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Measurement of General and Specific Approaches to Physical Activity Parenting: A Systematic Review

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Abstract

Background: Parents play a significant role in shaping youth physical activity (PA). However, interventions targeting PA parenting have been ineffective. Methodological inconsistencies related to the measurement of parental influences may be a contributing factor. The purpose of this article is to review the extant peer-reviewed literature related to the measurement of general and specific parental influences on youth PA.

Methods: A systematic review of studies measuring constructs of PA parenting was conducted. Computerized searches were completed using PubMed, MEDLINE, Academic Search Premier, SPORTDiscus, and PsycINFO. Reference lists of the identified articles were manually reviewed as well as the authors' personal collections. Articles were selected on the basis of strict inclusion criteria and details regarding the measurement protocols were extracted. A total of 117 articles met the inclusionary criteria. Methodological articles that evaluated the validity and reliability of PA parenting measures ($n = 10$) were reviewed separately from parental influence articles ($n = 107$).

Results: A significant percentage of studies used measures with indeterminate validity and reliability. A significant percentage of articles did not provide sample items, describe the response format, or report the possible range of scores. No studies were located that evaluated sensitivity to change.

Conclusion: The reporting of measurement properties and the use of valid and reliable measurement scales need to be improved considerably.

Introduction

Adequate physical activity (PA) is considered essential for good health and optimal growth and development in children and youth. Recent comprehensive reviews have concluded that regular PA is associated with numerous positive health outcomes, including improved cardiovascular fitness, academic achievement, increased bone mass, and improved psychological well-being, and it is inversely associated with negative health outcomes such as obesity, elevated blood lipids, insulin resistance, elevated blood pressure, and cigarette smoking.[1–3] Moreover, because several health outcomes associated with lack of PA track from childhood into adulthood, regular PA during childhood and adolescence may be of critical importance in the prevention of chronic diseases later in life.[4] On the weight of this evidence, the US Department of Health and Human Services recommended that youth accumulate 60 or more minutes daily of aerobic moderate-to-vigorous PAs that are enjoyable and developmentally age-appropriate. Included in those 60 minutes, youth should also engage in bone and muscle strengthening activities on at least 3 days of the week.[5]

Despite the documented health benefits of regular PA, and nearly three decades of research evaluating programs and policies to increase PA in youth, significant percentages of children and youth do not participate in the level of PA recommended by experts. Data from the CDC Youth Risk Behavior Survey indicate that only 36% of US high school students meet the 60-minute moderate-to-vigorous physical activity (MVPA) guideline. Of concern, the prevalence of meeting the 60-minute guideline is higher among male (44%) than female (28%) students, and higher in white (39%) compared to African-American (30%) and Hispanic (33%) students.[6] Objectively measured PA data from the 2003–2004 cycle of the National Health and Nutrition Examination Survey (NHANES) indicates that only

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42% of children aged 6–11 years and 7.6% of adolescents aged 16–19 years accumulate 60 minutes or more of MVPA daily.[7] Collectively, these findings signal the need to continue research efforts to understand and intervene on the factors that influence youth PA behavior.[8]

It is widely acknowledged that parents play a significant role in shaping the PA behaviors of children and adolescents. Parents can influence their children's PA through numerous mechanisms, including direct modeling, providing instrumental support for PA, enforcing household rules that encourage or discourage PA, positively reinforcing participation in PA, and creating a home environment that is supportive of PA.[9,10] Yet, despite the importance of parents, intervention studies targeting PA parenting practices and behaviors have mostly been ineffective. While poor study design, inadequate statistical power, and compromised fidelity have clearly contributed to the lack of effectiveness,[11] it is reasonable to hypothesize that research efforts to understand the mechanisms of parental influence and design effective family-level interventions have been hindered by methodological challenges and inconsistencies related to the measurement of parental influences on PA.

The purpose of this article is to review the extant peer-reviewed literature related to the measurement of general and specific parental influences on youth PA. First, the current status of measurement in the PA parenting literature will be explored by analyzing studies using PA parenting measures. For a range of PA parenting constructs, the quality of reporting in the research literature will then be explored by evaluating the extent to which investigators are currently using measures with documented evidence of validity, reliability, or sensitivity to change. The results of the few studies specifically evaluating the psychometric properties of PA parenting measures will then be summarized. The article will conclude with a discussion of current gaps in the research literature and priorities for future research.

Methods

Identification of Studies

Computerized searches of the research literature were conducted using PubMed, MEDLINE, Academic Search Premier, SPORTDiscus, and PsycINFO. There were no restrictions used for publication dates or country of origin; however, all studies must have been published in the English language. Studies were identified using a search filter with combinations of the following keywords—physical activity, exercise, outdoor play, indoor play, parental influence, parent influence, parenting, family, parental support, parental monitoring, parenting style, parental socialization, family cohesion, and parent-child communication. In addition to this structured search, reference lists of the identified articles were manually reviewed as well as the authors' personal collections.

The initial keyword search identified 8757 candidate studies (see Fig. 1). After reviewing the abstract of each study for content relevance, and elimination of duplicate studies, 617 of these studies were retained for full text review. A study was included in the final review if the authors: (1) Evaluated the measurement properties of an instrument designed to measure one or more hypothesized parental influences on youth PA; or (2) measured at least one recognized parental influence on youth PA. The articles were independently reviewed by two research assistants (co-authors) with any discrepancies resolved by the primary author. Of the 617 studies examined, 117 met the inclusionary criteria. Methodological articles that evaluated the validity and reliability of PA parenting measures ($n = 10$) were reviewed separately from parent influence articles ($n = 107$).

Data Extraction

For studies measuring PA parenting constructs, information related to the following questions was recorded.

- What PA parenting constructs were measured?
- Was the measure a single item or scale?
- Was the response format fully reported?
- Were sample items provided?
- Were psychometric properties reported in the article? If so, what was reported?
- Were the reported psychometric properties derived from the study sample?
- Did the authors provide a citation supporting the psychometric properties of the measure(s)?
- If a citation was provided, was the citation a methodological article evaluating psychometric properties?

Responses to each question were coded and entered into an Access database, which was subsequently uploaded into the SAS statistical package (Version 9.2, Cary, NC) for calculation of sample frequencies. For methodological articles, the following information was noted: PA parenting construct(s) measured; the use of formative research or elicitation studies to derive items; analytical or statistical procedures used to establish evidence of validity, reliability, or sensitivity to change; and major findings.

Status of Measurement in PA Parenting Research

The 107 studies meeting the inclusionary criteria measured one or more of the following PA parenting constructs—parental PA, perceptions of parental PA, parental support for PA, social support from family, parents' perceptions of importance of PA, and parents' perceptions of PA competence. The results for each construct are summarized in Table 1.

Parental PA

Thirty-one studies examining the association between parental PA and child PA met the inclusionary criteria.[9,12–41] Of these 31 studies, 25 (80.7%) cited evidence of validity or reliability.[9,12,13,15–17,19,21–24,26–31,34–41] No studies cited evidence of sensitivity to change. Of the studies citing evidence of validity or reliability, 14 studies (56.0%) cited

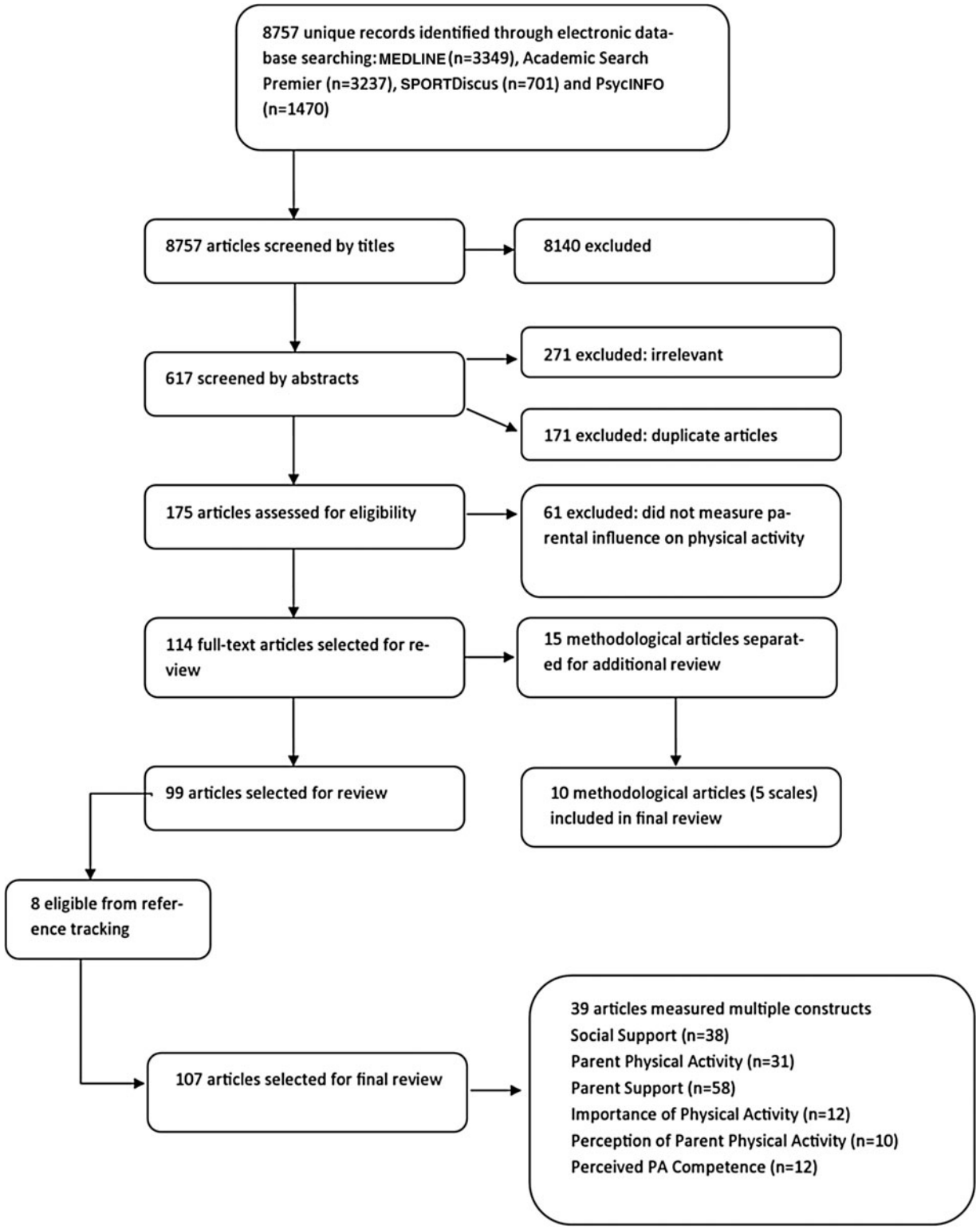

Figure 1. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) flow diagram describing each step of the systematic review process.

a methodological article.[12,13,15–17,19,21,24,26,28,30,31,37,41] Just 6 of the 31 studies (19.4%) reported psychometric properties in the article.[9,13,24,32,36,40] Of these studies, only 3 (50.0%) reported statistics that were obtained in the study population.[13,24,32] Twenty-six of the 31 studies measured parental PA using self-report methods, with 5 studies using an objective measure of PA such as an accelerometer or pedometer.[12,13,16,18,19] Of those 26 studies, 6 (23.1%) used single-item measures,[21,25,30,33,34,36] 11(42.3%) provided sample items,[9,15,17,20–22,31–34,36] 11 (42.3%) described the

Table 1. Summary of the Analyses Evaluating the Quality of Reporting in Studies Employing Measures of Physical Activity Parenting

Constructs	Validity or reliability cited	Methods article cited	Psychometric properties reported[a]	Statistics for the study population[b]	Single item measure	Provided sample items	Response format reported	Range of scores reported
Parental physical activity ($n=31$)	80.7%	56.0%	19.4%	50.0%	23.1%	42.3%	42.3%	23.1%
Perceptions of parental physical activity ($n=10$)	60.0%	16.7%	0.0%	0.0%	80.0%	40.0%	60.0%	20.0%
Parental support for physical activity ($n=58$)	81.0%	38.3%	62.1%	61.1%	6.9%	44.8%	70.7%	60.3%
Social support from family ($n=38$)	84.1%	34.4%	50.0%	79.0%	24.3%	50.0%	71.1%	50.0%
Importance of physical activity ($n=12$)	75.0%	11.1%	66.7%	50.0%	33.3%	41.7%	83.3%	75.0%
Perceived physical activity competence ($n=12$)	91.7%	63.6%	66.7%	87.5%	8.3%	41.7%	75.0%	50.0%

[a]Percentage of articles citing a methodological article was calculated from the number of studies reporting evidence of validity and reliability.

[b]Percentage of articles reporting reliability and/or validity statistics for the study population under study was calculated from the number of studies reporting psychometric properties.

response format, at least partially,[9,20,21,28,30–32,34,36,37,40] and 6 (23.1%) reported the possible range of scores.[30,32,34,36,37,40]

Perceptions of Parental PA

Ten studies examining the association between children's perceptions of parental PA and child PA met the inclusionary criteria.[32,42–50] Of these 10 studies, 6 (60.0%) cited evidence of validity or reliability.[42,43,45–47,49] No studies cited evidence of sensitivity to change. Of the studies citing evidence of validity or reliability, only 1 study (16.7%) cited a methodological article.[45] None of the 10 studies reported psychometric properties in the article. Of those 10 studies identified, 8 (80.0%) used single-item measures,[42–45,47–50] 4 (40.0%) provided sample items,[32,44,46,50] 6 (60.0%) described the response format, at least partially,[32,42,44–46,50] and 2 (20.0%) reported the possible range of scores.[44,50]

Parental Support for PA

Fifty-eight studies examining the association between parental support for PA and child PA met the inclusionary criteria.[9,22–26,28,30,31,34–38,40,41,49,51–91] Of these 58 studies, 47 (81.0%) cited evidence of validity or reliability.[9,22–24,26,30,31,34,36–38,40,49,51–53,56–60,62,64,66–76,79–91] No studies cited evidence of sensitivity to change. Of the studies citing evidence of validity or reliability, 18 studies (38.3%) cited a methodological article.[34,36,37,40,49,57,58,60,62,66,68,69,74,79,80,83,88,90] Thirty-six of the 58 studies (62.1%) reported psychometric properties in the article.[9,22,24,31,34–37,40,49,52–54,56–68,70,71,79,80,82,83,87,89–91] Of these studies, 22 (61.1%) reported statistics that were obtained in the study population.[22,24,49,53,54,56–58,61–63,65–68,79,80,82,83,89–91] Of those 58 studies identified, 4 (6.9%) used single-item measures,[61,72,81,84] 26 (44.8%) provided sample items,[9,23,35,37,49,52,54–56,59,61,64,65,67,68,70,71,73,74,77,79,83,84,86,87,89] 41 (70.7%) described the response format, at least partially,[9,22–24,28,30,31,34–37,40,41,51–56,59,61,63–65,67,70,72,74,75,77–84,86,87,89,91] and 35 (60.3%) reported the possible range of scores.[22–24,28,30,31,34–36,40,49,51–53,56,59,61,63,64,66,67,70,71,74,75,77–84,86,87]

Social Support from Family

Thirty-eight studies examining the association between social support from family and child PA met the inclusionary criteria.[24,27,29,33,39,42–45,47,48,61,92–117] Of these 38 studies, 32 (84.1%) cited evidence of validity or reliability.[27,29,39,42–45,47,48,61,92,94–104,107–110,112–117] No studies cited evidence of sensitivity to change. Of the studies citing evidence of validity or reliability, 11 studies (34.4%) cited a methodological article.[47,61,92,94,96,98,99,103,107–109] Nineteen of the 38 studies (50.0%) reported psychometric properties in the article.[24,29,33,44,47,48,61,92–94,96,100,101,109,110,112,115–117] Of these studies, 15 (79.0%) reported statistics that were obtained in the study population.[24,44,47,48,61,92,94,96,101,109,110,112,115–117] Of the 38 studies identified, 9 (24.3%) used single-item measures,[24,43,93,95,103,105–107,111] 19 (50.0%) provided sample items, 27 (71.1%) described the response format, at least partially,[24,29,33,42,44,45,47,48,61,93–97,99–101,103,104,107–110,112,113,115,117] and 19 (50.0%) reported the possible range of scores.[24,29,33,44,47,61,93,94,96,99,101,103,107,109,110,112,113,115,117]

Importance of PA

Twelve studies examining the association between parents perceived importance of PA and child PA met the inclusionary criteria.[9,22,30,31,38,40,54,61,78,91,92,112] Of these 12 studies, 9 (75.0%) cited evidence of validity or reliability.[9,22,30,31,38,40,91,92,112] No studies cited evidence of sensitivity to change. Of the studies citing evidence of validity or reliability, only 1 cited a methodological article.[92] Eight of the 12 studies (66.7%) reported psychometric properties in the article.[9,31,40,61,78,91,92,112] Of these studies, 4 (50.0%) reported statistics that were obtained in the study population.[61,91,92,112] Of the 12 studies identified, 4 (33.3%) used single-item measures,[61,78,91,112] 5 (41.7%) provided sample items,[9,22,54,92,112] 10 (83.3%) described the response format, at least partially,[9,22,30,31,40,54,61,78,91,112] and 9 (75.0%) reported the possible range of scores.[9,22,30,31,40,61,78,91,112]

Perceived PA Competence

Twelve studies examining the association between parents' perception of PA competence and child PA met the inclusionary criteria.[31,44,54,55,57,58,70,88,92,106,110,112] Of these 12 studies, 11 (91.7%) cited evidence of validity or reliability.[31,44,54,55,57,58,70,88,92,110,112] No studies cited evidence of sensitivity to change. Of the studies citing evidence of validity or reliability, 7 studies (63.6%) cited a methodological article.[54,55,57,58,88,92,110] Eight of the 12 studies (66.7%) reported psychometric properties in the article.[31,44,57,58,70,92,110,112] Of these studies, 7 (87.5%) reported statistics that were obtained in the study population.[44,57,58,70,92,110,112] Of the 12 studies identified, just one used a single-item measure,[106] 5 (41.7%) provided sample items,[44,55,57,70,112] 9 (75.0%) described the response format, at least partially,[31,44,54,55,57,58,70,110,112] and 6 (50.0%) reported the possible range of scores.[31,44,57,70,110,112]

Methodological Studies

While a relatively large number of studies have used measures of PA parenting, very few published studies have rigorously evaluated the psychometric properties of PA parenting measures. The following section summarizes the research evidence addressing the validity and reliability of five instruments designed to measure parental influences on youth PA. The findings are also summarized in Table 2.

Parental Support for PA (Sallis)

The parental support for PA scale developed by Sallis and colleagues[118] is arguably one of the most widely used measures of parental influence in the youth PA literature. The scale consists of five items assessing the weekly frequency with which parents: ''encouraged their child to do physical activity or play sports''; ''participated in a physical activity or played sports with their child''; ''provided transportation so their child could go to a place where he or she can do physical activities or sport''; ''watched their child participate in physical activity or sport''; and ''told their child that physical activity was good for you''.

Despite its widespread use in the research literature, information about the instrument's initial psychometric properties is difficult to find. Reports from the Amherst Health and Activity Study [59,119] indicate that factor analysis with varimax rotation provided evidence of unidimensionality; however, the full results of the factor analysis were never reported. The Sallis et al.[118] article does, however, report the details of the analyses to determine internal consistency and test–retest reliability. In a racially diverse sample of 105 parents of children aged 6–15 years, test–retest [intraclass correlation (ICC)] and coefficient alpha reliabilities were 0.81 and 0.78, respectively.

Subsequent methodological studies have more rigorously assessed and reported on the measurement properties of the Sallis parental support scale. As part of the European Youth Heart Study, Ommundsen et al.[120] evaluated the measure's factorial validity and factorial invariance across age, gender, and country. Initial factorial validity was evaluated using confirmatory factor analysis. Along with the support from friends and teachers, parental support for PA represented two factors of a four-factor measurement model labeled social support for PA. Three of the five items were specified to form a ''general support'' subscale, with the remaining two items forming a ''parental encouragement'' subscale. Results of the initial confirmatory factor analyses indicated that the four-factor model yielded a good fit to the data. The Cronbach alpha

Table 2. Summary of the Research Evidence Addressing the Validity and Reliability of Five Instruments Designed to Measure Parental Influences on Youth Physical Activity

Scale	Alpha	Test–retest	Factorial validity	Factorial invariance	Sensitivity to change	Construct validity
Parental Support, Sallis[118–122]	X	X	XX	XX	—	XX
Rules and Restrictions, McMinn[121]	X	X	X	—	—	—
Parental Encouragement, Anderson[123,124]	XX	—	XX	—	—	XX
Activity Support Scale, Davison[125,126]	X	—	XX	X	—	XX
Parental Influence, Jago[127]	X	X	X	—	—	—

X, modest or inconsistent evidence; XX, strong or consistent evidence; —, no evidence or not examined.

for the three-item parent support scale was 0.63, whereas the inter-item correlation for the two-item parental encouragement was 0.50.

Factorial invariance across groups defined by country, gender, and age was evaluated by testing and comparing a series of increasingly restrictive hypotheses related to the equivalence of measurement model parameters. The four-factor social support model, which included parental support, exhibited evidence of invariance across different genders, age groups, and countries. In support of construct validity, children and adolescents accumulating 60 minutes or more of accelerometer-measured MVPA reported significantly higher levels of parental support and encouragement.

As part of the Southampton Women's Survey, McMinn and colleagues[121] evaluated the factorial validity and internal consistency of the Sallis parental support measure. Just fewer than 400 mothers of 4-year-old children ($n = 398$) completed the measure as part of a comprehensive survey measuring influences on preschool children's PA. Principal components factor analysis with varimax rotation supported a single-factor solution, contingent on removal of the item related to telling children that PA is good for their health. The single factor accounted for 62% of the common variance. Internal consistency as measured by the Cronbach alpha was 0.68.

Extending the results of the three aforementioned studies, Dishman et al.[122] assessed the factorial validity and factorial invariance of the Sallis parental support measure in 6th and 8th grade girls participating in the Trial of Activity for Adolescent Girls (TAAG) intervention study ($n = 4885$). Configured as one of two factors in the social support scale (support from family and friends), the authors evaluated factorial validity, multigroup invariance (race/ethnicity within each grade, age level within each grade, weight status), and longitudinal invariance over a 2-year period. Factorial validity was assessed using standard confirmatory factor analysis. Multigroup and longitudinal invariance was evaluated by testing and comparing nested models with increasingly restrictive hypotheses-related equivalency of the model parameters across groups.

The confirmatory factor analysis revealed a large covariance for two items on the parental support scale (''encouraged their child to do physical activity or play sports'' and ''done a physical activity or played sports with their child'), necessitating the removal of the item on encouragement. The resultant two-factor model fit well in both 6th and 8th grade girls; and among black, white, and Hispanic/Latino girls in each grade. Factor structure, factor loadings, and factor variances were invariant across racial/ethnic group and over time. Item measurement errors were also invariant across age groups within grade and BMI groups.

Parental Rules and Restrictions (McMinn)

McMinn and colleagues[121] evaluated the factorial validity and internal consistency of an 11-item scale measuring parenting rules and restrictions related to PA. Seven items evaluated household rules related to: ''watching TV at meal times''; ''going to bed when they want to''; ''play ball games in the house''; ''eat snacks while watching TV''; ''playing in the park/play area accompanied by older children without adult supervision''. The four-item restrictive scale asked mothers to rate the frequency with which they restricted: ''watching TV or videos''; ''playing computer games''; ''playing outside''; and ''using the computer''.

Principal components analysis with varimax rotation initially identified a three-factor solution; however, the third factor exhibited a low internal consistency (Cronbach alpha = 0.06). Deletion of the item related to playing in the park/play area without adult supervision resulted in an acceptable two-factor solution comprising indoor rules for sedentary behavior and PA. The Cronbach alpha for these two factors was marginal at 0.56 and 0.60, respectively. For the items measuring parental restrictions on children's PA, the principal components analysis revealed low communalities for the items related to restricting outdoor play and television watching. Deletion of these items resulted in a final two-item measure with an internal consistency of 0.63.

Parental Encouragement for PA (Anderson)

The Athletic Identity Questionnaire (AIQ) for children and adolescents developed by Anderson and colleagues[123,124] included a seven-item subscale measuring parental encouragement for PA. The measure asks respondents to rate the extent to which parents ''encouraged me to exercise or be physically active''; ''exercised or worked out along with me''; ''gave me words of confidence concerning sports and exercise''; ''watch me closely and give me feedback on what I'm doing''; ''spent time teaching me how to play a sport or do a physical activity; ''are proud of me when I exercise''; ''are willing to help me in every way when it comes to sports and exercise''. The child version of the AIQ included the same items with minor modifications in wording to accommodate the cognitive abilities of children.

Confirmatory factor analysis in two independent samples of adolescents ($N = 408$ and $N = 1586$) supported the unidimensionality of the parental encouragement subscale. In both samples, the seven-item subscale exhibited excellent fit [sample 1: comparative fit index (CFI) = 0.99, root mean square error of approximation (RMSEA) (90% confidence interval, CI) = 0.032 (0.000–0.064); sample 2: CFI = 0.99, RMSEA (90% CI) = 0.039 (0.027–0.053]. Factor loadings were significant and substantive, ranging from 0.66 to 0.84. Coefficient alpha reliabilities for the two samples were 0.86 and 0.87, respectively. Comparable findings were observed in two independent samples of elementary school children ($N = 432$, $N = 504$). Confirmatory factor analysis supported the unidimensionality of the seven-item subscale (sample 1: CFI = 0.99, RMSEA (90% CI) = 0.069 (0.062–0.075); sample 2: CFI = 0.99, RMSEA (90% CI) = 0.042 (0.035–0.049). Factor loadings in both samples of elementary school children were significant and substantive, ranging from 0.59 to 0.76. Coefficient alpha reliabilities for the two samples were 0.85 and 0.86, respectively.

Activity Support Scale (Davison)

Davison et al.[125] developed a brief questionnaire to measure PA-related parenting practices. Initially designed to capture the influence of parenting practices on girls' PA behavior, the measure comprised the following seven-items: (1) ''How active are you in enrolling your daughter in sports''; (2) ''How often do you go to your daughter's sporting events''; (3) ''How important is it to you to be actively involved in your daughter's sporting events''; (4) ''How much do you enjoy sport/physical activity''; (5) ''How frequently do you participate in sport/physical activity each week''; (6) ''How often does your family use sport/physical activity as a form of family recreation''; and (7) ''How much do you use your own behavior to encourage your daughter to be physically active''.

Factor structure was initially examined in 90 parents of 9-year-old children using exploratory factor analysis. Factorial validity was subsequently tested in a second sample using confirmatory factor analysis ($N=90$). The exploratory factor analysis identified two conceptually distinct factors for mothers and fathers that were labeled logistic support (three items) and explicit modeling (four items). Confirmatory factor analysis provided strong support in fathers (CFI = 0.99, RMSEA = 0.02) and acceptable support for mothers (CFI = 0.93, RMSEA = 0.07) for the two-factor model. Supporting construct validity, mothers' logistic support, and fathers' explicit modeling were independently associated with higher levels of self-reported PA after controlling for body fatness.

More recently, Davison and colleagues[126] modified the Activity Support Scale for use among African-American families. Following a series of focus groups with African-American parents, 13 new items were added to the measure, and the wording of six of the seven original items was modified. Exploratory factor analysis identified four conceptually distinct factors—logistic support, use of community resources, explicit modeling, and limiting sedentary activities. Follow-up confirmatory factor analysis demonstrated the four factor model to have acceptable fit in both African-American ($N=119$) (CFI = 0.94, RMSEA (90% CI) = 0.05 (< 0.001–0.086) and white parents ($N=117$) (CFI = 0.94, RMSEA (90% CI) = 0.05 (0.033–0.097). Factor loadings were significant and substantive, ranging from 0.62 to 0.78. Alpha coefficients for African-American and white parents ranged from 0.69 to 0.77 and 0.72 to 0.88, respectively. Multigroup invariance was assessed in standard fashion by testing a series of increasingly restrictive hypotheses related to the equivalence of model parameters across racial groups. Nested chi-squared tests supported the equivalency of the factor pattern and factor loadings, providing acceptable evidence of factorial invariance in African-American and white parents.

Parental Influence Scale (Jago)

Jago and colleagues[127] evaluated the measurement properties of a scale designed to measure parental influences on youth PA. Items were generated from focus groups conducted with primary school students residing in Bristol, England. The item pool was first administered to a sample of 173 10-year-old children to evaluate item variance, test–retest reliability, and internal consistency. After confirming reliability, 14 items were submitted to a principal components analysis. The results identified four conceptually distinct factors that accounted for 68% of the common variance—general parenting support (six items), active parents (four items), parent's past activity (two items), and guiding support (two items). The general parenting support subscale provided an indication of the overall support the child perceived their parent provided for PA (alpha = 0.83). The active parents subscale provided an indication of the extent to which the child perceived their parent(s) to be active (alpha = 0.84). The past parent activity subscale addressed whether or not the child perceived their parent as being active in the past (alpha = 0.80). The guiding support subscale addressed the extent to which the child's parents had supportive rules related to PA (alpha = 0.82). Test–retest correlations (ICCs) for the individual items in the parental influence scale were between 0.60 and 0.80, indicating acceptable reliability.

Discussion

An important goal of this review was to determine if investigators studying parenting PA influences are using measures with sound psychometric properties. Our analyses suggest that a significant percentage of studies in the youth PA literature use parenting PA measures with indeterminate validity and reliability. For the six parenting constructs examined, between 10% and 40% of published studies did not provide citations supporting the validity and/or reliability of the measure. Of the studies providing supporting citations, between 11% and 64% of the studies cited were actual methods articles. Thus, it appears that a large percentage of articles in the peer-reviewed literature simply cite other studies that have used the same measure. Adding further to the concern, a large proportion of studies reviewed did not provide validity and reliability statistics. The percentage of studies providing psychometric data ranged from 0% for perceived parental PA to 67% for perceived importance of PA. However, it is important to note that a significant percentage of these studies reported validity and reliability statistics that were obtained in different study populations. A second important goal was to appraise the quality of reporting in studies employing measures of PA parenting. Our results suggest that the standard of reporting in research employing PA parenting measures could be improved considerably. A large percentage of studies did not include sample items, describe the response format, or report the possible range of scores.

To increase awareness of the psychometric foundations of the PA parenting literature, we summarized research evidence addressing the validity and reliability of five instruments designed to measure parental influences on

youth PA. Nearly all studies evaluated factorial validity and internal consistency using conventional exploratory and confirmatory factor analytic approaches. Three studies evaluated factorial invariance across groups,[120,122,126] while one study examined factorial invariance across time.[122] Of note, no studies were located that evaluated sensitivity to change. The results provided moderate evidence of factorial validity and reliability for the parental support scales. Nevertheless, the absence of measurement articles for other PA parenting constructs underscores the urgent need for further instrument development and testing in this field.

Conclusion

To advance our current understanding of the mechanisms of parental influence and enhance the effectiveness of school and/or family intervention to increase youth PA, we make the following recommendations regarding the measurement of PA parenting constructs.

There is an urgent need for the development of more comprehensive, multidimensional measures of PA parenting constructs.

- All new PA parenting measures should be rigorously evaluated for evidence of factorial validity, factorial invariance, and sensitivity to change.
- Future studies should explore the use of objective measures of parental influence (e.g., accelerometry, direct observation, ecological momentary assessment).
- Investigators should carefully scrutinize the origins and quality of existing measures of parental influence prior to use. Only measures with supportive evidence of validity and reliability in the population under study should be used.
- Investigators electing to develop new measurement scales, modify an existing measure, or use a measure validated in a different population should conduct the appropriate analyses to confirm validity and reliability and report these results. Journal editors and reviewers should enforce this requirement.
- When authors choose to cite evidence of validity and reliability, they should cite methodological studies that report the psychometric properties of the measure. Studies using the scale but not reporting on its measurement properties should not be cited.

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