

Effects of short bouts of structured physical activity on preschooler's during preschool-day physical activity level



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Background

- Most preschoolers do not meet the current PA recommendation of 120 minutes per day
- Children engage in approximately 8 min of MVPA per hour of preschool attendance
- Different types of PA studies have been conducted to improve the PA level of preschoolers, with mixed results
 - ▣ Most of these studies have rarely focused on changing the PA level within the classroom setting



- Intermittent nature of preschoolers play patterns are not accounted for
- Recent review indicated that the duration of most PA interventions in preschoolers' ranges between 30 to 45 minutes per session.
- There is a body of evidence suggesting that long duration PA interventions may not be effective for young children.



- Preschoolers accumulate 8-12 minutes of MVPA during a typical 30-minute gross-motor playtime
 - ▣ Accumulation of MVPA during the 1st 10 minutes
- Longer children participate in activity, the less activity they accumulate during the entire activity period
- Shorter bouts in PA (e.g., ≤ 10 minutes in duration per session) have been shown to be a successful strategy for improving children's PA, body weight, and academic performance in elementary school age children.



- Intermittent nature of preschoolers' play patterns suggests that short bouts of activity implemented during the preschool-day may be beneficial to preschoolers' PA levels.
- The purpose of this study was to examine the feasibility and effect of short bouts of structured PA (SBS-PA) implemented in the classroom for the first part of designated gross motor playtime on preschoolers during school PA level



Methods

- 10 preschool centers with similar PA environment and policies with serving low-SES areas in Springfield, MA
 - PA environment and policy assessed with a modified version of the Environment and Policy Assessment and Observation Audit Tool
- All children within each preschool were exposed to the assigned study condition
 - Within each center, between 25 – 30 children were individually recruited for the assessment portion of the study



Randomization

- Preschool centers were randomized (stratified by school size)
 - ▣ Short structured bouts of PA (SBS-PA)
 - ▣ Traditional unstructured PA (UPA)



Teacher Training

- Training sessions held separately for staff at each preschool
- SBS-PA teachers
 - ▣ Information on the importance of PA
 - ▣ Study protocol
 - ▣ How to implement the SBS-PA protocol
 - ▣ Teachers were taught how to lead preschoolers in SBS-PA activities and were guided through three different routines
- UPA teachers
 - ▣ Importance of allowing students to play freely during gross-motor playtime
 - ▣ Study protocol
- Researchers were available throughout the 6-month protocol to assist teachers in implementing their assigned intervention



Intervention Description

- All preschool centers are required to provide 60 minutes of gross-motor playtime per day
 - ▣ Typically provided as one 30 minute session in the morning and one in the afternoon [MA Department of Early Education and Care policy number 606 CMR 7.04(7)(a)8].
- No requirements regarding PA intensity level



Intervention

- Both interventions were designed to be in line with the state mandate and provided an opportunity for 60 minutes of daily PA
- Morning and afternoon gross motor playtime
 - ▣ 30 minutes each time
 - ▣ 5 days/week for 6 months



UPA (control intervention)

- Supervised free time for preschoolers to play on their own or with other children
- Gross motor playtime activities were not altered and instructions were not provided



SBS-PA intervention development

- Intervention adapted from the Instant Recess® program
- SBS-PA intervention consisted of 10-minute routines recorded onto DVDs that featured music and movements appropriate for preschoolers
 - ▣ Each 10-minute routine consisted of 1-min warm-up, 8-min moderate- intensity activity and 1-min cool-down
- Total of 16 routines were created and rotated weekly throughout the 6-month study
- Routines designed to be led by teachers (who are watching the video) --- preschoolers follow the teachers rather than watching the video



Intervention – SBS-PA

- All classrooms provided with
 - ▣ Portable DVD player
 - ▣ Written and picture guide instructions
- Intervention
 - ▣ Short structured bouts of PA (DVD)
 - During 1st 10 min of gross motor playtime (classroom)
 - ▣ Remaining 20 minutes
 - Supervised free playtime for the preschoolers to play on their own or with other children



Study fidelity and process evaluation

- Study fidelity assessed at least twice per week at each center
- Research staff used a standardized semi-structured questionnaire to assess the following
 - If intervention was implemented as designed
 - Duration of the gross-motor playtime
 - Location of gross-motor playtime
 - Percentage of children in the classroom participating in intervention
 - Perceived children enjoyment level
 - Time allowed for structured and unstructured free playtime
 - Transition time
- Teachers' perceptions of the intervention were assessed at the completion of the study using an open-ended questionnaire



Assessments

- Baseline
 - Physical measures
 - Intervention times
 - Physical activity
 - Actigraph
 - Direct observation
- Mid-point (3-months)
 - Physical activity
 - Intervention times
- Post (6-month)
 - Physical measures
 - Intervention times
 - Physical activity



Statistical analysis

- Generalized linear mixed models used to test for the interactive effect of time and intervention with a random intercept, and individual student nested in school
- Subset analyses
 - ▣ Participants with PA data at all time points
 - ▣ Intervention classrooms that conducted the intervention with fidelity



Baseline characteristics

| | SBS-PA (n=141) | UPA (n=150) | All (n=291) |
|----------------------|-------------------|----------------|----------------|
| Age (yrs.) | 4.0 ± 0.8 | 4.1 ± 0.9 | 4.1 ± 0.8 |
| Gender, n(%) | | | |
| Boys | 59 (52%) | 62 (49%) | 121 (50.2%) |
| Girls | 55 (48%) | 65 (51%) | 120 (49.8%) |
| BMI Percentile | 64.8 ± 28.4 | 71.9 ± 24.5 | 68.5 ± 26.7 |
| Race/Ethnicity, n(%) | | | |
| African-American | 33 (31%) | 25 (20%) | 58 (25%) |
| Hispanic | 35 (33%) | 59 (48%) | 94 (41%) |
| White | 36 (34%) | 36 (29%) | 72 (31%) |



Results: Direct Observation of PA



during 30 min session

| | Baseline | 3 month | 6 month |
|-------------------------------|-------------|-------------|-------------|
| % Interval spent at Sedentary | | | |
| SBS-PA | 27.5 ± 27.4 | 18.3 ± 29.0 | 22.6 ± 35.3 |
| UPA | 22.2 ± 25.7 | 18.3 ± 18.3 | 23.2 ± 28.0 |
| % Interval spent at Light PA | | | |
| SBS-PA | 32.1 ± 21.3 | 34.3 ± 24.7 | 44.3 ± 29.8 |
| UPA | 49.6 ± 23.7 | 54.0 ± 23.0 | 47.6 ± 28.3 |
| % Interval spent at MVPA | | | |
| SBS-PA | 38.6 ± 30.6 | 43.8 ± 33.3 | 33.0 ± 28.2 |
| UPA | 27.9 ± 27.6 | 25.4 ± 23.1 | 27.7 ± 27.2 |

- No group by visit interaction
- Group main effect
 - Light ($p < 0.0001$)
 - MVPA ($p = 0.0009$)



Results Accelerometer: Change in Sedentary



| | During Preschool-day PA | | | Within group change (p-value) | | |
|---------|-------------------------|------------|------------|-------------------------------|---------|--------|
| | Baseline | 3 month | 6 month | BL-3mo | 3mo-6mo | BL-6mo |
| SBS-PA | 73.2 ± 6.9 | 75.2 ± 7.3 | 76.4 ± 7.2 | 0.13 | 0.62 | 0.05 |
| UPA | 76.0 ± 5.9 | 76.4 ± 5.9 | 77.2 ± 6.1 | 0.96 | 0.30 | 0.27 |
| p-value | 0.23 | 0.93 | 0.17 | | | |



Results Accelerometer: Change in Light



PA

| | During Preschool-day PA | | | Within group change (p-value) | | |
|---------|-------------------------|------------|------------|-------------------------------|---------|--------|
| | Baseline | 3 month | 6 month | BL-3mo | 3mo-6mo | BL-6mo |
| SBS-PA | 20.0 ± 4.6 | 19.2 ± 5.0 | 18.2 ± 4.8 | 0.74 | 0.23 | 0.11 |
| UPA | 18.5 ± 4.1 | 18.0 ± 4.4 | 17.5 ± 4.0 | 0.82 | 0.52 | 0.65 |
| p-value | 0.27 | 0.39 | 0.45 | | | |



Results Accelerometer: Change in MVPA

| | During Preschool-day PA | | | Within group change (p-value) | | |
|---------|-------------------------|-----------|-----------|-------------------------------|---------|--------|
| | Baseline | 3 month | 6 month | BL-3mo | 3mo-6mo | BL-6mo |
| SBS-PA | 6.9 ± 3.3 | 5.5 ± 3.2 | 5.2 ± 3.3 | 0.008 | 0.37 | 0.11 |
| UPA | 6.3 ± 3.5 | 5.8 ± 3.1 | 5.7 ± 3.1 | 0.76 | 0.21 | 0.11 |
| p-value | 0.39 | 0.13 | 0.08 | | | |



Results: Study fidelity

| Fidelity Question (% responding “yes” for each question) | SBS-PA | UPA |
|---|--------|-------|
| Did intervention last for at least 30 minutes | 56.6% | 75.2% |
| Was <i>TFIR</i> DVD implemented during the 1st 10 minutes of intervention? | 86.5% | n/a |
| Was the <i>TFIR</i> DVD implemented in the expected 10-minute duration? | 89.3% | n/a |
| Did at least 50% of classroom children participate during the <i>TFIR</i> DVD? | 75.3% | n/a |
| Did classroom teacher implement the <i>TFIR</i> DVD as intended (i.e., teacher leading the <i>TFIR</i> DVD and students following teacher)? | 67.2% | n/a |
| Did 20 minutes of gross motor time follow the <i>TFIR</i> ? | 68.5% | n/a |
| Did gross motor time last for at least 20 minutes? | 52.0% | n/a |



Conclusion

- SBS-PA intervention led to significant improvements (OSCAR-P data) in light PA and MVPA during intervention time
- No changes were observed in total preschool-day PA levels (accelerometer)
- Significant differences in the delivery of the two intervention components
 - ▣ SBS-PA teachers were more likely to implement the DVD compared to the 20-minute gross motor free playtime



- SBS-PA teachers cited time as the main barrier for implementing classroom portion of intervention
- One teacher stated...
 - ▣ *“in order to do the DVD I have to rearrange my classroom, which takes time and then after the DVD; I have to get the children into circle time before they can get dressed to go outside. So although the program is only 30 minutes, it actually took me anywhere from 45 to 60 minutes.”*



- SBS-PA teachers indicated that they used the DVD at other times of the day
- Teacher stated...
 - ▣ *“the DVDs were really handy when I needed to set up for lunch and need to keep them busy with doing something else”.*
 - ▣ *“the DVD was really useful when they were acting out, and I need them to settle down. I noticed that they were a bit calmer when they did the DVD or right when we came back from outside.”*
- It is possible that SBS-PA intervention may work better if it was not part of schedule playtime or gross motor time but as an additional tool for classroom teachers to use.



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