

The Influence of Social Support Specific to Physical Activity on Physical Activity Among College and University Students: A Systematic Review

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Background: Starting college or university is a significant life event that can impact students' physical activity (PA). Social support specific to PA (SSPA) is a social determinant of PA among college and university students. This review had 3 aims: (1) to systematically review studies examining the association between SSPA and PA among students; (2) to examine whether potential associations differed in terms of types or sources of SSPA; and (3) to examine whether any potential associations differed in terms of gender. **Methods:** Studies were identified using Academic Search Premier, PsycInfo, Sociological Abstracts, and SPORT-Discus. **Results:** This review included 25 papers. The results suggested that there is a positive association between SSPA and PA among college and university students. Although the importance of different sources of SSPA is not clear, the results suggested that family and friends provide significant SSPA. **Conclusions:** High variability in measurement methods made it difficult to compare studies and to come to a clear consensus. However, the findings suggested that SSPA may be a determinant of PA. In order to better understand the relationship between SSPA and PA among students, some elements, such as gender, socioeconomic level, and off- or on-campus housing, should be considered in future studies.

Keywords: health determinants, exercise psychology, active behavior, social relationships

Starting college or university is a significant life event that can induce a weight gain, a decrease in active behaviors, and an increase in sedentary behaviors.¹⁻⁴ According to a meta-analysis,⁵ about 40% to 50% of college students are physically inactive. Some reviews^{1,4} linked the weight gain during the first year of college and university to stress, drinking alcohol, unhealthy eating, and lack of physical activity (PA).

In order to encourage engagement in a more active lifestyle, it is important to understand the determinants of engagement in active behavior. A review of 38 articles describing factors associated with adults' PA participation divides these factors into 6 categories: (1) demographic and biological factors; (2) psychological, cognitive, and emotional factors; (3) behavioral attributes and skills; (4) social and cultural factors; (5) physical environment factors; and (6) PA characteristics.⁶ Many behavior change theories⁷⁻⁹ as well as health behavior adoption theories^{10,11} highlight the importance of psychosocial factors in the form of social support (SS) in initiating and/or maintaining active behavior change. In this review of 38 articles, SS was significantly correlated with PA in every study that included such a variable.⁶

The SS has been defined in numerous ways; one definition is any behavior that assists another person in achieving a desired goal.¹² This support for individuals can come from several sources within an individual's social network (eg, family, friends, coworkers). SS specific to PA (SSPA) can take several forms, such as emotional support (eg, encouragement, praise), informational support (eg, advice, instruction), or instrumental support (eg, equipment, financial aid).¹³ To these, modeling (influence of PA from a

source on PA of an individual) and coparticipation (eg, performing PA with another person) can be added, based on the PA literature.¹⁴

There have been a number of meta-analyses and systematic reviews of the literature on the influence of SSPA as a determinant of PA.¹⁴⁻¹⁶ According to a meta-analysis undertaken in adolescent girls,¹⁴ SSPA from friends, parents, and family had a small but positive relationship with PA, with similar associations in terms of magnitude for different providers and types of SSPA. With regard to older adults, higher amounts of SSPA from all sources combined and from family in particular were associated with higher levels of PA or with regard to meeting PA guidelines.¹⁶ According to a systematic review among healthy adults,¹⁵ there was a small positive association between support for PA from friends and future PA.

Despite the importance of this life event on health, as far as we know, no systematic review has been conducted on the influence of SSPA on PA among college and university students. The aims of this systematic review were to (1) systematically review and summarize studies examining the association between SSPA and PA among college or university students; (2) examine whether potential associations differed in terms of types or sources of SSPA; and (3) examine whether potential associations differed in terms of gender.

Methods

This systematic review followed the guidelines for the Preferred Reporting Items for Systematic Reviews and Meta-Analyses.¹⁷

Study Eligibility Criteria

Studies that examined the relationship between SSPA and PA among college and university students were included. No limitation with regard to dates of coverage was applied. Studies were included if (1) they related to at least one distinct group or subgroup of healthy college or university students (ie, a nonclinical sample),

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(2) they included a measure of SSPA as an independent variable, (3) they included a measure of PA as a dependent variable, (4) they examined the relationship between SSPA and PA, and (5) they were peer-reviewed studies published in English or French. Studies were excluded if (1) the students were recruited from physical education classes, (2) they did not include a measure of SSPA and a measure of PA, (3) they did not examine the relationship between SSPA and PA, (4) they included an interventional design about SS/social networks, or (5) they were not peer-reviewed studies published in English or French.

Search Strategy

Systematic searches of 4 databases (Academic Search Premier, PsycInfo, Sociological Abstracts, and SPORTDiscus) were conducted in January 2019. The search terms included a combination of target population, SSPA, and PA terms (see Table 1). Keywords and their associated terms were connected using Boolean operators AND and OR. The search strategy was adapted for each database.

Study Selection

Results of the database searches were imported into Endnote X9. Duplicates were removed. Titles were screened by one reviewer,

and clearly irrelevant citations were excluded. Two reviewers independently screened abstracts to remove papers that went beyond the scope of the study. Full articles were screened in detail by 2 reviewers to check that they met the inclusion criteria. Results were compared between the 2 reviewers and all disagreements were resolved by discussion.

Data Extraction

Data were extracted by 1 reviewer and included general study information, study design, participant characteristics, SSPA and PA measures, methods of analysis, and results.

Risk of Bias Assessment

The Critical Appraisal Skills Programme for cohort studies tool (www.casp-uk.net), used previously in other systematic reviews of the PA literature,^{14,15} was used to formally assess the risk of bias in each selected study. This appraisal tool was used independently by the 2 reviewers.

Four categories were identified relating to study sampling and instrument validation that may have posed a risk of bias to the type of studies likely to be included in the review, including selection bias, SSPA measurement bias, PA measurement bias, and confounding variables. For each of the categories, 3 qualitative ratings for evaluating the risks of bias were used—high, unclear, and low risk of bias.

Specifically, risk of selection bias was assessed by examining the method of sample selection and its representativeness in relation to the population targeted by the systematic review; if the sample was not representative of the population targeted or if the method of sample selection was not a guarantee of such representativeness, the study was scored as being at high risk of selection bias. SSPA and PA risks of measurement bias were assessed by determining whether or not a valid measure was used; if there was no use of a validated scale or if an originally validated scale was modified, studies were deemed to be at high risk of measurement bias. Confounding variable measurement bias was assessed in terms of whether or not the association between SSPA and PA was controlled for gender; if it was not, that study was scored as being at high risk of confounding bias. For each bias, if relevant information was not reported, the assessment was rated as unclear. The risk of bias assessment was not used to exclude. Disagreements between reviewers in the final ratings were resolved by discussion.

Data Synthesis

Studies were summarized by grouping together those that specified types of SSPA or not, sources of SSPA or not, or that reported differences in terms of gender. Studies that reported differences in results in terms of the types or sources of SSPA and gender were considered multiple times.

Results

Study Selection

Of the 852 papers identified in the search, 658 remained after removing duplicates. After screening titles and abstracts to remove papers beyond the scope of the study, 62 full-text papers were checked. Of these, 25 met the inclusion criteria. No additional paper was added from other sources. The detailed process of study

Table 1 Systematic Review Search Terms

Target population	Social support specific to physical activity	Physical activity
College	Social network	Active behaviour
Colleges	Social networks	Active lifestyle
College student	Social networking	Active living
College students	Social support	Exercise
Higher education	Support network	Exercises
Undergraduate	Support networks	Leisure activity
Undergraduates		Leisure activities
University		Motor activity
Universities		Motor activities
		Physical activity
		Physical activities
		Physical effort
		Physical efforts
		Physical exercise
		Physical exercises
		Physical fitness
		Physically active people
		Sedentary behaviour
		Sedentary lifestyle
		Sport
		Sports

selection is summarized in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram presented in Figure 1.

General Study Characteristics

The included studies were published between 1994 and 2017. Fourteen studies were conducted in the United States, 3 in Canada, 3 in Spain, 1 in Australia, 1 in South Africa, 1 in the United Kingdom, 1 in Japan, and 1 in Korea. Of the included studies, 22 were cross-sectional and 3 were longitudinal. Most studies incorporated both males and females, and 2 included females only.^{18,19} See Table 2 for details.

Risk of Bias Within Studies

Included studies were assessed for risk of bias (see Figure 2). As shown in the figure, most studies were at high risk in terms of selection (72%) and SSPA (68%) measurement bias or did not report the relevant information. Half of the studies (52%) were at high risk of PA measurement bias or did not report the relevant information. The majority of studies (60%) did not control for sex as a confounding variable in the risk of bias assessment.

Measurement and Analysis of SSPA and PA

The way in which the SSPA dimension was measured and analyzed varied widely between studies. The Social Support for Exercise Scale (SSES) developed by Sallis et al²⁰ was the tool most regularly used by researchers (44%), either in its original form or in a modified version.

The PA behavior that was measured and analyzed varied widely between studies. There were no articles that objectively measured the amount of PA. Most used self-reported measures of the amount of PA behavior (80%) and the stage of change to exercise questionnaire²¹ was used by 4 articles. See Table 2 for details.

Relationship Between SSPA and PA Depending on the Sources and Types of SSPA

To best fit the first aim of this review, the results were structured by grouping together the research specifying sources of SSPA or not and the types of SSPA or not. From this, 4 groups of articles were formed based on the nature of the relationship: unspecified sources and types, specified sources and unspecified types, unspecified sources and specified types, and specified sources and types of SSPA.

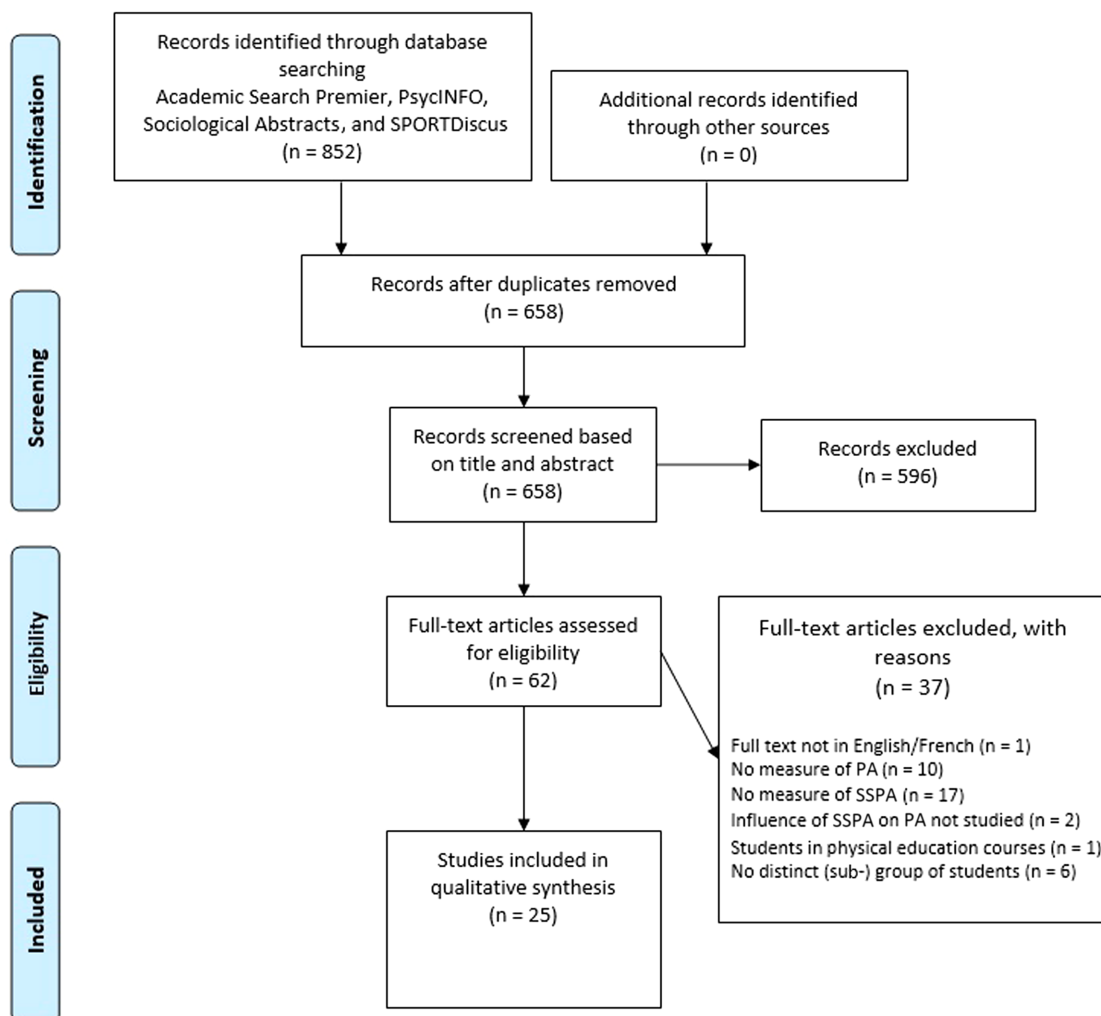


Figure 1 — Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram of selected studies. PA indicates physical activity; SSPA, social support specific to PA.

Table 2 Summary of Study Characteristics Included in the Systematic Review

Study (location)	Sample size		PA measurement Domains of PA	SSPA measurement Types of SSPA Sources of SSPA
	Gender	Age (y): range Age (y): mean (SD)		
Belanger and Patrick ²² (United States)	733 82.3% female None reported 19.28 (1.14) y		The Health-Promoting Lifestyle Profile-II PA subscale ⁴⁹ Engagement in PA behaviors	A modified version of Positive Social Influence Scale ^{44,47} Frequency of SSPA from family and friends Family: companionship, informational support, and esteem support Friends: companionship, informational support, and esteem support Average scores for family and friends combined, for family, for friends, and for each type of support
Darlow and Xu ⁴⁵ (United States)	220 56.4% female 18–26 y 18.9 y		Leisure-Time Exercise Questionnaire ⁵⁰ 3 questionnaires: participants' exercise, romantic partners' exercise, and best friends' exercise For each questionnaire: frequency of mild, moderate, and strenuous exercise International Physical Activity Questionnaire short form (2002) PA behavior: intensity and duration for aerobic PA and muscle-strengthening PA Inclusion criteria for the study: inactive people at the moment of the fieldwork	“How much support do you receive for participating in regular PA from the people closest to you?” Perceived social support from close others that can influence exercise habits
Farren et al ²³ (United States)	396 53.5% male 18–20 y 19.16 (0.77) y		International Physical Activity Questionnaire short form (2002) PA behavior: intensity and duration for aerobic PA and muscle-strengthening PA Inclusion criteria for the study: inactive people at the moment of the fieldwork	Social Support for Exercise Habits scale ²⁰ Family and friends
Gomez-Lopez et al ³⁶ (Spain)	323 32.5% male None reported None reported		International Physical Activity Questionnaire short version ⁵¹ Vigorous PA, moderate PA, walking, and sitting: frequency and duration Scores of energy expenditure Involvement in vigorous PA Vigorous PA, moderate PA, and strength training: number of days during a week Physical Activity Index: exercise intensity, duration, and frequency	CHDEV standardized questionnaire (Questionnaire for the Analysis of Sports Habits and Lifestyles) Barriers: reasons for being inactive
Kim et al ³⁸ (Korea)	216 56.5% female 17–29 y 21.7 (2.3) y		International Physical Activity Questionnaire short version ⁵¹ Vigorous PA, moderate PA, walking, and sitting: frequency and duration Scores of energy expenditure Involvement in vigorous PA Vigorous PA, moderate PA, and strength training: number of days during a week Physical Activity Index: exercise intensity, duration, and frequency	Social Influences Scale ⁴⁶ Family and friends
King et al ⁴² (United States)	480 66.2% female 17–29 y 19.68 (1.756) y		International Physical Activity Questionnaire short version ⁵¹ Vigorous PA, moderate PA, walking, and sitting: frequency and duration Scores of energy expenditure Involvement in vigorous PA Vigorous PA, moderate PA, and strength training: number of days during a week Physical Activity Index: exercise intensity, duration, and frequency	Perceived benefits, barriers, and cues for vigorous PA Parents: involvement in and encouragement of vigorous PA Peers: involvement in and encouragement of vigorous PA
Ler et al ³⁹ (Spain)	359 74.4% male None reported 20.4 (1.5) y		Physical Activity Index: exercise intensity, duration, and frequency	SSES ²⁰ Family and friends
Leslie et al ³⁴ (Australia)	2729 42.8% male 15–76 y 20 y		PA recall ⁵² Walking, moderate exercise, and vigorous exercise: frequency and average duration	Adapted from SSES ²⁰ Family and friends
Maglione and Hayman ²⁹ (United States)	95 79% female None reported 19.7% (1.57) y		International Physical Activity Questionnaire short version (2005) Vigorous PA, moderate PA, walking, and sitting: frequency and duration Scores of energy expenditure International Physical Activity Questionnaire short version ⁵¹ Vigorous PA, moderate PA, walking, and sitting: frequency and duration Scores of energy expenditure	SSES ²⁰ Family and friends
Marr and Wilcox ²⁴ (United States)	838 73.4% female None reported 21.4 (4.805) y		International Physical Activity Questionnaire short version ⁵¹ Vigorous PA, moderate PA, walking, and sitting: frequency and duration Scores of energy expenditure	Modified version of SSES ²⁰ Family and friends together

(continued)

Table 2 (continued)

Study (location)	Sample size Gender Age (y): range Age (y): mean (SD)	PA measurement Domains of PA	SSPA measurement Types of SSPA Sources of SSPA
Molina-García et al ⁴⁰ (Spain)	639 50.2% male 18–29 y 21.43 (2.78) y	LTPA Combined index: frequency and duration	Variable support of significant others Parents, friends, partner, and sports coaches
Molloy et al ³¹ (United Kingdom)	1418 62.6% female 16–62 y 22.2 y At baseline (prospective design)	Leisure-Time Exercise Questionnaire ⁵⁰ Strenuous PA: frequency	Adapted from SSES ²⁰ No specific source
Okun et al ⁴⁴ (United States)	363 62% female None reported None reported (younger than 18 y: 4%; 18 y: 46%; 19 y: 32%; and 20 y and older: 18%)	Leisure-Time Exercise Questionnaire ⁵⁰ Strenuous exercise, moderate exercise, and light exercise: frequency	Adapted from Social Influence on PA Questionnaire ⁴⁷ Companionship, esteem support, and informational support Friends
Petosa et al ³³ (United States)	350 63% female None reported 21 y	7-d recall of PA instrument ⁵³ Vigorous PA: mode, duration, and day during a week	SSES ²⁰ Family and friends
Rhodes et al ²⁵ (Canada)	192 72.4% female None reported 19.81 (4.05) y	Leisure-Time Exercise Questionnaire ⁵⁰ Mild, moderate, and strenuous exercise: frequency	Modified version of Social Provisions Scale for the exercise domain ⁵⁴ Attachment, social integration, reassurance of worth, reliable alliance, guidance, and opportunity to nurture SSES ²⁰ Family and friends
Rovniak et al ²⁸ (United States)	353 69% female 17–28 y 19.56 (1.39) y At baseline (prospective design)	Stages of Change for Exercise Behavior Scale ⁵⁵ Statement of current level of exercise Modified version of the Aerobics Centre Longitudinal Study Physical Activity Ques- tionnaire ⁵⁶ PA, energy expenditure, and number of PA modes over a week	Adapted from SSES ²⁰ Friends
Scarapicchia et al ³⁵ (Canada)	819 64% female None reported 18.28 (1.35) y At baseline (prospective design)	Moderate to vigorous PA participation International Physical Activity Questionnaire short version ⁵¹ Vigorous PA and moderate PA: frequency and duration	SS networks “How many of your family members participate in regular PA?” and “How many of your friends at university participate in regular PA?” Social Support for Exercise Survey ²⁰ Family and friends Tangible received SS drawn from the Social Support Survey ⁵⁷ “How many individuals provide you with financial assistance, products and/or gifts to be physically active?” and “How satisfied are you with the overall quality of financial assistance, products and/or gifts to be physically active?”

(continued)

Table 2 (continued)

Study (location)	Sample size Gender Age (y): range Age (y): mean (SD)	PA measurement Domains of PA	SSPA measurement Types of SSPA Sources of SSPA
Shifflet et al ⁴³ (United States)	138 40.6% male None reported Male: 22.2 (3.2) y; female: 24.3 (7.3) y	Adherence to an active lifestyle	"An active lifestyle is easier to develop when friends are interested in the same activities I am" and "An active lifestyle would be more enjoyable if I received support and encouragement from my friends"
Shores and West ⁴¹ (United States)	139 50% female 18–35 y None reported	Time allocated to LTPA Time diaries	"Who is involved with you in the main activity?"
Spivey and Hritz ³⁰ (United States)	1857 50.5% female None reported None reported (21.8% freshman, 26.2% sophomore, 27.4% junior, 21.2% senior, and 63.3% graduate)	Participation in various recreational sports on campus	Benefits and constraints to participation in recreational sports ⁵⁸
Ulvick and Spink ¹⁸ (Canada)	136 100% female None reported 20.9 (4.1) y	Activity involvement Modified version of Modifiable Activity Questionnaire ⁵⁹ LTPA: frequency, duration, and intensity for a week	Modified version of Social Provisions Scale for activity setting with others ⁶⁰
Van Niekirk ³² (South Africa)	370 63.5% female 18–22 y 20.2% (1.456) y	You and Exercise Barriers Questionnaire Reasons to be Active Questionnaire PA: time/week	You and Exercise Barriers Questionnaire Family and friends Reasons to be Active Questionnaire Family and partner SSES ²⁰ Family and friends
Wallace et al ²⁶ (United States)	937 59.8% female None reported 22.0 (5.6) y	Exercise behavior stage of change ⁵⁵ Enrollment in physical education classes and participation in intra/extramural sports (number of sports) Coronary Artery Risk Development in Young Adults CARDIA Physical History Questionnaire ⁶¹ Type, frequency, and duration of typical PA behaviors Scores of energy expenditure Sedentary behaviors Average number of hours/weeks spent watching TV/videos, studying, and using computer. To compute the cumulative amount of time (total) spent in sedentary activities. Stage of exercise behavior change ⁵⁵	
Wallace and Buckworth ³⁷ (United States)	165 64.4% female None reported 22.1 (6.1) y		SSES ²⁰ Family and friends
Yasunaga et al ²⁷ (Japan)	2273 100% female None reported 19.8 (2.5) y	Stage of exercise behavior change ⁵⁵	Exercise SS ⁶² Functional, emotional, and informational support for exercise No specific source

Abbreviations: LTPA, leisure-time physical activity; PA, physical activity; SS, social support; SSES, Social Support for Exercise Scale; SSPA, social support specific to PA.

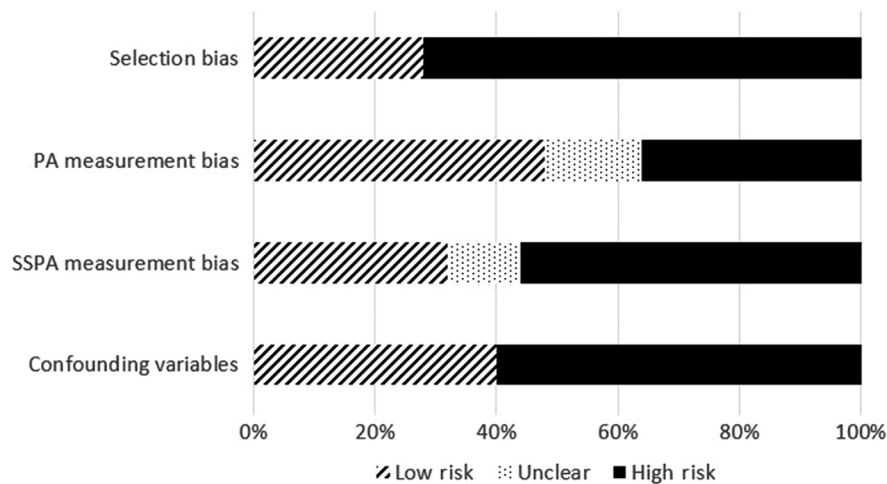


Figure 2 — Risk of bias of included studies. PA indicates physical activity; SSPA, social support specific to PA.

Unspecified Sources and Types of SSPA. When sources and types of SSPA were unspecified, SSPA was positively associated with active behaviors,^{22–27} in particular after controlling for intent to practice, perceived behavioral control, or the internal locus of control.^{24,25} The positive association was mediated by self-efficacy,²⁸ commitment to a plan of PA,²⁹ and perceived behavioral control.³⁰ This positive association was mediated by coping planning only among women.³¹ However, lack of SSPA was reported as a limitation of practice among individuals with low and high levels of activity³⁰ or to be a stronger barrier to exercise for those who did not exercise than for those who did.³²

Specified Sources and Unspecified Types of SSPA. When sources were specified but types of SSPA were unspecified, SSPA from friends and family differentiated between sedentary and active individuals³³ and predicted active behaviors.^{22,34,35} In addition, a decrease or lack of SSPA from friends and family was associated with inactive behaviors.^{36,37} However, not all articles agreed on the influence of friends and family. According to Belanger and Patrick,²² SSPA from friends was stronger than SSPA from family. According to Maglione and Hayman,²⁹ only SSPA from family was related to PA and not SSPA from friends. Other authors reported that only SSPA from friends was related to PA and not SSPA from family.^{38,39} According to Molina-García et al.,⁴⁰ SSPA from family and friends was not important; only SSPA from coaches was important.

Unspecified Sources and Specified Types of SSPA. One research publication specified a type of SSPA, but sources were unspecified. This article reported that leisure-time physical activity occurred more often in the presence of others.⁴¹

Specified Sources and Types of SSPA. When sources and types of SSPA were specified, esteem support from family was positively associated with PA, while informational support was negatively associated with PA.²² According to King et al.,⁴² parental involvement in and encouragement of vigorous PA resulted in a significantly higher involvement in vigorous PA on the part of college students.

With regard to SSPA from friends, the influence of active friends contributed to having active behaviors.⁴³ Esteem support from friends positively predicted active behavior.^{22,44} Companionship was sometimes negatively related to intense PA,⁴⁴ sometimes positively.²²

Another source of SSPA was “close others,” which corresponded to close friends and romantic partners.⁴⁵ According to this study, the perceived exercise of close others was associated with an individual’s own exercise habits. Friends’ exercise was only associated with an individual’s exercise when the perceived support for exercising was high compared with when the perceived support was low.⁴⁵ According to King et al.,⁴² peer involvement in and encouragement of vigorous PA resulted in higher involvement in vigorous PA on the part of college students.⁴²

Relationship Between SSPA and PA Depending on Characteristics

To achieve the second aim of this review, a group was formed with regard to articles examining differences for gender. Based on the results included in this systematic review, another group was formed to report differences based on additional characteristics.

Depending on Gender. Studies focusing only on women indicated that SSPA was important.^{18,27} In studies focused on both genders, some authors indicated that SSPA was more important for women than for men.³¹ In contrast, Belanger and Patrick²² reported that SSPA was more important for men than for women. However, other authors reported that SSPA was important for both genders.^{23,26}

In terms of the sources of SSPA, SSPA from family was more important for women,^{26,34,39} and SSPA from friends was more important for men.²⁶

Depending on Another Characteristic: Housing. Another characteristic noted by some authors was housing during time at college or university. According to Maglione and Hayman,²⁹ SSPA from family was more important with regard to commuters than with regard to on-campus residents. According to Scarapicchia et al.,³⁵ satisfaction with tangible support was associated with higher PA only among on-campus residents and not among commuters.

Discussion

This review had 3 aims. First, this review summarized the results of studies assessing whether or not SSPA was associated with PA among college and university students. Second, it investigated

whether or not potential associations differed between types or sources of SSPA. Finally, it examined whether or not potential associations differed in terms of gender.

As presented in the results, this review discovered many methodological differences with regard to the measurement of SSPA and PA. Many different scales were used to measure SSPA and PA. Some articles used original scales, while others used adapted versions of these scales. The way in which PA behavior was measured and analyzed varied widely between studies. There were no articles that objectively measured the amount of PA. The sources of SSPA investigated in the studies were very commonly family and/or friends, and the different types of SSPA were rarely investigated separately but were almost always systematically included in the overall SSPA. Moreover, when types of SSPA were investigated, there was a high level of variability in the terms used. There were some differences in definitions of specific SSPA networks. In studies using the SSES,²⁰ “family” referred to all people living in the same household, while other studies focused more specifically on the influence of parents.⁴² The SSES²⁰ defined “friends” as friends, acquaintances, or coworkers. This broad definition included people from different networks to which the individual belonged (eg, professional or private). Clear definitions that focus on specific networks of individuals would allow for a more insightful understanding of the influences of such networks on students’ PA practices. These differences in measurements make it difficult to arrive at clear conclusions.

Unspecified Sources of SSPA

Many studies did not focus on specified types and sources of SSPA but only on its overall dimension. The main results suggested that SSPA is positively associated with active behaviors on the part of students. This positive association may sometimes be mediated by other concepts such as self-efficacy²⁸; or, SSPA may sometimes be a mediator of another association, such as the relationship between health locus of control and PA behaviors.²⁴ Other studies highlighted the fact that a lack of SSPA may become a barrier to PA.^{31,32} These findings suggested that SSPA is beneficial to PA and that a lack of SSPA may also influence PA behaviors. These findings were consistent with those of a systematic review of older adults¹⁶ that suggested that there was a positive association between SSPA and PA levels. Regarding associations between SSPA and PA based on gender, 2 studies focused exclusively on female subjects and highlighted the importance of SSPA on women’s PA practice.^{18,27} Among studies that focused on both genders, not all results agreed. SSPA was sometimes more important for women,^{31,32} sometimes more important for men,²² and sometimes equally important to both.^{23,26} These differences in results make it difficult to synthesize, but there were similarities with the findings of a systematic review among older adults that suggested that the PA levels of women were more likely to be influenced by overall SSPA than were the PA levels of men.¹⁶

With regard to specified types but unspecified sources of SSPA, Shores and West⁴¹ reported that leisure-time physical activity occurred more often in the presence of others. In their study, the SSPA dimension was explored by asking the question “Who is involved with you in the main activity?” This corresponds to the coparticipation that we found in the various types of SSPA.¹⁴ These findings suggested that coparticipation motivates leisure-time physical activity participation on the part of college students.

Specified Sources of SSPA

Family and Friends. With regard to studies that specified sources of SSPA, studies generally agreed on the beneficial aspect of SSPA from family and friends, taken together or separately, and the deleterious side of a lack or decrease of such SSPA. However, not all studies reported the same influence with regard to these 2 distinct sources. According to Belanger and Patrick,²² SSPA from friends was stronger than SSPA from family. Some authors reported that only SSPA from friends was related to PA and not SSPA from family.^{38,39} Conversely, other authors reported that only SSPA from family was related to PA but not SSPA from friends.²⁹ A possible explanation for the differences in these results may be that not all of the studies used the same SSPA measurement questionnaire. Maglione and Hayman²⁹ and Ler et al³⁹ were inspired by the SSES,²⁰ while Kim et al³⁸ and Belanger and Patrick²² used the Social Influence Scale⁴⁶ and a modified version of the Positive Social Influence Scale,⁴⁷ respectively. These different questionnaires and their different versions differed in terms of many methodological elements, such as the number of items for each category of source of SSPA or the response methodology (dichotomous, 5-point Likert scale). These different elements may potentially explain the variability observed in the results. Regarding specified sources of SSPA depending on gender, the findings of this systematic review suggested that SSPA from family and SSPA from friends seem to be important for both genders. Nevertheless, SSPA from family seems to be more important for women, and SSPA from friends seems to be more important for men. The variability of results among students reflected the variability found in the literature with regard to age groups. A meta-analysis relating to adolescent girls identified that both friends and family influenced adolescent girls’ PA.¹⁴ The findings of another systematic review dealing with healthy adults highlighted that there was a small positive association between SSPA from friends and future PA.¹⁵ However, the findings of a systematic review of older adults highlighted that SSPA was an important factor with regard to being physically active, especially when it came from family.¹⁶ This variability of findings in the literature highlights the need for more studies in order to develop a clearer consensus regarding the influence of SSPA from various sources on PA, especially on the part of students.

Regarding the specified types of SSPA from friends, their respective influences have been little discussed in the literature. The findings suggested that the overall influence of active friends and esteem support from friends are positively related to active behavior.^{22,43,44} However, companionship from friends may be negatively⁴⁴ or positively related to PA.²² This contradiction in terms of companionship may partially be explained by the questionnaire used to measure SSPA. Although both studies^{22,44} were inspired by the Positive Social Influence Scale,⁴⁷ the adaptations seem different in terms of the number of items for each category. In this scale, companionship SS involves partnership assistants that suggest that “we participate together.”⁴⁷ Based on this clear definition, companionship can be considered as coparticipation. The findings, therefore, suggested that the coparticipation of friends is not always related to PA. Moreover, the designation “having active friends” may correspond to several types of SSPA identified in the literature, such as coparticipation or modeling. Future research requires more precision with regard to the specific definitions of types of SSPA, and such research is needed in order to establish a clear consensus on the influence of types of SSPA from friends on students’ PA.

Regarding specified types of SSPA from family, only 2 studies focused specifically on this.^{22,42} King et al⁴² reported that parental involvement in and encouragement of vigorous PA resulted in

significantly higher involvement in vigorous PA among college students. Belanger and Patrick²² reported that SSPA from family was not always positive. Indeed, in this study, esteem support from family was positively related to PA, while informational support was negatively related to PA. With regard to the different definitions of types of SSPA,^{13,14} these findings suggested that emotional support and modeling from family have positive associations with PA practice, while informational support has a negative association with it. These findings were somewhat similar to those of a meta-analysis of adolescent girls that highlighted that encouragement (emotional support) and instrumental support from family were associated with adolescent girls' PA and that coparticipation with family was not. From this, it appears that emotional support from family is an important type of SSPA for adolescent girls and students, whereas other types of SSPA from family do not seem to be shared by these different age groups. The differences in types of SSPA used depending on the target population highlights the importance of further research in order to understand the specific needs with regard to types of SSPA for each age group.

Other Sources of SSPA. Regarding SSPA from other sources, SSPA from coaches and close friends (close friends and romantic partners) and emotional support from peers may be important for the practice of PA among college and university students. In this systematic review, few studies examined the influence of individuals' networks other than family and friends on student PA. Nevertheless, the transition to university is often a time of social relationship change.⁴⁸ Therefore, it is important to investigate who the significant others are and what influence they have on the PA of college and university students.

Other General Findings of the Review. Student life is an event that can sometimes lead to accommodation modifications. In practice, some college or university students live on campus, while others remain with their families. Only 2 studies^{29,35} looked at possible differences in SSPA depending on a student's housing. The findings suggested that SSPA from family is more important among commuters, than it is among on-campus residents, while satisfaction with tangible support (instrumental support) for PA is associated with higher PA only among on-campus residents. This underresearched element deserves to be studied more closely in order to correspond to the particular characteristics of university life and the accommodation patterns associated with it.

Study Limitations and Strengths

There were a number of limitations associated with this systematic review. The first limitation was related to the inclusion of studies. Intervention studies were not included because they methodologically induced the creation of new social networks to support PA. This prevents an understanding of the general determinants of PA participation among college and university students. This decision led to the exclusion of a significant number of studies.

The second limitation corresponded to the variability of SSPA and PA measurements. Although the SSES²⁰ was used many times (44%), many different scales were used to measure SSPA. Some articles used original scales, while others used adapted versions of such scales. Moreover, there was a high level of variability in the types of SSPA studied and the terms used. In addition, many different scales were used to measure PA, and these scales focused on different dimensions of active behavior. In addition, no study used an objective measure of PA. Therefore, these wide variabilities made comparisons and clear consensus building difficult.

Despite the aforementioned limitations, this systematic review contained some strengths. The primary strength of this review was that the literature search was comprehensive and drew from 4 key databases. In addition, although this was not used to exclude studies from selection, a risk of bias assessment of each selected study was included.

Future Research

This review highlighted a need for research with particular care regarding measures of SSPA and PA among college and university students. First, there is a need to standardize the definitions of the different sources and types of SSPA. Second, the creation and validation of a scale for measuring sources and types of SSPA among college and university students seems relevant, in order to propose a standardized scale.

In order to better understand the different determinants influencing the association between SSPA and PA, comprehensive studies are needed. These studies must investigate the various factors that may affect this association, such as gender, socioeconomic level, and housing on and off campus. This last factor seems particularly interesting, given the social networks formed specifically in these contexts, and deserves to be further investigated. In addition, qualitative studies could provide a deeper understanding of these different elements.

Given the large number of cross-sectional studies included in this review, it is not possible to clarify the direction of the association between SSPA and PA. In order to do so, longitudinal or prospective studies highlighting the direction of the association between SSPA and PA over time are necessary. These studies could examine changes in the influence of various sources of SSPA during a student's life. It would also be interesting to conduct intervention studies in which SSPA, from different sources and different types, could be manipulated in order to increase active behaviors among college and university students.

Conclusion

Despite the wide variability in study methodologies, particularly with respect to the measurement of SSPA and PA, it appears that SSPA is related to the practice of PA among college and university students. Although the respective importance of different sources of SSPA is not clear, the results suggested that family and friends provide significant SSPA for students' practice and that this association can vary by gender. However, future studies focusing on different sources and types of SSPA are needed to corroborate or refute this finding.

The findings of this study suggested that PA interventions for college and university students should consider the different possible sources and types of SSPA. It also appears to be important to consider differences between gender and between commuters and on-campus residents in order to plan the most appropriate interventions. These findings with regard to the social dimensions of practice should be of interest in terms of the health policies of colleges and universities whose goal is to promote PA among all students in order to enable them to be active adults throughout their lives.

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References

1. Crombie AP, Ilich JZ, Dutton GR, Panton LB, Abood DA. The freshman weight gain phenomenon revisited. *Nutr Rev*. 2009;67(2): 83–94. PubMed ID: [19178649](#) doi:[10.1111/j.1753-4887.2008.00143.x](#)
2. Deforche B, Van Dyck D, Deliens T, De Bourdeaudhuij I. Changes in weight, physical activity, sedentary behaviour and dietary intake during the transition to higher education: a prospective study. *Int J Behav Nutr Phys Act*. 2015;12(1):16. doi:[10.1186/s12966-015-0173-9](#)
3. Vadeboncoeur C, Townsend N, Foster C. A meta-analysis of weight gain in first year university students: is freshman 15 a myth? *BMC Obesity*. 2015;2(1):22. doi:[10.1186/s40608-015-0051-7](#)
4. Vella-Zarb RA, Elgar FJ. The “Freshman 5”: a meta-analysis of weight gain in the freshman year of college. *J Am Coll Health*. 2009; 58(2):161–166. PubMed ID: [19892653](#) doi:[10.1080/07448480903221392](#)
5. Keating XD, Guan J, Piñero JC, Bridges DM. A meta-analysis of college students’ physical activity behaviors. *J Am Coll Health*. 2005;54(2):116–126. PubMed ID: [16255324](#) doi:[10.3200/JACH.54.2.116-126](#)
6. Trost SG, Owen N, Bauman AE, Sallis JF, Brown W. Correlates of adults’ participation in physical activity: review and update. *Med Sci Sports Exerc*. 2002;34(12):1996–2001. doi:[10.1097/00005768-200212000-00020](#)
7. Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice-Hall; 1986.
8. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. *Health Educ Q*. 1988;15(2):175–183. PubMed ID: [3378902](#) doi:[10.1177/109019818801500203](#)
9. Ajzen I. The theory of planned behavior. *Organ Behav Hum Decis Process*. 1991;50(2):179–211. doi:[10.1016/0749-5978\(91\)90020-T](#)
10. Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: toward an integrative model of change. *J Consult Clin Psychol*. 1983;51(3):390–395. PubMed ID: [6863699](#) doi:[10.1037/0022-006X.51.3.390](#)
11. Schwarzer R. Modeling health behavior change: how to predict and modify the adoption and maintenance of health behaviors. *Appl Psychol*. 2008;57(1):1–29. doi:[10.1111/j.1464-0597.2007.00325.x](#)
12. Taylor W, Baranowski T, Sallis J. Family determinants of childhood physical activity: a social-cognitive model. In: Dishman RK, ed. *Advances in Exercise Adherence*. Human Kinetics Publishers; 1994:319–42.
13. Duncan SC, Duncan TE, Strycker LA. Sources and types of social support in youth physical activity. *Health Psychol*. 2005;24(1):3–10. PubMed ID: [15631557](#) doi:[10.1037/0278-6133.24.1.3](#)
14. Laird Y, Fawcner S, Kelly P, McNamee L, Niven A. The role of social support on physical activity behaviour in adolescent girls: a systematic review and meta-analysis. *Int J Behav Nutr Phys Act*. 2016;13(1):79. doi:[10.1186/s12966-016-0405-7](#)
15. Scarapicchia TMF, Amireault S, Faulkner G, Sabiston CM. Social support and physical activity participation among healthy adults: a systematic review of prospective studies. *Int Rev Sport Exerc Psychol*. 2017;10(1):50–83. doi:[10.1080/1750984X.2016.1183222](#)
16. Lindsay SG, Banting L, Eime R, O’Sullivan G, van Uffelen JGZ. The association between social support and physical activity in older adults: a systematic review. *Int J Behav Nutr Phys Act*. 2017;14(1):56. doi:[10.1186/s12966-017-0509-8](#)
17. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Ann Intern Med*. 2009;151(4):264–9. PubMed ID: [19622511](#) doi:[10.7326/0003-4819-151-4-200908180-00135](#)
18. Ulvick JD, Spink KS. Social provisions and young women’s health-related physical activity. *Women & Health*. 2015;55(8):960–974. PubMed ID: [26086201](#) doi:[10.1080/03630242.2015.1061093](#)
19. Akitomo Y, Yukari K, Yumiko K, Kyoko N. Individual and environmental factors related to stage of change in exercise behavior: a cross-sectional study of female Japanese undergraduate students. *J Phys Act Health*. 2014;11(1):62–67. doi:[10.1123/jpah.2011-0210](#)
20. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. *Prev Med*. 1987;16(6):825–836. PubMed ID: [3432232](#) doi:[10.1016/0091-7435\(87\)90022-3](#)
21. Marcus B, Banspach S, Lefebvre RC, Rossi J, Carleton RA, Abrams D. Using the stages of change model to increase the adoption of physical activity among community participants. *Am J Health Promot*. 1992;6(6):424–429. PubMed ID: [10146803](#) doi:[10.4278/0890-1171-6.6.424](#)
22. Belanger NMS, Patrick JH. The influence of source and type of support on college students’ physical activity behavior. *J Phys Act Health*. 2017;15(3):183–190. PubMed ID: [28872393](#) doi:[10.1123/jpah.2017-0069](#)
23. Farren GL, Zhang T, Martin SB, Thomas KT. Factors related to meeting physical activity guidelines in active college students: a social cognitive perspective. *J Am Coll Health*. 2017;65(1):10–21. PubMed ID: [27593500](#) doi:[10.1080/07448481.2016.1229320](#)
24. Marr J, Wilcox S. Self-efficacy and social support mediate the relationship between internal health locus of control and health behaviors in college students. *Am J Health Educ*. 2015;46(3):122–131. doi:[10.1080/19325037.2015.1023477](#)
25. Rhodes RE, Jones LW, Courneya KS. Extending the theory of planned behavior in the exercise domain: a comparison of social support and subjective norm. *Res Q Exerc Sport*. 2002;73(2):193–199. PubMed ID: [12092894](#) doi:[10.1080/02701367.2002.10609008](#)
26. Wallace LS, Buckworth J, Kirby TE, Sherman WM. Characteristics of exercise behavior among college students: application of social cognitive theory to predicting stage of change. *Prev Med*. 2000; 31(5):494–505. PubMed ID: [11071829](#) doi:[10.1006/pmed.2000.0736](#)
27. Yasunaga A, Kawano Y, Kamahori Y, Noguchi K. Individual and environmental factors related to stage of change in exercise behavior: a cross-sectional study of female Japanese undergraduate students. *J Phys Act Health*. 2014;11(1):62–67. PubMed ID: [23249761](#) doi:[10.1123/jpah.2011-0210](#)
28. Rovniak LS, Anderson ES, Winett RA, Stephens RS. Social cognitive determinants of physical activity in young adults: a prospective structural equation analysis. *Ann Behav Med*. 2002;24(2):149–156. PubMed ID: [12054320](#) doi:[10.1207/S15324796ABM2402_12](#)
29. Maglione JL, Hayman LL. Correlates of physical activity in low income college students. *Res Nurs Health*. 2009;32(6):634–646. PubMed ID: [19777502](#) doi:[10.1002/nur.20353](#)
30. Spivey LM, Hritz NM. A longitudinal study of recreational sport participation and constraints. *Recreational Sports Journal*. 2013; 37(1):14–28. doi:[10.1123/rsj.37.1.14](#)
31. Molloy GJ, Dixon D, Hamer M, Sniehotta FF. Social support and regular physical activity: does planning mediate this link? *Br J Health Psychol*. 2010;15(4):859–870. doi:[10.1348/135910710X490406](#)
32. Van Niekerk RL. Understanding the barriers to and reasons for physical exercise among university students. *Afr J Phys Health Edu Recreat Dance*. 2010:172–81.
33. Petosa RL, Suminski R, Hartz B. Predicting vigorous physical activity using social cognitive theory. *Am J Health Behav*. 2003; 27(4):301. PubMed ID: [12882424](#) doi:[10.5993/AJHB.27.4.2](#)

34. Leslie E, Owen N, Salmon J, Bauman A, Sallis JF. Insufficiently active Australian college students: perceived personal, social, and environmental influences. *Int J Prev Med*. 1999;28(1):20–27. doi:10.1006/pmed.1998.0375
35. Scarapicchia TMF, Sabiston CM, Pila E, Arbour-Nicitopoulos KP, Faulkner G. A longitudinal investigation of a multidimensional model of social support and physical activity over the first year of university. *Psychol Sport Exerc*. 2017;31:11–20. doi:10.1016/j.psychsport.2017.03.011
36. Gomez-Lopez M, Gallegos AG, Extremera AB. Perceived barriers by university students in the practice of physical activities. *J Sci Med Sport*. 2010;9(3):374–81.
37. Wallace LS, Buckworth J. Longitudinal shifts in exercise stages of change in college students. *J Sports Med Phys Fitness*. 2003;43(2):209–12. PubMed ID: 12853902
38. Kim GS, Lee CY, Kim IS, et al. Dyadic effects of individual and friend on physical activity in college students. *Public Health Nurs*. 2015;32(5):430–439. PubMed ID: 25565084 doi:10.1111/phn.12176
39. Ler HY, Wee EH, Ling SK. Differences in psychosocial determinants by gender and physical activity index among undergraduates. *Rev de Psicología del Deporte*. 2017;26:127–131.
40. Molina-García J, Castillo I, Pablos C. Determinants of leisure-time physical activity and future intention to practice in Spanish college students. *Span J Psychol*. 2009;12(1):128–137. PubMed ID: 19476226 doi:10.1017/S1138741600001542
41. Shores KA, West ST. Pursuing leisure during leisure-time physical activity. *J Phys Act Health*. 2010;7(5):685–694. PubMed ID: 20864766 doi:10.1123/jpah.7.5.685
42. King KA, Vidourek RA, English L, Merianos AL. Vigorous physical activity among college students: using the health belief model to assess involvement and social support. *Arch Exerc Health Dis*. 2014;4(2):267–279. doi:10.5628/aeht.v4i2.153.
43. Shifflet B, Cator C, Megginson N. Active lifestyle adherence among individuals with and without disabilities. *Adapt Phys Activ Q*. 1994;11(4):359–67. doi:10.1123/apaq.11.4.359
44. Okun MA, Ruehlman L, Karoly P, Lutz R, Fairholme C, Schaub R. Social support and social norms: do both contribute to predicting leisure-time exercise? *Am J Health Behav*. 2003;27(5):493–507. PubMed ID: 14521246 doi:10.5993/AJHB.27.5.2
45. Darlow SD, Xu X. The influence of close others' exercise habits and perceived social support on exercise. *Psychol Sport Exerc*. 2011;12(5):575–578. doi:10.1016/j.psychsport.2011.04.004
46. Saunders RP, Pate RR, Felton G, et al. Development of questionnaires to measure psychosocial influences on children's physical activity. *Prev Med*. 1997;26(2):241–247. PubMed ID: 9085394 doi:10.1006/pmed.1996.0134
47. Chogahara M. A multidimensional scale for assessing positive and negative social influences on physical activity in older adults. *J Gerontol*. 1999;54B(6):S356–S67. doi:10.1093/geronb/54B.6.S356
48. Bray SR, Born HA. Transition to University and vigorous physical activity: implications for health and psychological well-being. *J Am Coll Health*. 2004;52(4):181–188. PubMed ID: 15018429 doi:10.3200/JACH.52.4.181-188
49. Walker S, Sechrist K, Pender N. *Health-Promoting Lifestyle Profile II*. Omaha, NE: University of Nebraska Medical Center, College of Nursing; 1995.
50. Godin G, Shephard RJ. A simple method to assess exercise behavior in the community. *Can J Appl Sport Sci*. 1985;10(3):141–6. PubMed ID: 4053261
51. Craig CL, Marshall AL, Sjöström M, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc*. 2003;35(8):1381–1395. PubMed ID: 12900694 doi:10.1249/01.MSS.0000078924.61453.FB
52. Booth ML, Owen N, Bauman AE, Gore CJ. Retest reliability of recall measures of leisure-time physical activity in Australian adults. *Int J Epidemiol*. 1996;25(1):153–159. PubMed ID: 8666485 doi:10.1093/ije/25.1.153
53. Petosa PS. *Use of Social Cognitive Theory to Explain Exercise Behavior Among Adults*. Columbus: The Ohio State University; 1993.
54. Duncan TE, McAuley E. Social support and efficacy cognitions in exercise adherence: a latent growth curve analysis. *J Behav Med*. 1993;16(2):199–218. PubMed ID: 8315646 doi:10.1007/BF00844893
55. Marcus BH, Selby VC, Niaura RS, Rossi JS. Self-efficacy and the stages of exercise behavior change. *Sport is Res Q Exerc Sport*. 1992;63(1):60–66. PubMed ID: 1574662 doi:10.1080/02701367.1992.10607557
56. Kohl HW, Blair SN, Paffenbarger RS Jr, Macera CA, Kronenfeld JJ. A mail survey of physical activity habits as related to measured physical fitness. *Am J Epidemiol*. 1988;127(6):1228–1239. PubMed ID: 3369421 doi:10.1093/oxfordjournals.aje.a114915
57. Richman JM, Rosenfeld LB, Hardy CJ. The social support survey: a validation study of a clinical measure of the social support process. *Res Soc Work Pract*. 1993;3(3):288–311. doi:10.1177/104973159300300304
58. Young SJ, Ross CM, Barcelona RJ. Perceived constraints by college students to participation in campus recreational sports programs. *Recreational Sports Journal*. 2003;27(2):47–62. doi:10.1123/rsj.27.2.47
59. Kriska AM, Knowler WC, LaPorte RE, et al. Development of questionnaire to examine relationship of physical activity and diabetes in pima Indians. *Diabetes Care*. 1990;13(4):401. PubMed ID: 2318100 doi:10.2337/diacare.13.4.401
60. Courneya KS, McAuley E. Reliability and discriminant validity of subjective norm, social support, and cohesion in an exercise setting. *J Sport Exerc Psychol*. 1995;17(3):325–337. doi:10.1123/jsep.17.3.325
61. Jacobs DR, Hahn LP, Haskell WL, Pirie P, Sidney S. Validity and reliability of short physical activity history: cardia and the Minnesota heart health program. *J Cardiopulm Rehabil Prev*. 1989;9(11):448. doi:10.1097/00008483-198911000-00003
62. Itakura M, Oka K, Takeda N, Furuichi M, Sakai K, Nakamura Y. Relevance of social and physical environmental influences to physical activity promotion. *Japanese J Phys Fit Sports Med*. 2005;54(3):219–227. doi:10.7600/jspfsm.54.219