of peer and/or friends' support on PA levels
9 among adolescent girls. In a study among rural adolescent girls, Beets, Pitetti, and Forlwa
10 (2007) tested two models that examined the relationships between social support for PA from
11 mother, father and peers, self-efficacy, and PA. PA levels were determined by the three
12 following questions, Q.1 asked about vigorous physical activity (VPA), Q.2 asked how many
13 times over the past 7 days participants were physically active for a minimum of 60 minutes,
14 and Q.3 asked about organized sports participation. Model 1 detailed the sub-dimensions of
15 self-efficacy to mediate the relationship between social supportive behaviors and PA. Model
16 2 specified that self-efficacy for support seeking affected perceived levels of social support,
17 which in turn was related to PA. For both models, peer support was directly related to PA. In
18 addition, peer support was related to increased self-efficacy for overcoming barriers and
19 resisting competing activities. The findings suggest that having peers that promote PA
20 involvement and the perception that one's peers are open to PA are linked with efficacious
21 beliefs of one's ability to overcome potential hindrances (i.e. feeling tired, poor weather
22 conditions) to participating in physical activities. Peers, but not mother or father, were the
23 only provider of support associated with physical activity. This study confirms the findings
24 of Beets, Vogel, Forlwa, Pitetti, and Cardinal's (2006) study which also demonstrated that
25 peer support, but not parent support, was related to PA among younger adolescent boys and

1 girls. PA was assessed with the same self-report questions used by Beets et al. (2007).
2 Voorhees and colleagues (2005) studied the role of peer social network factors in influencing
3 PA levels among 6th and 8th grade girls. An adapted version of the Physical Activity
4 Questionnaire for Older Children (PAQ-C) was used to assess the child's physical activity in
5 a variety of situations and times. Both validity and reliability for the PAQ-C has been
6 demonstrated. The study found that adolescent girls who had more physically active friends
7 reported higher activity levels. Most activity-related peer social network items (i.e. peer
8 involvement in doing activity, participating in a class or on a sports team with a friend,
9 having a friend ask you to be active, and asking the friend to be active with you) were
10 positively associated with increased activity among adolescent girls. In an additional cross-
11 sectional study, Springer, Kelder, and Hoelscher (2006) used the Self-Administered Physical
12 Activity Checklist (SAPAC) to assess intensity, duration and types of physical activity, as
13 well as the moderate-to-vigorous PA (MVPA) scale to sum minutes of activities
14 corresponding to these intensity levels, and vigorous PA (VPA). The SAPAC was previously
15 validated with sample of 5th grade students. The researchers found that both family and friend
16 social support indicators (encouragement and PA participation) were associated with MVPA
17 among adolescent girls. Friend encouragement, however, was the only variable related to
18 VPA.

19 There is evidence that the relationship between peer activity support and PA differs
20 for young people at high versus low risk of physical inactivity. Davison and Schmalz (2006)
21 found that associations between activity support and PA was moderated by risk status among
22 young adolescents. Three self-report measures were used to assess participants' physical
23 activity including the Children's Physical Activity scale, an activity checklist, and the
24 physical activity subscale of the Physical Self Description Questionnaire. The study found
25 that associations between activity support from parents and friends and PA were stronger for

1 adolescents at high risk for physical inactivity (including girls, overweight youths and youths
2 with low perceived sport competence) than low risk adolescents. These results suggest that
3 youths at risk of physical inactivity may be more responsive to activity-related support than
4 youths at low risk.

5 Two studies assessed PA with both subjective and objective measures. In these
6 studies, parents completed surveys and participants completed a daily record of physical
7 activities and also wore a pedometer to record the number of steps taken each day. Duncan
8 and colleagues (2007) examined the influence of different sources (parents/ caregivers,
9 siblings, friends) and types of social support (encouragement, do with, watch, talk, transport)
10 on PA among young adolescents. The study found that friend support was the source of
11 support most highly related to PA. In another study, correlates of VPA were examined for
12 children in grades 1 to 12 and parent-reported and objectively measured PA were compared
13 (Sallis, Taylor, Dowda, Freedson, & Pate, 2002). Peer support was significant for
14 adolescents in grades 7 to 12 in parent-reported analyses of VPA and was also significant for
15 older males in grades 7 to 12 in analyses of the objective measure of VPA. Peer support was
16 the only significant correlate of objectively monitored activity among older males. These
17 studies demonstrated that peer support was associated with both subjective and objective
18 measures of PA. Given the cross-sectional nature of studies examining peer support for PA,
19 the interpretation of the impact of peer support on PA is limited.

20 [Insert Table 1 Here]

21 **Presence of Peers and/or Friends**

22 Three experimental studies examined whether the presence of peers and friends was related
23 to an increase in PA among adolescents. In the first of these studies, Salvy, Bowker,
24 Roemmich et al. (2008) investigated whether the presence of peers, close friends, and family
25 members was associated with PA intensity among overweight and lean adolescents. The

1 study used an experience-sampling methodology with two-way pagers to record participants'
2 activity intensity, activities they were engaged in, and the presence of others. This study
3 showed that adolescents were more likely to report more intense PA when in the company of
4 peers or close friends than when alone. Overweight adolescents also reported greater PA
5 when in the presence of peers than did lean adolescents; however, overweight adolescents
6 also reported more time spent alone. Gender differences were also found. Boys engaged in
7 less intense activity in the presence of family than when they were with peers. Girls engaged
8 in more intense activity in the presence of family than friends. This was one of the few
9 studies to examine gender differences in the role of peers and friends on PA among
10 adolescents. Given that it was experimental in nature, there is some evidence that the nature
11 of the relationship between peers and/or friends and PA may differ between boys and girls.
12 In another laboratory-based study, Salvy, Roemmich, Bowker et al. (2009) tested whether the
13 presence of a peer or a friend increases the motivation to be physically active in overweight
14 and non-overweight youth. Youth motivation to be physically active as a function of the
15 social context was measured using a computerized relative reinforcing value task to earn
16 points exchangeable for physical and/or sedentary activities. Findings showed that the
17 presence of a friend increased overweight and non-overweight youths' motivation to be
18 physically active and their PA intensity (i.e. distance biked). The presence of an unfamiliar
19 peer increased overweight youths' motivation to be physically active and their PA intensity
20 but this was not the case for lean youths. Participants also reported greater PA when in the
21 presence of a friend than when alone. In line with this finding, Rittenhouse and Barkley
22 (2009) found that at-risk-for-overweight boys were less active than lean boys when alone but
23 as active when a peer was present in an experimental study. Additionally, the presence of a
24 lean peer significantly increased the at-risk-for-overweight boys liking for that activity
25 session.

1 **Peer Norms**

2 Normative beliefs concerning PA may affect activity behavior in adolescents. In a two-week
3 longitudinal study, Baker, Little, and Brownell (2003) examined the association between peer
4 norms and PA among adolescents aged 13-17 years. Peer normative beliefs were assessed
5 with the item 'my friend would approve of me being physically active' ($\alpha = .75$). Self-
6 reported PA was assessed two weeks later. Findings revealed that adolescents' boys and girls
7 perceptions of peer norms predicted their attitudes toward PA. Additionally, boys' but not
8 girls' perceptions of their peer norms predicted their intentions to engage in PA. Further
9 research is warranted to examine gender differences in the role of peer norms in influencing
10 PA.

11 **Friendship Quality and Acceptance**

12 Seven of the 23 articles reviewed demonstrated that friendship quality and peer acceptance
13 were associated with enjoyment and motivation for PA among adolescents. There were six
14 cross-sectional studies and one longitudinal study. Friendship quality and acceptance were
15 manifested by quality of friendship in sport and perceived peer acceptance in all seven
16 studies. Ullrich-French and Smith (2009) employed a longitudinal design to assess factors of
17 youth soccer club members' relationships and motivations in one season and tracked the
18 same youths' continued soccer participation behavior a year later. This study found that more
19 positive friendship quality and peer acceptance provided a source of support for soccer
20 continuation in youth soccer players. Greater perceived competence was of most importance
21 in terms of continuation and more positive friendship quality and the combination of mother
22 relationship quality and peer relationships predicted soccer continuation on the same team.
23 Tying in with Ullrich-French and Smith's (2009) finding that perceived competence is
24 important in terms of sports continuation, Stuntz and Weiss's (2009) study of middle school
25 students' social orientations found that peer acceptance and close friendships were central to

1 perceived competence. Weiss and Smith (2002) employed a quantitative measurement of
2 sport friendship quality in tennis players aged 10 to 18. Results suggested that junior tennis
3 players who had similar beliefs and interests, companionship, pleasant play, and conflict
4 resolution with their best tennis friends perceived their experiences as more fun and
5 pleasurable and were psychologically committed to continued participation in the sport. Age
6 and gender differences were also noted; younger players (10 to 13 years) rated
7 companionship and pleasant play higher whereas older players (14 to 18 years) placed more
8 importance on loyalty and intimacy, things in common, and conflict. Girls tended to rate
9 loyalty and intimacy, self-esteem enhancement and supportiveness, and things in common
10 higher than did boys, who rated conflict higher. Similar findings were also reported by
11 Ullrich-French and Smith (2006) with 10 to 14 year old youth soccer athletes. The Sports
12 Enjoyment Scale (Scanlan, Carpenter, Schmidt, Simons, & Keeler, 1993) was used to assess
13 participants' perceptions of enjoyment in a soccer team. Scanlan and colleagues have
14 demonstrated support for the reliability and validity of the measure with youth sport
15 participants. They found that more positive perceptions of friendship quality and peer
16 acceptance were associated with higher enjoyment and self-determined motivation.

17 Cox, Duncheon, and McDavid (2009) conducted a cross-sectional study with
18 physical education students in 6th to 8th grade. In line with Ullrich-French and Smith (2006),
19 a modified version of the Sports Enjoyment scale was used to assess students' enjoyment of
20 physical education activities. Results demonstrated that feelings of relatedness mediated the
21 association between peer relationship variables and self-determination motivation in physical
22 education. Cox et al. (2009) suggest that adolescents feel socially connected within the
23 setting. Specifically, the study found that students with strong close friendship qualities in
24 class, and who felt more accepted by their peers, experienced greater feelings of belonging,
25 and expressed more self-determination in their motivation. Peer acceptance was more

1 important than the quality of close friendships in terms of motivation.

2 Cox and Ullrich-French (2010) deduced that peer relationships can act as a buffer for
3 poor relationships with the teacher. PA was assessed with the PAC-Q also used by Voorhees
4 et al. (2005). Using a computerized cross-sectional survey analysis in order to identify
5 naturally occurring profiles of physical education students based on relationship
6 perceptions, the study found that teacher support is not required in terms of adaptive
7 motivation. Their study used a relationship variable cluster analysis. It was found that
8 certain combinations of relationships corresponded to differences in positive perceptions,
9 affect, and behavior. Positive relationships with peers and teacher reported the most
10 adaptive motivation. Solely having good relationships with peers (mixed profile), however,
11 still matched the positive relationship profile in terms of perceptions of competence, worry,
12 and PA levels. Cox and Ullrich-French (2010) supported the notion that a combination of
13 relatively high peer acceptance and a trend toward high friendship quality were the most
14 important relationship determinants of PA in a school setting.

15 Smith, Ullrich-French, Walker, and Hurley (2006) conducted a study in a youth
16 sports camp using a cluster analysis of friendship profiles. Self-report measures were used to
17 assess sports enjoyment (Sports Enjoyment Scale), perceived friendship sport quality (Sport
18 Friendship Quality Scale), sports' anxiety (Sport Anxiety Scale), self-presentation concerns
19 in one's sport (Self-Presentation in Sports Questionnaire), perceived competence, and
20 perceived peer acceptance in sports (subscales of the Self-Perception Profile for Children)
21 and support was provided for the reliability and validity of these measures. The study
22 observed five peer relationship profiles of youth sport participants. These profiles were based
23 on friendship quality, friendship conflict, and peer acceptance. The fully adaptive peer
24 relationship profile included high perceptions of acceptance, high perceptions of positive
25 friendship quality, and low perceptions of friendship conflict. The study found that more

1 adaptive relationship profiles yielded higher perceived competence, enjoyment, and self-
2 determined motivation relative to sport and concluded that peer relationship profiles are
3 motivationally salient in sport. It was observed that males were disproportionately
4 represented in the profile characterized by relatively low perceptions of peer acceptance and
5 positive friendship quality as well as having a tendency toward relatively low friendship
6 conflict.

7 **Peer Crowd Affiliation**

8 Another important aspect of adolescents' peer relations pertains to the larger peer crowds
9 which adolescents affiliate. MacKey and La Greca (2007) examined the association
10 between peer crowd affiliation and exercise among ethnically diverse adolescents.
11 Examples of peer crowds include 'populars' - those who are socially oriented and
12 outgoing, 'burnouts' - those who often get into trouble, and 'jocks' - those who are active in
13 sports and athletics. Self-reported exercise was assessed by asking about the number of
14 days during the past week that the adolescent engaged in heavy, light, and toning exercise,
15 and on how many sports teams the adolescent played during the past month. Peer crowd
16 affiliation contributed significantly to the prediction of exercise. Those adolescents who
17 affiliated with 'jocks' and 'populars' reported exercising significantly more than other
18 adolescents.

19 **Peer Victimization**

20 Peer victimization (the experience of being a target of peers' aggressive behavior) has
21 become increasingly recognized as an important and prevalent adolescent occurrence (Storch
22 & Ledley, 2005). Three cross-sectional studies provided evidence that peer victimization
23 among adolescents was associated with lower levels of PA. Faith, Leone, Ayers, Moonseong,
24 and Pietrobelli (2002) tested the association of weight criticism during PA (WCA) by peers
25 with attitudes toward PA and reported PA levels among adolescents aged 10 to 14 years. The

1 Activity Rating Scale (Sallis, Patterson, Buono, & Nader, 1988) which has demonstrated
2 good reliability and validity was used to provide a global index of perceived overall activity
3 relative to peers. The study found that WCA was more common among girls and among
4 heavier adolescents. WCA was associated with reduced sports enjoyment, reduced perceived
5 activity compared with peers, and reduced mild-intensity leisure activity. These associations,
6 however, were moderated by problem-focused coping skills such that the relationships were
7 attenuated in adolescents who were better able to cope with weight criticism. Storch et al.
8 (2006) examined the associations between peer victimization, psychosocial adjustment, and
9 PA among overweight and at-risk children and adolescents. The two-item PACE+ measure
10 was used to assess PA. The PACE+ assesses how many days participants' were physically
11 active for at least 60 min per day over the past 7 days, and how many days participants' were
12 physically active for at least 60 min per day over a typical or usual week. The PACE+ has
13 demonstrated stability and convergent validity with other measures of PA (Prochaska et al.,
14 2001). Peer victimization was negatively associated with PA and positively associated with
15 self-reports of depressive symptoms, anxiety, loneliness, and social physique anxiety.
16 Similarly, Gray et al. (2008) investigated the relationship between peer victimization, barriers
17 to PA (e.g., feelings of self-consciousness when engaging in PA, perceived ability to access
18 PA equipment), and PA among clinically overweight youths. PA was assessed with one item
19 measuring participants' perceptions of PA relative to their peers. Higher levels of parent
20 distress, peer victimization, and childhood depression were predictive of a variety of barriers
21 to PA, with peer victimization emerging as the strongest predictor of barriers. Barriers to PA
22 were found to mediate the relationships between peer victimization, parent distress, child
23 depression, and PA.

24 **Discussion**

25 The purpose of this review was to evaluate and synthesis existing research on the

1 relationship between peer and/or friends' influence and PA among adolescents in the US.
2 Twenty three studies were identified in total, of which 18 employed a cross-sectional design.
3 These studies were separated into six categories based on different types of peer processes
4 investigated including: peer and/or friend support, presence of peers and/or friends during
5 PA, peer norms, friendship quality and peer acceptance, peer crowd affiliation, and peer
6 victimization.

7 The studies reviewed provided evidence that there is a relationship between peer and/or
8 friend variables and adolescents' PA. The research consistently demonstrated that peer
9 support is associated with PA, and emerging evidence also indicates that the 'power' of peer
10 support to influence PA may be greater for at-risk/overweight youths than low-risk youths.
11 The presence of peers and friends during PA was also shown to be associated with PA. A
12 limited body of experimental research revealed that adolescents, particularly those who were
13 overweight, were more likely to report more intense PA when in the company of peers or
14 close friends than when alone. Peer norms were also found to be associated with adolescents'
15 attitudes to, and intention to engage in PA. Furthermore, research demonstrated that
16 friendship quality and peer acceptance in adolescence was crucial for sport continuation,
17 perceived self-competence, and enjoyment of PA. This indicates that adolescents' positive
18 relationships with their peers contribute significantly to PA participation. Good quality
19 friendships and a feeling of social connectedness with peers strengthen self-determined
20 motivation for adolescents in sport and enjoyment of PA was increased through having more
21 in common with one's peers. Acceptance and friendship quality, therefore, were highly
22 influential for adolescent PA. Peer crowd affiliation may also be related to PA levels among
23 adolescents and there is tentative support that peer victimization was negatively associated
24 with PA. Peer victimization, in particular, may create an environment where adolescents feel
25 more insecure about being active, worry about not being selected to participate on sports

1 teams, and have limited opportunities and support for PA; all of which may cause them to
2 avoid situations that involve PA.

3 **Practical Implications**

4 The utility of these findings, in an intervention context, lies with the promotion of peer
5 support for PA and the encouragement of peer acceptance, approval, and friendship in sports
6 to increase motivation and participation in PA. Furthermore, identifying and working with
7 adolescents' peer crowd affiliations and reducing peer victimization in PA may lead to
8 increases in PA. Peer support for PA may be enhanced by teaching adolescents how to ask
9 peers for assistance/participation in being active (i.e. support seeking). A program employing
10 this approach might focus on developing communicative and self-disclosure skills in peer-to-
11 peer relationships. Targeting inactive youth, particularly girls, and facilitating participation in
12 PA with their peers and friends may be another effective strategy to promote increased
13 activity. Using peer crowd affiliations to target adolescents at potential high-risk of physical
14 inactivity (e.g., those who affiliated with 'burnouts') might also help to improve PA
15 interventions. If interventions can be designed to focus on several peer and/or friend
16 components including peer facilitation of physical activities, the identification of peer crowd
17 affiliations to target at-risk adolescents, and the encouragement of strong friendships among
18 adolescents playing team sports, increases in PA among adolescents may follow. Many
19 successful interventions targeting adolescents' inactivity are school-based (van Sluijs et al.,
20 2007), therefore, identifying ways to harness existing peer processes that influence and
21 support PA in this setting could increase program effectiveness. Some of the studies found
22 that peers may also feasibly have a negative influence on PA. For example, adolescents who
23 are the targets of weight criticism by peers may have reduced PA levels because of this.
24 Interventions targeting increases in PA should, therefore, include a psycho-emotional
25 component to address peer victimization. Implementing interventions using the strategies and

1 methods identified above may lead to increased and better maintenance of PA with
2 adolescents. Furthermore, the family, peer, and school environments have been identified as
3 contexts in which adolescents' health behaviors are established and maintained (Williams et
4 al., 2002). Therefore, social ecological models hold promise as a useful theoretical
5 framework for improvement in physical activity among adolescents.

6 **Measurement issues and protocol**

7 A variety of measurement approaches were used to assess peer correlates of PA in this
8 review. In a number of studies, measures of peer correlates included exploring self-report
9 levels and types of peer support during PA, such as encouragement (e.g., Beets et al., 2007),
10 active participation (e.g., Davison & Schmalz, 2006), and frequency of participation (e.g.,
11 Sallis et al., 2002). The presence of peers and close friends was assessed in experimental
12 research to draw inferences about role of peers (e.g., Salvy et al., 2008). Additionally,
13 perceptions of peer norms (Baker et al., 2003) and peer friendship sport quality (e.g., Smith et
14 al., 2006) were incorporated into the findings. Peer correlates were also formulized by
15 determining perceptions of the level of acceptance among peers for PA (e.g., Smith et al.,
16 2006) In terms of peer victimization, participants were asked to rate their experiences of
17 criticisms (e.g., Faith et al., 2002). Peer crowd affiliation was determined by associating
18 oneself with a peer crowd (MacKey & La Greca, 2007). Thus, peer correlates of PA were
19 assessed in a variety of ways, though mainly through self-report measures. Furthermore,
20 relatively few studies using self-report have used psychometrically valid measures to assess
21 peer variables associated with PA. Clearly, the use of a variety of assessment methods of peer
22 variables makes it difficult to draw reliable cross-study comparisons. Additionally, findings
23 from studies using self-report measures to assess peer variables may reflect adolescents'
24 perceptions of peer behavior rather than actual peer behavior. Another concern with
25 adolescent's reports of their peers' behavior is how accurately they report their peers'

1 thoughts, feelings, and behaviors. Inaccuracies may occur because of a failure to recall
2 important events, selective recall or bias, and in some cases, intentional distortions (Mash &
3 Wolfe, 2008). Consequently, the use of a multi-informant research design would be
4 worthwhile in future research as data collected from others such as close friends, peers, or
5 teachers would serve as useful adjuncts to the self-report methodology, and increase the
6 ecological validity of data.

7 Other design weaknesses in these studies are apparent, and may affect reported
8 findings. Both the type and measurement of PA varied across studies. Studies assessed
9 different types of PA including moderate PA (Strauss et al., 2001), moderate-to-vigorous PA
10 (Springer et al., 2006), and vigorous PA (Sallis et al., 1994). Furthermore, the measurement
11 of PA is not consistent across studies, because some studies employed self-report measures
12 (e.g., Gray et al., 2008), whereas, others employed objective measures such as
13 accelerometers (e.g., Strauss et al., 2001), activity monitors (e.g., Sallis et al., 2002), or
14 pedometers (e.g., Duncan et al., 2005). Even when PA outcomes are labeled in the same
15 way, the instruments used to assess these outcomes often differ across studies. For example,
16 Beets et al. (2007) assessed VPA using both objective and subjective measures, whereas,
17 Sallis et al. (1994) assessed VPA using a subjective measure. Such variability in
18 measurement instruments and protocols increases the likelihood that measurement error has
19 had an influence on study outcomes. Associations of behaviors may also vary depending on
20 the measure of PA used (Sallis et al., 2002). Additionally, some of the measures used to
21 assess PA were not assessed for reliability and validity (e.g., Beets et al., 2006; 2007). Fewer
22 significant associations would be expected in studies that relied on unvalidated self-report
23 measures of PA. Even with the use of objective measures of PA in studies, it is important to
24 note that accelerometers, pedometers, and activity monitors measure different aspects of PA.
25 Thus, consistent use of methods and tools would make comparisons more meaningful, as

1 would the reporting of validity and reliability for those tools and the consistent reporting of
2 effect sizes. A noteworthy contribution to this field would be to establish internationally
3 accepted objective measures of PA among young people (Edwardson & Gorely, 2010).
4 Finally, another measurement concern in some of the studies is the common use of self-
5 report measures to assess participants' ratings of peer correlates and PA (e.g., Beets, Pitetti,
6 & Forlaw, 2007), which may result in artificially inflated correlations among constructs
7 because of shared method variance.

8 Samples vary in their characteristics, with studies including participants of varied
9 weight status (Beets et al., 2007; Salvy et al., 2008; Salvy et al., 2009), locations (urban
10 versus rural) (Davison & Schmalz, 2006; Sallis et al., 2002), and ages (mean ages) (Beets et
11 al., 2007; Smith, Ullrich-French, Walker, & Hurley, 2006). In some instances, differences
12 exist in sample characteristics, yet consistency in findings is reported across those samples
13 (e.g., peer support (Beets et al., 2007; Springer et al., 2006), potentially reinforcing reported
14 associations due to this diversity. A small number of the studies utilized relatively small,
15 potentially non-representative samples (with 30 or less) (Rittenhouse & Barkley, 2009; Salvy
16 et al., 2008), and findings from these studies need to be interpreted with caution.
17 Measurement and analysis tools may not be sensitive enough to detect significant
18 associations in small samples. The use of larger samples may provide additional power to
19 allow for the detection of small yet significant associations previously concealed. Moreover,
20 the majority of studies included a predominantly Caucasian sample (with a minority of the
21 sample identified as African-American or Hispanic), and no study looked at ethnic
22 differences in peer and/or friend correlates of PA. Further research should include a more
23 ethnically diverse sample of adolescents with sufficient sample sizes for different ethnic
24 groups (e.g., African-American, Hispanic) in order to examine whether peer and/or friends'
25 influence on activity differ across ethnicities. In support of examining ethnic differences,

1 research has shown that correlates of PA differed among white and African American
2 adolescent girls (Ward et al., 2006).

3 **Recommendations for Future Research**

4 Prior research has varied considerably in the manner by which ‘peers’ are operationalised.
5 The various definitions of peers and friends across studies limit comparability of data in this
6 review, therefore, a future recommendation would be to establish a uniform definition of
7 peers so that comparisons of findings can be made across studies. The authors suggest that a
8 distinction needs to be made between ‘peers’ and ‘friends’ in the physical activity literature.
9 The authors recommend that ‘peers’ are defined as those individuals who are equal to
10 another with respect to some characteristics such as skills, educational level, background,
11 and social status, whereas, a ‘friend’ is defined as a person with whom one has a bond of
12 mutual affection. The distinction between ‘peers’ and ‘friends’ is important because the
13 behaviour and processes of peers and friends may differ in terms of their influence on
14 physical activity behaviors.

15 As seen from the current review, past research has offered an important contribution
16 by demonstrating the important role of peers and/or friends on PA. Further work, however, is
17 required to more fully understand peer and friend influences on adolescents’ PA. The
18 dominance of samples from the US has restricted opportunities for cross-cultural
19 comparisons and it is not clear whether associations found in these studies may be applicable
20 to, for example, European countries. Studies conducted outside the US are necessary to
21 provide more conclusive results for the role of peer and friend variables in different cultural,
22 social, and physical environments. Thus, findings must be considered in relation to the socio-
23 cultural context of adolescents’ physical activity behaviors in the US. Obesity is rising at an
24 alarming rate among American adolescents (Ogden, Carroll, Curtin, & Lamb, 2010), and an
25 increased risk of obesity in adolescence has been linked with insufficient PA (Troost, Kerr,

1 Ward, & Pate, 2001). Reports indicate that most adolescents fall short of the PA
2 recommendations for Americans of at least 60 minutes of aerobic PA each day, as only 18%
3 of adolescents aged 13-18 years meet this recommendation (USDHSS, 2008). In the US,
4 several studies have shown that PA among adolescents is associated with parental variables
5 (Edwardson & Gorely, 2010), access to equipment and facilities, availability of school PA
6 programs, community facilities and programs, socioeconomic status (e.g., income,
7 education). A more detailed investigation into why these variables are important in an
8 American context would be worthwhile.

9 The present review comprehensively evaluated the published studies of peer and
10 friends' influence on adolescents' PA over the past decade. Eighteen of these studies
11 employed cross-sectional designs, whereas, only three studies adopted experimental designs,
12 and two studies employed a longitudinal design. While cross-sectional studies are a practical
13 method for identifying associations between variables (Mann, 2003), a limitation of the
14 available research is that the majority of studies have employed cross-sectional designs to
15 examine the relationship among these variables. Cross-sectional studies do not allow for
16 causal inferences and the development of more experimental and longitudinal studies is
17 needed before firm conclusions can be drawn about the specific peer and friend variables that
18 influence adolescents' PA. Experimental studies can also provide a greater insight into the
19 variables that demand greater focus for adolescent PA programmes. A further examination
20 into gender is also needed as, although some cross-sectional studies found that peers had a
21 particularly important impact on girls' PA, little research has investigated this relationship in
22 comparison to boys. Furthermore, an experimental study reported conflicting results, that
23 girls engage in more exercise when in the presence of family members than friends (Salvy et
24 al., 2008). Other factors that were mentioned in a minority of studies and warrant further
25 investigation were that younger adolescents may put greater emphasis on the peer

1 relationship compared to older adolescents, older adolescents may view peer conflict as
2 having an impact on their PA, and at-risk or overweight adolescents may also find peer
3 influences to be of significant importance in their PA behaviors when compared to normal
4 weight adolescents.

5 **Conclusion**

6 Findings from this research lend support to the view that peers and friends play an important
7 role in adolescents' PA levels. All of the studies under review found that peers and/or friends
8 had a direct association with PA. This association was positive in terms of peer support,
9 presence of peers and/or friends, peer norms, friendship quality, peer acceptance, and peer
10 'jock' and 'popular' crowd affiliation and negative in terms of peer victimization. In
11 summary, peers and friends need to be involved in adolescents' PA in a variety of ways if
12 adolescents are to lead a physically active lifestyle. This critical review has highlighted
13 limitations of existent research and offered suggestions for furthering our understanding of
14 each set of processes. In light of the poor levels of PA among adolescents (USDHHS, 2008),
15 the prominent role that peers and friends play in PA deserves further attention. These
16 findings suggest that there is merit in promoting the importance of PA amongst peers and
17 friends in order to increase their PA levels.

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Authors	Study Design	Characteristics of Study Participants	Relationship between PA and Peer and/or Friend's Influence	Measures Assessing PA	Subjective or Objective	Main Findings
Baker, Little & Brownell (2006)	Two-Week Longitudinal	N=279 (197 girls & 82 boys) M=14.95yrs, SD=.65, Ethnicity = 89.15% European American, 5.35% Asian American, 2% African American, 1% Hispanic American	Peer normative beliefs for PA	PA was assessed two-weeks after the initial questionnaire was administered. PA was assessed with the Godin Lesiure-Time Exercise Questionnaire which has demonstrated validity. Participants provided with number of times over the past 2 weeks that they engaged in strenuous, moderate, and light activity. Activity was also assessed with 6 additional items (alpha=.88). Over the past two weeks, on how many days did you..” followed by the options a-e: “exercise for at least 15 minutes”, “do something active with your friends during your free time”, “try to stay physically fit”, “do exercises to strengthen/tone muscles”, and “do active instead of non-active things”. The sixth question asked Over the past two weeks, how active have you been?	Self-report	Peer norms predicted attitudes about PA. Peer norms directly predicted intentions for boys but not for girls.

Beets, Pitetti, & Forlaw (2007)	Cross-sectional	N = 259 girls, M = 15.5yrs, SD = 1.2, Ethnicity = 84.2% Caucasian, 1.4% African American, 14.4% Other	Social support for PA (praise, encourage, do activity with, transport, watch) from 3 providers: mom, dad, and peers.	Typical PA levels were determined by 3 questions. Q. 1 asked about vigorous physical activity (VPA). Q. 2 asked how many times over the past 7 days participants were physically active for a minimum of 60 mins. Responses ranged from 0 to 7 or more times per week for both questions. Q. 3 asked about organized sports participation, either through the school or community. Each respondent indicated the number of sports they participated in during the previous month.	Self-report	Peers were the only provider of support associated with PA. Peer support was associated with increased self-efficacy for overcoming barriers and resisting competing activities to PA.
Beets, Vogel, Forlaw Pitetti & Cardinal (2006)	Cross-sectional	N = 363 (189 girls & 174 boys), Grade = 5th to 8th grade, M = 12.3 yrs, SD = 1.1, Ethnicity = 96% Caucasian, 4% Other.	Social support for PA (praise, encourage, do activity with, transport, watch) from 3 providers: mom, dad, and peers.	PA was assessed with the same 3 self-report questions used in the study above by Beets et al. (2007)	Self-report	The only support provider related to activity levels was that of peers. Boys reported greater social support than girls.

Cox, Duncheon, & McDavid (2009)	Cross-sectional	N = 411 (232 girls & 179 boys), Grade = 6 th to 8 th grade, M = 12.27 yrs, Ethnicity = 83% Caucasian, 17% Other.	Perceived sport friendship quality, perceived peer acceptance and perceived relatedness.	The Perceived Locus of Causality scale was used to assess self-determined motivation, because it measures four types of motivation regulation in physical education. The Sport Enjoyment Scale which measures perceptions of fun and happiness was modified to assess students' enjoyment of physical education activities.	Subjective	Relationships with both teachers and peers are important for students' relatedness perceptions, motivation, enjoyment, and worry in physical education. Perceptions of support and acceptance among peers contribute to students' feelings of self determination during physical education.
Cox & Ullrich-French (2010)	Cross-sectional	N = 249 (134 girls, 115 boys), Grade = 7 th to 8 th grade, M = 12.75 yrs, SD = .72, Ethnicity = 83% Caucasian, 17% Other.	Perceived sport friendship quality, perceived peer acceptance and perceived relatedness.	Intrinsic motivation identified regulation, introjected regulation, and external regulation were measured with a modified version of the Academic Self-Regulation Questionnaire. The Sport Enjoyment Scale was modified to assess students' perceptions of having fun engaging in different activities in physical Education. An overall indicator of students' activity levels was assessed with 5 items from the Physical Activity Questionnaire for Older Children.	Self-report	A combination of relatively high peer acceptance and a trend toward high friendship quality were the most important relationship determinants of physical activity in a school setting.

Davison & Schmalz (2006)	Cross-sectional	N = 202 (92 girls & 110 boys), Grade = 6th to 8th grade, M = 12.7 yrs, SD = .8 for boys, M = 12.5 yrs, SD = .8 yrs for girls.	Social support for physical activity from mothers, fathers, siblings and peers (e.g. friends do active things with them and admire people who are physically active).	Three self-report measures were used to assess PA. (1) the Children's Physical Activity (CPA) scale: general tendency to be physically active, (2) an activity checklist: participation in activities on a regular basis, (3) the physical activity subscale of the Physical Self Description Questionnaire: levels of PA. Research supports the predictive validity of the CPA, CPA $\alpha = .80$.	Self-report	High risk adolescents (which included girls, overweight youth and youth with low perceived sport competence) reported significantly lower levels of activity support from fathers and friends than low risk adolescents. Risk status moderated the association between activity support and physical activity.
Duncan, Duncan & Strycker (2005)	Cross-sectional	N = 372 (187 girls & 185 boys), M = 12.05 yrs, SD = 1.63, Ethnicity = 76% Caucasian, 12% African American, 12% Other.	Social support included the extent to which different people (parent/ caregivers, siblings, friends) provided different types of support.	The measures of PA included survey items and data from pedometers. Parents completed surveys in their home. For 7 days prior to the survey assessment, children completed a daily record of physical activities and wore a pedometer to record the number of steps taken each day.	Both	Perceptions of increased support from friends, and youth who perceived their parents, siblings, and friends watched their PA more, had higher levels of physical activity. The source of support most highly related to physical activity was friends.

Faith et al. (2002)	Cross-sectional	N = 574 (305 girls & 269 boys), Age range = 10 to 14 yrs, Grade = 5 th to 8 th , M = 11.6 yrs, SD = 1.24, Ethnicity = 87.2% Caucasian, 1.2% African-American, 11.6% Other.	Peer victimization and weight criticism during PA.	The Sports Enjoyment Questionnaire was used to measure the extent to which respondents find sports participation enjoyable. The Activity Rating Scale provided a global index of perceived overall activity relative to peers. The Godin-Shepard Physical Activity Survey measured the frequency with which subjects engage in light-, moderate-, and strenuous-intensity activities during a 1-week period.	Self-report	Weight criticism during physical activity (WCA) was more common among girls than boys and among heavier children. WCA was associated with poorer sports enjoyment, reduced perceived activity compared with peers, and reduced mild-intensity physical activity.
Gray et al. (2008)	Cross-sectional	N= 95, Age range = 8 to 17 yrs, M =12.84 yrs SD =1.79, Ethnicity = 51.6% Caucasian, 29.5% African American, 18.9% Other.	Barriers to participation in PA and peer victimization.	The Barriers to Physical Activity Scale is a 21-item measure that was used to assess children's perceived barriers to PA. Physical Activity was assessed by asking "Compared with other kids your age and sex, how much physical activity do you get?"	Self-report	Children with more self-reported barriers to PA report engaging in less PA. Social and fitness barriers domains were significantly associated with self-reported PA. PV is related to individual barrier domains, as well as total barriers to PA. PV causes children to feel more self-conscious about being active, worry about not being selected to participate on sports teams or have limited opportunities and support for PA.

Mackey & LaGreca (2007)	Cross-sectional	<p>N = 705 (465 girls & 240 boys),</p> <p>Age range = 14 to 19 yrs, M = 15.51 yrs, SD = 1.03,</p> <p>Ethnicity = 16% Caucasian, 25% African American, 59% Other.</p>	Peer crowd affiliation was determined by asking adolescents how much they identified with each peer crowd. Common peer crowds were listed such as “jocks”, “brains”, “populars”, “burnouts”, and “alternatives”.	Exercise items from the Youth Risk Behavior Surveillance System (YRBSS) were used to measure PA. Adolescents completed four items from the YRBSS. The items asked about the number of days during the past week that the adolescent engaged in heavy, light, and toning exercise, and on how many sports teams the adolescent played during the past month. The PA scale demonstrated adequate internal consistency in this sample, $\alpha = .66$	Self-report	Controlling for gender and ethnicity, adolescents affiliating with “Jocks” and “Populars” reported engaging in more exercise compared to other peer crowd groups.
Sallis, Taylor, Dowda, Freedson, & Pate (2002)	Cross-sectional	<p>N = 781 (406 girls & 375 boys),</p> <p>Age range = 6 to 18 yrs,</p> <p>Grades = 1st to 12th,</p> <p>Note: For this review, the authors focus on the results for children in grades 7 to 12.</p> <p>Ethnicity = 76% Caucasian, 24% Other.</p>	Peer support included the frequency that child’s five closest friends are physically active, friends encourage to be active and friends are active with participant.	<p>VPA was assessed by parent reports of child’s PA and potential correlates of youth activity in demographic, psychological, social, and physical environmental domains.</p> <p>Children wore an activity monitor to estimate the child’s PA over seven days, whereby 46 physical activities and sedentary behaviors were listed. Children indicated whether the activity was done and if so, on how many days and how many min per day. Additional questions were asked about sports team participation and activity classes.</p>	Both	For boys and girls in grades 7 to 9, both use of recreation time and peer support were associated with VPA. For boys in grades 7 to 12, peer support was a positive correlate of VPA. Peer support which was significant for adolescents in grades 7 to 9 in parent reported analyses was significant for boys in grades 7 to 12 in analyses of the objective measure.

Smith Ullrich-French, Walker, & Hurley (2006)	Cross-sectional	N = 243 (86 girls & 157 boys), Age range = 10 to 14 yrs, M = 11.6 yrs, SD = 1, Ethnicity = 92.2% Caucasian, 5% Other.	Perceived sport friendship quality and perceived peer acceptance.	Enjoyment of one's sport was assessed using the Sport Enjoyment Scale. The four items of the scale were tailored to the specific sport of the participant. Motivation for participation in sport ranging on a self-determination continuum was assessed using a modified version of the Sport Motivation Scale (SMS).	Self-report	The more adaptive relationship profiles yielded higher perceived competence, enjoyment and self-determined motivation relative to sport.
Springer, Kelder, & Hoelscher (2006)	Cross-sectional	N = 718 girls, Age range = 10 to 14 yrs, Grade = 6th grade, M = 11.6 yrs, SD = .39, Ethnicity = 72% Caucasian, 28% Other.	Family and friend social support for physical activity.	The Self-Administered Physical Activity Checklist (SAPAC) is a one-day recall of 22 common physical activities and assesses intensity, duration and types of physical activity. It was administered on three separate days, which included one weekend day and two weekdays. The SAPAC was validated with a multi-ethnic 5th grade sample. The Moderate-vigorous physical activity (MVPA) was used to sum minutes of activities corresponding to these intensity levels, and vigorous physical activity (VPA).	Self-report	Friend's PA participation and friend and family encouragement were positively related to MVPA. Both PA participation and encouragement (family and friend) were important for MVPA but (friend) encouragement had the strongest correlation with VPA. Friend's encouragement was the only variable related to VPA.

Storch et al. (2006)	Cross-sectional	N = 92 (54 girls & 38 boys) Age range = 8 to 18 yrs, M = 13 yrs, SD = 2.8, Ethnicity = 60.9% Caucasian, 32.6% African-American, 6.5% Other.	Peer victimization.	PACE+ Adolescent Physical Activity Measure was used for children to report how many days they were physically active for at least 60 min per day over the past 7 days, and how many days they were physically active for at least 60 min per day over a typical or usual week.	Self-report	Peer victimization (PV) was negatively related to PA. Depression & loneliness resulting from PV may cause to lower rates of PA because of diminished mood, depression-related fatigue, or a poor social-reinforcement history for exercise.
Strauss, Rodzilsky, Burack, & Colin (2001)	Cross-sectional	N = 82 (48 girls & 44 boys), Age range = 10 to 16 yrs, M = 13.2 yrs Ethnicity = 17% African American or Hispanic.	Social support from a family or friend for physical activity.	Levels of habitual physical activity were assessed with a biaxial accelerometer. Children were instructed to wear the monitor during waking hours for 1 week.	Objective	Increased levels of high activity were associated with increased social support from family or friends. Moderate activity was not associated with social from family or friends.

Stuntz & Weiss (2009)	Variable- centred analysis (correlational)	N = 302 (157 girls & 145 boys), Grade = 6 th to 8 th grade, Age range = 11 to 14 yrs, M = 12.57 yrs, SD = .89, Ethnicity = 81.8% Caucasian, 7.3% African American, 10.9% Other.	Friendship and group acceptance.	Sport enjoyment was assessed with the following items, “How fun is sports participation for you?”, “How much do you like sports?”, and “How much do you enjoy sports?” Participants completed a 28-item achievement goal orientation measure which was based on the Task and Ego Orientation in Sport Questionnaire. Participants completed the preference for challenge and independent mastery subscales of the Motivational Orientation in Sport Scale.	Self-report	Social orientations, successful friendships and being accepted by the peer group in combination with task and ego orientations, positively relate to enjoyment, perceived competence, and intrinsic motivation.
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Ullrich-French & Smith	Cross-sectional	N = 186 (87 girls & 99 boys), Age range = 10 to 14 yrs, M = 11.6 yrs, SD = 1, Ethnicity = 93% Caucasian, 2% African American, 5% Other.	Friendship quality and peer acceptance.	The Sport Enjoyment Scale was used to assess soccer enjoyment. The athletic competence subscale of the Self-Perception Profile for Children was used to assess perceptions of athletic ability and competence. Selected items from the Sport Motivation Scale (SMS) were used to assess motives for participating in soccer.	Self-report	More positive perceptions of social relationships were associated with more positive motivational outcomes.
(2006)						
Ullrich-French & Smith	Prospective	N = 186 (87 girls & 99 boys), Age range = 10 to 14 yrs, M = 11.7 yrs, SD = 1, Ethnicity = 92% Caucasian, 8% Other.	Perceived sport friendship quality and perceived peer acceptance.	Athletes completed soccer-contextualized measures of social relationships and motivation. Twelve items from the Sport Motivation Scale (SMS) was used to assess various motives for participating in soccer that fall on a self-determination continuum.	Objective	Perceived competence was the only self-motivational outcome to predict continuation. There was a main effect for friendship quality.
(2009)						

Voorhees et al. (2005)	Cross-sectional	N = 488 girls, Age range = 11 to 14 yrs, Grade = 6th to 8th grade, Ethnicity = 51% Caucasian, 18% African American, 31% Other.	The girls listed the initials of three closest friends to determine their social network. Subsequent items ask her questions about the participants' experiences in participating in PA with each of the 3 closest friends.	An adapted version of the Physical Activity Questionnaire for Older Children (PAQ-C) was used to assess overall activity patterns. The instrument assesses a child's physical activity in a variety of situations and times (e.g., school, recess, after school, evening, weekend). The psychometrics of the PAQ-C instrument include internal reliability of >.80 in several different studies. Evidence for validity has also been demonstrated.	Self-report	Higher levels of PA with friends was significantly related to self-reported PA. Adolescent girls who had more physically active friends report higher activity levels.
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Weiss & Smith (2002)	Cross-sectional	N = 221 (77 girls, 144 boys) Age range = 10 to 18 yrs, M = 13.8 yrs, SD = 2.3, Ethnicity = 93.2% Caucasian, 5% African American, 6.2% Other.	Age and gender differences in the quality of sport friendship and the relationship between friendship quality and motivation related variables.	Members of a tennis training programme completed the Sport Friendship Quality Scale (SFQS) which taps into six dimensions of friendship quality. Tennis Enjoyment and Commitment was completed assessing positive affect toward playing tennis.	Self-report	Junior tennis players who had similar beliefs and interests, companionship/pleasant play and conflict resolution with their best tennis friends found their experiences more fun and pleasurable.
Authors	Study Design	Characteristics of Study Participants	Relationship between PA and Presence of Peers	Measures Assessing PA	Subjective or Objective	Main Findings

Rittenhouse & Barkley (2009)	Experimental	N = 24 overweight & lean boys, Age range = 8 to 12 yrs, Ethnicity = Overweight boys (50% Caucasian) & lean boys (46% Caucasian, 4% African American.	Presence of peers	Children rated their liking of the sample and actual exercise protocols using visual analog scales (VAS). The ActiGraph GT1M Monitor was used to measure the number of counts or amount of activity. The amount of time each child spent performing each individual PA, the total amount of PA and the amount of time spent performing sedentary activities was recorded.	Objective	At-risk for/overweight boys were less active than lean boys when alone but as active when a peer was present. The presence of a lean peer significantly increased the at-risk-for/overweight boys liking for that activity session.
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Salvy, Bowker, Roemmich et al. (2008a)	Experimental	<p>N = 20 (10 girls & 10 boys),</p> <p>Age range = 12 to 14 yrs,</p> <p>M = 13.4 yrs,</p> <p>SD = .8,</p> <p>Ethnicity = 7% African-American, 11% Other.</p> <p>12 participants were between the 15th and 85th BMI percentile and 8 youth were at or above the 85th percentile</p>	Presence of peers	<p>Participants reported on their activity intensity and whether the activity was solitary or with others for seven consecutive days.</p> <p>Two-way pagers were used to measure intensity of activity.</p> <p>Participants reported on their activity intensity and whether their activity was solitary or in the presence of others.</p>	Objective	<p>The presence of peers and close friends was associated with higher activity intensity, and time spent alone was associated with youths' lower activity intensity.</p> <p>Adolescents were more likely to report more intense physical activity when in the company of their peers or close friends.</p> <p>Gender differences were also found. Boys engaged in less intense activity in the presence of family than when they were with peers. Girls engaged in more intense activity in the presence of family than friends.</p> <p>Overweight adolescents reported greater physical activity when in the presence of peers than did lean children; however, overweight children also reported more time spent alone.</p>
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Salvy, Roemmich, Bowker et al. (2008b)	Experimental	<p>N = 88 (44 girls & 44 boys),</p> <p>Age range = 12 to 14 yrs,</p> <p>M = 13 yrs,</p> <p>SD = 1,</p> <p>Ethnicity = 81% Caucasian, 12% African American, 6% Other.</p> <p>44 participants were between the 15th and the 85th BMI percentile and 44 youth were at or above the 85th BMI percentile.</p>	<p>Youth motivation to be physically active as a function of the social context (presence of a peer-unfamiliar peer or friend-child's friend).</p>	<p>Youth motivation to be physically active was measured using a computerized relative reinforcing value task to earn points exchangeable for physical and/or sedentary activities.</p> <p>PA was assessed by measuring the distance biked by participants. The number of pedal revolutions was recorded.</p>	Objective	<p>The presence of a friend increased youth's motivation to be physically active. The presence of an unfamiliar peer increased overweight youth's motivation to be physically active, whereas this was not the case for lean youth. Participants biked a greater distance in the presence of a friend than when alone. Overweight youth biked a greater distance in the presence of a peer than when alone, while this was not the case for lean youth.</p>
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