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Measuring the Physical Activity Practices Used by Parents of Preschool Children

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Abstract

Parents play a critical role in shaping children's attitudes, beliefs and behaviors, including those around physical activity and inactivity. Our ability to identify which practices effectively promote children's physical activity and limit inactivity is limited by existing measurement instruments. This project will present a newly developed physical activity parenting practices survey, the psychometric properties of this survey's scales, and their association with child physical activity and screen time behaviors.

Methods—A sample of 324 parents with 2–5 year old children from central North Carolina completed a series of questionnaires, including this newly developed survey of physical activity parenting practices. Child physical activity was assessed by ActiGraph (GT3X) accelerometers and parent report. Exploratory factor analysis was used to identify physical activity parenting practice constructs, and Pearson correlations were used to explore relationships between constructs and child physical activity.

Results—Fourteen parent practices used to either control or support children's physical activity or screen time were identified. Limits on screen time ($r=-0.44$), use of screen time to control behavior ($r=0.23$), exposure to TV ($r=0.33$), and parent modeling of physical activity ($r=0.37$) were all significantly associated with children's TV viewing. Use of physical activity to control child behavior was significantly associated with time spent outside ($r=0.15$) and minutes of moderate or vigorous physical activity ($r=0.16$). Several supportive practices were associated with time outside (+) and TV time (-).

Conclusions—Results provide support for this new measure of physical activity parenting practices and identify several practices that are clearly associated with child physical activity.

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CONFLICT OF INTEREST

Authors have no conflicts of interest to declare.

Keywords

home environment; physical activity; sedentary time; screen time; scale development; psychometric properties

INTRODUCTION

Regular physical activity is important for child health and development. Recent reviews of the literature and meta-analyses have found that physical activity is associated with improved child cardio-metabolic (lower blood pressure, triglycerides, HDL cholesterol, and fasting insulin) and mental health (reduced depression and anxiety, increased self-esteem and cognitive functioning) outcomes. (8) To achieve these health benefits, current physical activity guidelines suggest that children get 60–120 minutes or more of physical activity each day. (22, 34)

Parents and the home environment are thought to play a critical role in children's socialization, including the attitudes, beliefs and behaviors children adopt around physical activity. (2, 25) Current conceptual models suggest that parent behaviors such as encouragement of child activity, personal activity patterns, preferences for activity, monitoring of child TV viewing, and family TV viewing can influence children's physical activity and inactivity behaviors. (5, 12) *Physical activity parenting practices* is used to refer to this collection of techniques or behaviors parents may use to encourage or limit their children's physical activity or inactivity. Several individual studies have seen associations between child physical activity or sedentary time with parenting practices like role modeling of physical activity or screen use, support/encouragement for activity, and screen time rules. (10, 13, 17, 20, 24, 30, 31, 36) However, a recent umbrella review found that there was not clear and consistent evidence linking specific physical activity parenting practices to children's physical activity behaviors, particularly for those under 12 years old. (2) At the same time, this review found that parent involvement increased the effectiveness of interventions designed to promote child physical activity and prevent obesity. (2) Together, this evidence suggests that parents play an important role in shaping children's physical activity habits, but more work is needed to identify the specific practices through which they are exerting this influence.

One of the major challenges of interpreting existing literature is the discrepancies in how physical activity parenting practices are conceptualized and measured. Existing studies and measurement instruments generally take a very fragmented approach, measuring only a few select practices. A recent review of questionnaires assessing physical activity parenting identified 11 unique instruments (29), only 5 of which measured parenting practices around both physical activity and inactivity (7, 10, 11, 17, 32). While a few additional instruments have come out in recent years (9, 13, 15, 18, 21, 30), there is a clear preference for measuring practices that support physical activity (e.g., role modeling, co-participation, and praise, negotiation and rationalizing) or restrict inactivity (e.g., rules and limits, monitoring). Even among these more comprehensive instruments, parent practices that may unintentionally support inactivity (e.g., modeling of screen time, enjoyment of sedentary

activities) (10, 13, 17, 32) and control/restrict physical activity (e.g., rules around outdoor play, pressure to be active, bribes to be active) (11, 19, 21, 27, 32) are rarely measured. Rarely have studies included measures of both supportive and controlling practices around both physical activity and inactivity to see how these practices may interact to influence child activity and/or inactivity. More comprehensive instruments are needed in order to fully evaluate parents' influence on child activity levels.

Much can be learned from the general parenting and food parenting literature to help inform the development of a more comprehensive measure of physical activity parenting practices. General child-rearing behaviors have been characterized using two major dimensions – demandingness and responsiveness. (1) When trying to identify specific parenting practices to measure, it is important to recognize that there will be multiple specific parenting practices within each. Demanding or controlling practices would include constructs such as discipline, restriction, pressure, and bribes; while responsive or supportive practices would include constructs such as encouragement, negotiation, and positive reinforcement. Costanzo and Woody applied these concepts to help understand domain specific parenting, specifically around child obesity. (4)

Food parenting measures have often used this general parenting literature to guide its identification of practices parents use to influence their child's dietary intake and eating behaviors. Food parenting and physical activity parenting are similar in that they are trying to identify practices that both increase healthy behaviors (e.g., consumption of fruits & vegetables, participation in regular physical activity) and decrease unhealthy ones (consumption of sweets & snacks, watching excessive TV). The food parenting literature has identified a more balanced list of supportive and controlling parent practices thought to influence child intake of healthy and unhealthy foods and beverages. In comparison, most physical activity parenting measures have focused on measuring the supportive practices that parents use to encourage physical activity, and the controlling practices parents use to restrict sedentary behaviors. More attention is needed to identify parents' physical activity practices that may unintentionally support inactivity and discourage physical activity.

Another limitation of current literature is a lack of information about how the parent practices influence the physical activity levels of young children, particularly those under the age of 5 years. These children have limited autonomy and are therefore even more dependent upon others for many of their behavioral choices. (23) Yet, few studies to date have explored the relationship between parent practices and child physical activity in families with young children. (14)

Work is needed to develop a comprehensive conceptual model of physical activity parenting practices, to create a measure that assesses these practices, and to explore how these practices influence physical activity and inactivity, particularly for those under the age of 5. This paper is intended to help address these gaps in the literature, in that it will (a) describe the development of an instrument designed to assess physical activity parenting practices and the content map used to guide its development, (b) present the factor analysis and identification of constructs from the content map, and (c) explore the association between

these practices and child physical activity in a sample of families with 2–5 years old children.

METHODS

Instrument Development

This new instrument was designed to assess parenting practices thought to influence children's physical activity and inactivity (i.e., screen time behaviors). PubMed was used to identify articles describing development of instruments to assess parenting practices around child physical activity and screen time. Items and scales from these instruments were reviewed to identify common physical activity parenting practice constructs captured by existing instruments. The constructs identified provided the foundation for the content map (see Figure 1). Items and scales measuring similar constructs were compared in order to select the most appropriate items for inclusion and prevent redundancy. Also, experts on the project team reviewed the content map and identified additional constructs they felt there were missing. For example, there were existing items to capture rules and limits around TV time, but there were insufficient existing items to assess the variety of rules and limits parents may impose around active play. For these constructs, new items were created. The final survey included 147 items, which included: 47 items about the home's physical environment, including presence of TV, video games, and computers throughout the house, variety of adult exercise equipment, and variety and accessibility of child play equipment; 41 items about controlling practices, such as rules around indoor and outdoor active play, limits on and monitoring of screen time, parent control over child activity and screen time, rewarding and punishing with either physical activity or screen time, and using activity or screen time as a distraction for the child; and 45 items about supportive practices like support, encouragement and praise of physical activity, explicit modeling of physical activity or sedentary behaviors, and talking with children about activity/inactivity and health, parent attitudes around activity and sedentary behaviors, support from other adults in the household, and child preference for active versus sedentary activities. A few additional items were also included to capture parent report of child physical activity behaviors. (Instrument is available upon request.)

Study Sample

This new survey was administered as part of a larger intervention study involving families with preschool-age children (2–5 years old). Protocols have been described in detail elsewhere (35) but are reviewed in brief here. A sample of 324 families with at least one child between the ages of 2–5 years old was recruited from central North Carolina. Recruitment strategies included interceptions at child care centers, flyers sent home by child care providers, advertisements and postings throughout the community, listserv announcements, direct postal mailings, recruitment website, and informational tables at community fairs. Parents who indicated interest were screened by phone to confirm eligibility: having at least one child aged 2–5 years, having at least one overweight parent (BMI $\geq 25\text{kg/m}^2$) in the household, and ability to read and comprehend English. All protocols were approved by the Institutional Review Board at the University of North Carolina at Chapel Hill.

Data Collection

Interested and eligible parents were scheduled for an in-person measurement event held in their local community. After signing consent, parents completed a variety of psychosocial surveys, including the newly developed physical activity parenting practices survey. Additionally, parents were asked to have their child wear a belt with an ActiGraph GT3X accelerometer for 7 days (except when sleeping or participating in water activities). Monitors were programmed with a 15-second epoch and belts were fit to the child's waist so that the monitor was over their right hip. Parents were provided with a pre-addressed, postage paid envelop for monitor return.

Analysis

The overarching themes of control and support were used to guide the exploratory factor analysis (EFA) of items from the physical activity and screen time parenting practices survey. Before beginning the EFA, item variability and correlations between items were examined. Any item where 85% or more of respondents selected one option (e.g., "strongly agree") were considered for elimination due to low variation and limited ability to discriminate among participants. All items were found to have sufficient variability to be retained. Five pairs of items were found to be highly correlated ($r > 0.80$), and were therefore combined into a single item before beginning EFA. The EFA was performed with MPlus v6.1 using a WLSMV estimator, oblique GEOMIN rotation, and items as categorical where appropriate. Oblique rotation was used because we expect these social environment variables to be related with each other. Factors were developed and reduced using a stepwise process. At each step, Eigenvalues, the scree plot, factors, and item loadings were reviewed, items that did not load on any factor (loading < 0.20) were removed then the EFA was repeated. The 0.20 criterion was set so that, if applicable, multiple items could be eliminated at one time, but that every item with low loadings (less than 0.40) was not eliminated during the first stages of the EFA. This approach gives items with loadings close to 0.40 "a chance" to be retained on a factor after the least significant items are removed. Based on this, no more than two items were removed during each reduction step. The process was repeated until all retained items had factor loadings of 0.40 or higher. For the few items that loaded higher than 0.40 on multiple factors (crossloading), items were retained as part of the factor for which they had the highest factor loading. Once factors had been identified, alphas, means, standard deviations, and correlations among the factor scores were examined.

Minutes of moderate or vigorous physical activity (MVPA) and sedentary time were estimated from accelerometer data, while TV time and outside time were estimated from parent report. Accelerometer data were considered valid if a child wore the monitor for 6 or more hours on at least 4 days. (33) Minutes of MVPA and sedentary time were quantified based on calibration studies by Evenson and colleagues²³ and Pate and colleagues,²⁴ specifically less than 25 counts per 15-seconds was considered sedentary and more than 500 counts per 15-seconds was considered MVPA. Estimates of MVPA and sedentary time were standardized to a 10-hour day by computing MVPA and sedentary minutes per hour (minutes of MVPA/wear hours) and multiplying by 10 hours. This was done to account for the person to person variability in wear hours. Wear time should be accounted for in all

analyses that use minutes of physical activity as an outcome. Parent reported TV and outside time were summarized as hours of TV per day and hours outside play per day, respectively.

Simple correlations were calculated to explore the relationships between individual factors of physical activity parenting practices and child physical activity, objective and parent report. Partial correlations were also calculated, controlling for parent race, family income, child sex, and child age.

RESULTS

A total of 324 parent-child dyads completed baseline measures. The majority of parents were mothers (92.3%), either white (51.4%) or African American (39.8%), and well-educated (75.3% having a 4-year college degree or more). The majority of families (63.4%) had a household income \leq \$50,000 (approximate median income for the area). Average age of the parent was 34.9 years, and average age of the child was 41.9 months.

Parent-report of child outside and TV time was available for 303 children. Based on these data, children spend on average 1.87 ± 1.09 (mean \pm SD) hours per day outside and 1.75 ± 1.28 hours per day watching TV. Two hundred eighty one children had complete accelerometer data. On average, children spent 59.4 ± 19.7 minutes per day in MVPA and 323.0 ± 33.3 minutes per day in sedentary activity.

Of the original 147 items, 83 were retained to form the final 15 parent practices factors. Results from the EFA revealed six factors related to controlling parent practices and eight factors related to supportive parenting practices. There was one additional factor that captured parental perceptions of child preference for physical activity versus inactivity. Tables 1 and 2 provide descriptions for each factor along with their Cronbach's alpha, range of factor loadings, and mean scores. More specifically, there were four factors related to parents' controlling practices around children's active play: rules around active play indoors, rules around active play outdoors, use of physical activity to reward/ control behavior, and limiting outdoor play due to weather. There were two additional factors related to parents' controlling practices around screen time: use of screen time to reward/ control behavior and limiting or monitoring of screen time. With regard to supportive practices, there were six factors related to support for active play: explicit modeling and enjoyment of physical activity, verbal encouragement for physical activity, logistic support for sports, logistic support for active play, importance and value of physical activity, and support/reinforcement from other adults. In addition, there were two factors related to parental support for screen time: exposure to TV and explicit modeling and enjoyment of TV. Internal consistency for all factors was good, with Cronbach's alphas ranging between 0.54–0.88.

The correlation matrix (Table 3) shows that many of these factors are significantly correlated with one another. Of the 105 total correlations among the factors 65 were statistically significant ($p < 0.05$). Eleven were between 0.30 and 0.39 (absolute value), while 6 were greater than or equal to 0.40. Four of these correlations were between the screen related factors (exposure, modeling, and limiting screen time). The other 2 "larger correlation" involved explicit modeling of physical activity, which correlated with verbal

encouragement ($r=0.40$) and logistic support for physical activity ($r=0.52$). In addition, the four factors related to controlling practices around activity were often positively correlated with one another – parents who reported more rules, limits, or control tend to use more controlling practices in general. Importance and value for physical activity was significantly correlated with all 6 of supportive practices around physical activity – those who reported greater importance and value of child physical activity tend to provide more supportive practices for physical activity. Child preference for physical activity was also significantly correlated with all but one of the supportive practices around physical activity – parents who reported higher child preference for physical activity tend to use more supportive practices. While many correlations were statistically significant, strength of these correlations were modest (with the majority being less than 0.4), which would suggest that factors are indeed measuring separate constructs.

The correlations between parent report of child outside time and TV time and the physical activity and screen time parenting practices revealed several significant associations (Table 4). With regard to controlling practices around physical activity, use of physical activity to reward/control behavior was positively associated with outside time ($r=0.15$) while limiting outdoor play due to weather was negatively associated with outside time ($r=-0.22$). With regard to supportive practices around physical activity, five of the six practices (all but logistic support for sports) were positively associated with outside time ($r=0.15-0.28$). With regard to screen time practices, use of screen time to reward/control child behavior, exposure to TV, and explicit modeling and enjoyment of screen time were all positively associated with TV time ($r=0.23-0.37$). Limits and monitoring of screen time was negatively associated with TV time ($r=-0.44$).

Overall, the associations between parenting practices and accelerometer measured physical activity were less consistent than with parent reported outside and TV time. Specifically, MVPA was significantly associated with three controlling practices: rules around active play indoors ($r=0.20$), use of physical activity to reward/control behavior ($r=0.16$), and limiting outdoor play due to weather ($r=0.12$). However, use of physical activity to reward/control behavior was the only controlling factor to remain significant in partial correlations that controlled for demographic factors. Verbal encouragement for physical activity ($r=0.15$) and logistic support for active play ($r=0.15$) were the only two supportive practices significantly associated with child MVPA, but significance was only observed in the partial correlations controlling for demographic factors.

DISCUSSION

It is important to establish healthy lifestyle behaviors, such as regular physical activity, early in life, before unhealthy habits take root. During childhood, parents play a critical role in the socialization of their child and hence the behaviors they adopt, including physical activity and sedentary behaviors. Our results provide important construct validity and internal consistency evidence for a newly developed instrument that can be used to assess a wide range of parent practices to control and support their child's active play and screen time behaviors. EFA and correlational findings support the construct validity of the new instrument and show strong internal consistency reliability for the individual scales.

The comprehensiveness of this new instrument is a positive extension of existing measures of physical activity parenting practices. Interest in how parental practices influence child physical activity and inactivity has intensified in recent years. However, there are very few well-developed measures of physical activity parenting practices, and those that do exist are often limited in scope. (29) A recent review of existing measures called for the development of theory-based, multi-dimensional measures of physical activity parenting. Most instruments to date assess only a few select factors, primarily focusing on parental practices thought to support child activity, such as encouragement, logistic support, explicit modeling, and family activity. (6, 10, 16, 26, 32) However, parent practices can also impede child activity. Instruments like the PEAS survey, (18) capture the opposite end of the spectrum, with items that assess limiting, monitoring, or controlling practices. This new instrument was developed using the existing literature and a clear conceptual model to provide an assessment of both controlling and supportive parenting practices around physical activity and screen time. It includes 15 factors – ten specific to practices around active play, four to screen time, and one around child preference.

The content map (Figure 1) helps illustrate our attempts to create an instrument with comprehensive coverage of potential parental behaviors. It also shows how the original constructs were combined or separated during the EFA process. Some of the constructs emerged as unique factors, while others grouped together to form overarching factors. For example, parental value for physical activity was envisioned as one component of implicit modeling, and the factor analysis pulled 3 relevant items together to form one factor. In comparison, the factor that emerged for parental modeling of physical activity includes items related to multiple constructs in the original content map - parents' use of their own behavior to be a model of activity, as well as doing activities together with their child, and parental enjoyment of activity. While EFA is a useful strategy for scale development, it is also important to understand and describe the original constructs used to guide the initial selection of items. We can then better compare similarities across scales and possibly understand why results vary across studies.

One major theme that emerged from these data is a clear association between supportive practices around physical activity and child's outside time and TV time. Similar studies with families of preschool age children have also demonstrated an association between child physical activity and similar scales of "parental support" and "parental modeling". (20, 30, 36) In these other studies, parental support was measured using a single scale formed from five items about encouragement, coactivity, transportation, watching child do activities, and talking with child about health benefits of physical activity. In comparison, our instrument expands many of these items into separate scales. This could be explained by differences in how parental modeling was conceptualized or defined. It is common to use parent report of their own physical activity as a measure of parent modeling, (3, 6, 28, 32) but in our content map parental modeling was conceptualized as purposeful behavior on the part of the parent to use his/her own behavior to encourage the child to be more active by letting the child see him/her being active, hearing him/her talk about activity, being active together, and enjoyment of activity. Despite these differences, results from these different studies suggest that supportive practices may help promote children's physical activity. Using this new

instrument may allow researchers to highlight specific areas of support that offer the greatest impact on physical activity.

These findings are also consistent with the broader literature involving children and adolescents. Cislak's umbrella review of interventional and correlational studies looking at relationships of parent practices and child physical activity found strong evidence for the importance of instrumental support, and preliminary support for the importance of parental physical activity and modeling, and encouragement, at least for adolescents. (2) In addition, Pugiese's meta-analysis found that parental modeling, encouragement, and instrumental support were all significantly associated with child activity. (25)

Findings from this study also suggest that controlling physical activity practices may influence children's physical activity and inactivity. Use of physical activity to reward/control child behavior was positively associated with both parent report of child's outside time as well as accelerometer measured MVPA. This association may indicate that this strategy to manage child behavior encourages participation in physical activity. There were, however, some unexpected associations between child MVPA and rules around active play indoors and limiting outdoor play due to weather. One might hypothesize that rules and limits would decrease a children's physical activity, but these results show a positive association – more rules associated with more activity. Similar results have been observed in the food parenting practices literature around restrictive practices – with greater restriction being associated with higher intakes of junk foods. (2) As in the food practices, this relationship may reflect parents' reaction to their child's behavior, with parents of very active children finding that they need to impose more rules and limits as a strategy for managing their child's behavior.

A third theme that emerged from the results is the association between screen time practices and child TV time. Supportive practices, including exposure to TV and explicit modeling and enjoyment of screen time, were both positively associated with the time children spent watching TV. These constructs appear to operate similarly around screen time as they do physical activity with greater presence of TV and modeling of screen time behaviors by parents being associated with greater screen time behaviors in children. Controlling practices seemed to operate differently. Limits and monitoring of screen time was inversely associated with TV time, and thus may be an effective strategy for discouraging screen time. This is consistent with at least one other study in preschool age children. (30) However, use of screen time to reward/control behavior was associated with greater TV time. These findings may suggest that this strategy to manage child behavior leads to an increase in children's screen time.

The associations observed between parenting practices and child physical activity often varied depending on the method used to assess child activity. Parent report of children's time spent outside time and watching TV were more strongly related to parenting practice factors than the accelerometer-based estimates of MVPA and sedentary time. This may be due, in part, to some sort of self-reporting bias. While some reporting bias may be present, not all practices showed significant associations with child outside time and TV time and the strength of these associations also varied considerably, suggesting that the type of data

collection (self-report) does not account for all of this discrepancy. Another reason for these differences in findings is that different behaviors are being measured. Accelerometers are used to calculate minutes of MVPA and sedentary time. While children tend to be more active when outdoors, outside time and MVPA are very different concepts. Children may be outside and be engaged in sedentary activities, or they may be inside and engaged in active play. Similarly, sedentary and TV time are not equivalent measures of child activity. Not all sedentary time is spent watching TV and not all TV time is sedentary. In this data, neither TV and sedentary time ($r=0.12$, $p=0.06$) or MVPA and outside time ($r=-0.02$, $p=0.76$) were significantly related.

Additional research is needed to further explore how physical activity and screen time parenting practices influence children's physical activity and screen time habits. Similar to food parenting practices, associations may differ depending on the sample's demographic characteristics. More work is needed to examine differences between boys and girls, low-income and high-income families, across different races/ethnicities, and for different age groups. Controlling for parental race, family income, child gender, and child age lead some insignificant associations to become statistically significant and vice versa. Preliminary analyses looking at different sub-groups would suggest that this is a rich area for future research.

Limitations

As with any study of this nature we must acknowledge that the cross-sectional nature of the data does not allow for determination of causation, only association. Additionally, the sample was recruited for a larger intervention trial, which may limit generalizability. The sample does, however, include a larger number of African American mothers and overweight or obese parents compared to other measures development papers. In addition, due to the nature of this project and data collection we were unable to have participants complete the items a second time, thus we cannot provide test-retest reliability evidence for the scales. Finally, most participants were women. The literature has shown some differential effects of parent modeling of physical activity on child behavior between mothers and fathers. Unfortunately at this point we cannot evaluate this effect.

CONCLUSIONS

The results provide strong validity evidence for the 15 parental support and control for physical activity factors identified using EFA. These findings endorse the use and further development of these factors, which build on previous research, refining our understanding of the factors that influence physical activity behavior. Many of these factors show promise as modifiable intervention and public health targets.

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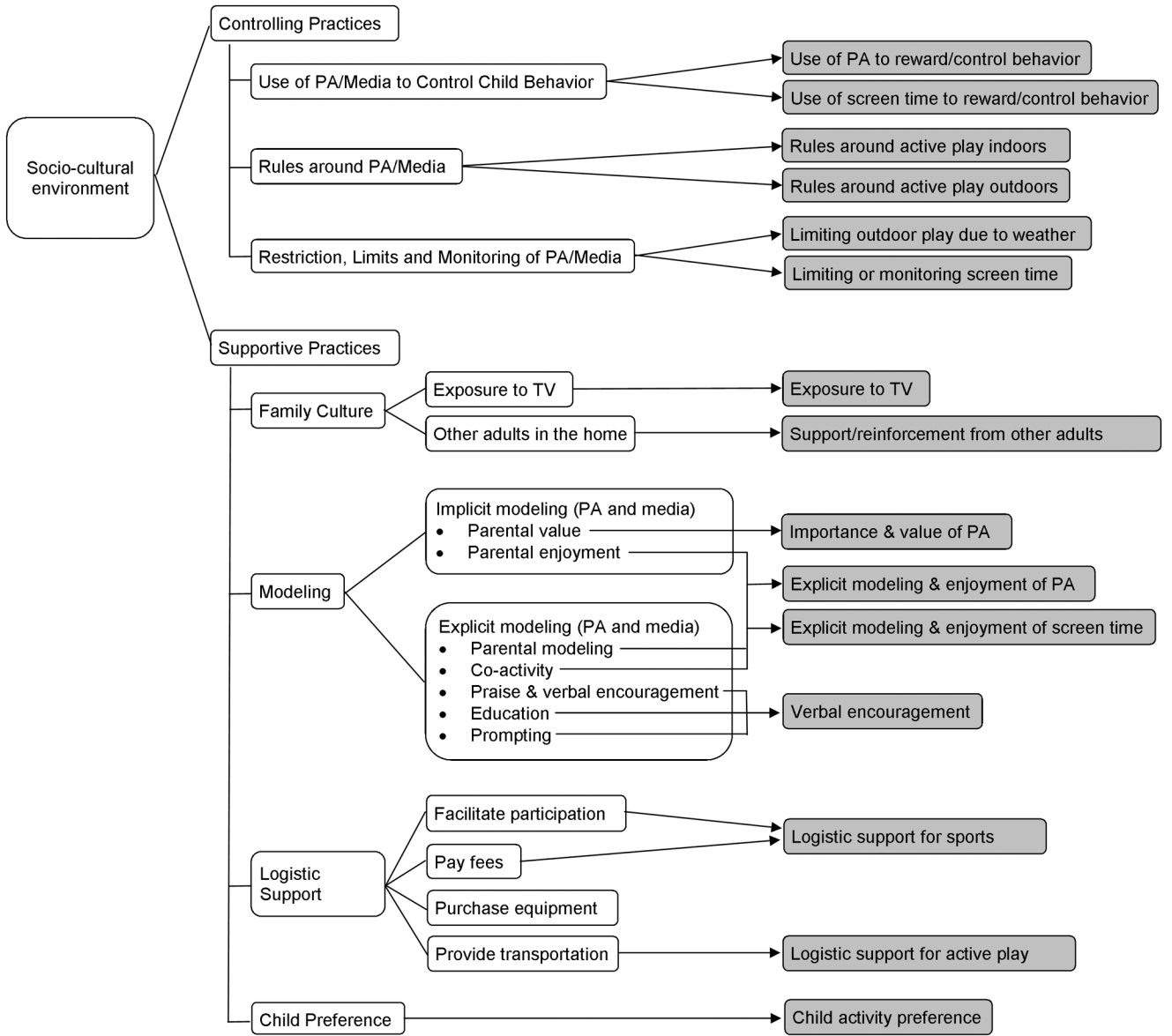


Figure 1.
Content Map

Table 1**Controlling Parent Practices**

| Scale (# items) | Sample items | Internal Consistency α | Range for factor loadings | Mean score (SD) |
|---|--|-------------------------------|---------------------------|-----------------|
| Controlling Practices around Physical Activity | | | | |
| Rules around active play indoors (14) | How often is your child allowed to do each of the following activities while playing inside your house... ...climbing ...hopping, skipping or galloping | 0.86 | 0.42–0.87 | 1.43 (0.48) |
| Rules around active play outdoors (4) | How often do you ask your child... ...to calm down his/her outdoor play? ...not to run while s/he is playing outside? | 0.69 | 0.44–0.70 | 2.14 (0.83) |
| Use of PA to reward/control behavior (5) | How often does your child get extra outside time as a reward? How often do you offer sports or physical activities to your child as a reward for good behavior? | 0.80 | 0.51–0.84 | 3.09 (1.01) |
| Limiting outdoor play due to weather (2) | How often do you let your child play outside... ...on cold days? ...on hot days? | 0.85 | 0.85–0.94 | 2.72 (1.04) |
| Controlling Practices around Screen Time | | | | |
| Limiting or monitoring screen time (10) | About how much time is s/he allowed to watch TV, videos, or movies each weekday/ weekend day?* | 0.79 | 0.53–0.82 | 3.51 (1.18) |
| Use of screen time to reward/control behavior (4) | How often do you... ...use TV time to control your child's behavior? ...take away TV, video, or movie time as a punishment for bad behavior? | 0.79 | 0.57–0.94 | 3.07 (1.06) |

* Indicates items that were reverse scored

Table 2

Supportive Parent Practices

| Scale (# items) | Sample items | Internal Consistency α | Range for factor loadings | Mean score (SD) |
|--|--|-------------------------------|---------------------------|-----------------|
| Practices Supportive of Physical Activity | | | | |
| Explicit modeling and enjoyment of PA (10) | During a typical week, how often does your child... ...hear you talk about participating in a sport or being physically active? ...see you doing, or going to do, something that is physically active? | 0.88 | 0.42–0.85 | 3.44 (0.75) |
| Verbal encouragement for PA (7) | During a typical week, how often do you... ...say things to encourage your child to spend less time being sedentary? ...tell your child how sedentary habits can be unhealthy? | 0.77 | 0.41–0.87 | 3.81 (0.85) |
| Logistic support for sports (3) | How active are you in enrolling your child in sports? For how many activities have you or other adult paid fees? | 0.69 | 0.72–0.82 | 2.26 (1.01) |
| Logistic support for active play (4) | During a typical week, how often do you take your child to the park to play? During the last month, how many times have you taken your child to play at a park? | 0.65 | 0.45–0.88 | 4.67 (1.15) |
| Importance and value of PA (3) | How important is it for your child to be physically active when s/he grows up? How valuable is it to you that your child be physically active? | 0.70 | 0.55–0.89 | 4.47 (0.53) |
| Support/reinforcement from other adults (3) | Other adults in my child's life make it hard to... ...get my child to be physically active. ...enforce household rules about TV viewing. | 0.54 | 0.39–0.67 | 4.14 (0.68) |
| Practices Supportive of Screen Time | | | | |
| Exposure to TV (3) | How many days per week does your family have the television on during... ...breakfast? ...the evening meal? | 0.66 | 0.50–0.79 | 2.55 (1.68) |
| Explicit modeling and enjoyment of screen time (6) | During a typical week, how often do you watch TV or videos with your child? I enjoy watching TV/movies with my child. | 0.76 | 0.54–0.67 | 3.73 (0.71) |

* Indicates items that were reverse scored

Table 3

Correlations (p-values) between factors of parent physical activity practices

| Factor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|------------------------------|--|----------------------|----------------------|---------------------|----------------------|----------------------|----------------------|---------------------|----------------------|----------------------|---------------------|---------------------|---------------------|----------------------|
| Controlling Practices | | | | | | | | | | | | | | |
| 1 | Rules around active play indoors | | | | | | | | | | | | | |
| 2 | Rules around active play outdoors | 0.372 (0.00) | | | | | | | | | | | | |
| 3 | Use of PA to reward/control behavior | 0.183 (0.00) | 0.259 (0.00) | | | | | | | | | | | |
| 4 | Limiting outdoor play due to weather | 0.237 (0.00) | 0.202 (0.00) | -0.026 (0.66) | | | | | | | | | | |
| 5 | Limiting or monitoring screen time | -0.042 (0.47) | -0.094 (0.10) | -0.030 (0.60) | -0.157 (0.01) | | | | | | | | | |
| 6 | Use of screen time to reward/control behavior | 0.225 (0.00) | 0.261 (0.00) | 0.405 (0.00) | 0.028 (0.63) | -0.237 (0.00) | | | | | | | | |
| Supportive Practices | | | | | | | | | | | | | | |
| 7 | Explicit modeling and enjoyment of PA | -0.139 (0.02) | -0.138 (0.02) | 0.174 (0.00) | -0.220 (0.00) | 0.322 (0.00) | -0.167 (0.00) | | | | | | | |
| 8 | Verbal encouragement for PA | 0.035 (0.55) | 0.023 (0.68) | 0.343 (0.00) | -0.113 (0.05) | 0.081 (0.16) | 0.090 (0.12) | 0.398 (0.00) | | | | | | |
| 9 | Instrumental support for sports | -0.088 (0.13) | -0.188 (0.00) | 0.049 (0.39) | -0.130 (0.02) | 0.073 (0.20) | 0.079 (0.17) | 0.176 (0.00) | 0.184 (0.00) | | | | | |
| 10 | Instrumental support for active play | -0.194 (0.00) | -0.132 (0.02) | 0.113 (0.05) | -0.251 (0.00) | 0.308 (0.00) | 0.524 (0.00) | 0.299 (0.00) | 0.193 (0.00) | | | | | |
| 11 | Importance and value for PA | -0.055 (0.33) | -0.090 (0.12) | 0.080 (0.17) | -0.138 (0.02) | 0.099 (0.08) | 0.315 (0.00) | 0.222 (0.00) | 0.190 (0.00) | 0.120 (0.04) | | | | |
| 12 | Other adults limit influence | -0.045 (0.43) | -0.149 (0.01) | 0.028 (0.62) | -0.055 (0.34) | 0.281 (0.00) | 0.282 (0.00) | 0.095 (0.10) | 0.070 (0.23) | 0.241 (0.00) | 0.117 (0.04) | | | |
| 13 | Exposure to TV | 0.004 (0.95) | 0.063 (0.27) | 0.039 (0.49) | 0.179 (0.00) | -0.533 (0.00) | -0.238 (0.00) | -0.043 (0.46) | 0.015 (0.79) | -0.265 (0.00) | 0.072 (0.21) | 0.146 (0.01) | | |
| 14 | Explicit modeling and enjoyment of screen time | 0.063 (0.27) | 0.131 (0.02) | 0.074 (0.20) | 0.252 (0.00) | 0.321 (0.00) | -0.337 (0.00) | -0.068 (0.24) | -0.125 (0.03) | -0.239 (0.00) | -0.066 (0.25) | 0.164 (0.00) | 0.422 (0.00) | |
| 15 | Child Preference | -0.004 (0.94) | -0.053 (0.36) | 0.177 (0.00) | 0.009 (0.88) | 0.165 (0.00) | 0.307 (0.00) | 0.235 (0.00) | 0.075 (0.19) | 0.279 (0.00) | 0.299 (0.00) | 0.351 (0.00) | -0.100 (0.08) | -0.196 (0.00) |

Table 4

Correlations and Partial Correlations^b between parent practices and child activity (n=259–303) with p-value in ()

| Factor | Accelerometer PA | | Parent Report PA | |
|---|--------------------|---------------------|---------------------|----------------------|
| | MVPA ^a | SED ^a | TV ^c | Outside ^c |
| Controlling Practices (PA) | | | | |
| Rules around active play indoors | 0.20 (0.00) | -0.19 (0.00) | 0.14 (0.01) | -0.06 (0.28) |
| | 0.03 (0.61) | -0.06 (0.32) | -0.07 (0.22) | -0.07 (0.25) |
| Rules around active play outdoors | 0.01 (0.93) | -0.04 (0.52) | 0.18 (0.00) | 0.02 (0.70) |
| | -0.03 (0.59) | -0.02 (0.79) | 0.10 (0.08) | 0.02 (0.75) |
| Use of PA to reward/control behavior | 0.16 (0.01) | -0.11 (0.07) | 0.08 (0.18) | 0.14 (0.02) |
| | 0.16 (0.01) | -0.09 (0.15) | 0.02 (0.75) | 0.15 (0.01) |
| Limiting outdoor play due to weather | 0.12 (0.04) | -0.08 (0.19) | 0.20 (0.00) | -0.16 (0.01) |
| | 0.04 (0.56) | -0.00 (0.98) | 0.10 (0.10) | -0.22 (0.00) |
| Controlling Practices (Screen Time) | | | | |
| Limits and monitoring of screen time | -0.10 (0.09) | 0.06 (0.36) | -0.47 (0.00) | -0.10 (0.09) |
| | 0.08 (0.22) | -0.07 (0.28) | -0.44 (0.00) | -0.09 (0.12) |
| Use of screen time to reward/control behavior | 0.08 (0.19) | -0.01 (0.83) | 0.24 (0.00) | -0.09 (0.11) |
| | -0.03 (0.63) | 0.04 (0.51) | 0.23 (0.00) | -0.09 (0.12) |
| Practices Supportive (PA) | | | | |
| Explicit modeling and enjoyment of PA | 0.02 (0.78) | 0.04 (0.50) | -0.26 (0.00) | 0.21 (0.00) |
| | 0.12 (0.06) | -0.01 (0.86) | -0.24 (0.00) | 0.23 (0.00) |
| Verbal encouragement for PA | 0.11 (0.07) | -0.01 (0.83) | -0.08 (0.19) | 0.26 (0.00) |
| | 0.14 (0.03) | -0.03 (0.59) | -0.07 (0.24) | 0.25 (0.00) |
| Logistic support for sports | 0.05 (0.44) | 0.04 (0.48) | -0.20 (0.00) | 0.05 (0.38) |
| | 0.03 (0.65) | 0.05 (0.46) | -0.18 (0.00) | 0.05 (0.44) |
| Logistic support for active play | 0.04 (0.55) | -0.07 (0.23) | -0.24 (0.00) | 0.27 (0.00) |
| | 0.15 (0.02) | -0.13 (0.04) | -0.22 (0.00) | 0.28 (0.00) |
| Importance and value of PA | 0.10 (0.09) | -0.03 (0.62) | -0.06 (0.32) | 0.09 (0.11) |
| | 0.06 (0.35) | -0.01 (0.88) | -0.06 (0.29) | 0.15 (0.01) |
| Support/ reinforcement from other adults | 0.09 (0.15) | -0.04 (0.51) | -0.11 (0.05) | 0.16 (0.00) |
| | 0.09 (0.16) | -0.02 (0.78) | -0.17 (0.01) | 0.18 (0.00) |
| Practices Supportive (Screen Time) | | | | |

| Factor | Accelerometer PA | | Parent Report PA | |
|--|--------------------|---------------------|---------------------|----------------------|
| | MVPA ^a | SED ^a | TV ^c | Outside ^c |
| Exposure to TV | 0.05 (0.40) | -0.00 (0.99) | 0.33 (0.00) | -0.04 (0.46) |
| | -0.08 (0.19) | 0.10 (0.11) | 0.31 (0.00) | -0.03 (0.61) |
| Explicit modeling and enjoyment of screen time | 0.03 (0.61) | -0.00 (0.95) | 0.38 (0.00) | -0.06 (0.32) |
| | -0.07 (0.27) | 0.07 (0.25) | 0.37 (0.00) | -0.06 (0.33) |
| Child Preference for PA | 0.21 (0.00) | -0.14 (0.02) | -0.19 (0.00) | 0.16 (0.01) |
| | 0.22 (0.00) | -0.11 (0.08) | -0.30 (0.00) | 0.19 (0.00) |

^aMinutes of MVPA, VPA, and sedentary has been standardized to a 10-hour day

^bbottom correlation = partial correlations controlling for Race, Income, Child Sex, Child Age

^cTV viewing and outside time are parent reported (hours per week)

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