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Environmental Policy Assessment & Observation (epao) In Daycare Centers: Does The Daycare Provider And Environment Matter?

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Running head: ABC TRIAL AND EPAO EVALUATION

Environmental Policy Assessment & Observation (EPAO) in Daycare Centers: Does the daycare provider and environment matter?

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Abstract

Background: Prior to the development of the Activity Begins in Childhood (ABC) Trial, no cluster-randomized control trial has investigated the effectiveness of a physical activity intervention with daycare providers in Canada.

Rationale: Educating daycare providers about the importance of improving their preschooler's gross motor skills, physical activity, and reducing sedentary time in their daycare environments is an important step toward diminishing the rates of childhood obesity and overweight across Canada.

Method: A total of N = 15 daycare centers were enrolled in the ABC trial and equally randomized to: Intervention 1, Intervention 2, or a Comparison Group. Intervention providers attended two 3-hour workshops, bi-monthly booster sessions, and obtained a physical activity guidebook. Changes in the daycare environment were assessed using the Environmental Policy Assessment & Observation (EPAO) instrument. Data collections occurred at baseline, 3-months, and 6-months. Higher scores on EPAO subscales and the total EPAO –Physical Activity (PA) component indicated higher quality daycare environments. Changes in total EPAO –PA scores and all eight EPAO subscales, total physical activity minutes, and positive staff statements were assessed over time between groups.

Results: No significant differences were found between groups at 6-months for mean total EPAO-PA scores. At 6 months, Intervention 2 descriptively had the highest mean EPAO-PA score. “Staff Behaviors and Physical Activity” subscale scores were significantly higher in the Intervention 2 group than the Control group at 6 months. More positive staff prompts were observed for Intervention 2 as compared to both groups at 6 months.

Conclusions: The Activity Begins in Childhood (ABC) intervention with daycare providers using the EPAO suggests that improvements in staff behaviors and the overall daycare environment are feasible. Future research should explore the validation of a more comprehensive tool to assess the daycare environment.

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Environmental Policy Assessment & Observation (EPAO) in Daycare Centers: Does the daycare provider and environment matter?

Obesity in Canada

Across the globe, obesity is one of the most widespread public health concerns and being obese or overweight is associated with an array of adverse health outcomes. Obesity is a detrimental risk factor for the development of type II diabetes mellitus, hypertension, cardiovascular disease, stroke, cancer, liver & gallbladder disease, sleep apnea and psychological difficulties (NIH, 2013). Global rates of obesity have risen dramatically over the past thirty years, and initiatives across the United States and Canada have been established to diminish the impact of this epidemic.

A 2013 census report from Statistics Canada indicated that approximately 18.8% of Canadians aged 18 years or older are obese. An increasing number of childbearing aged women are overweight or obese, and the impact of this excess weight is contributing to a youth population with a shorter life expectancy than their parents (Olshansky et al, 2005).

Childhood Obesity in Canada

In concordance with the rising rates of overweight and obesity in Canada, the prevalence of overweight and obese children has also steadily risen since the late 1970s (Shields, 2006). A 2007-2009 report from the Canadian Community Health Survey (CCHS) found that 8.6% of youth aged 6 to 17 years old were obese, and a surprising 6.3% of children aged 2 to 5 years old were obese (Roberts, Shields, de Groh, Aziz & Gilbert, 2012). Furthermore, more than 15.2% of Canadian aged 2 to 5 years old are overweight. Concerns for these increasing rates of overweight and obesity amongst Canadian youth are growing, and having both immediate and latent adverse physiological and psychological health outcomes.

Childhood obesity has been associated with several chronic conditions such as cardiovascular disease, insulin resistance, type II diabetes, chronic inflammation, asthma, poor motor function, hypertension, poor psychological and psychosocial health such as low self-esteem and eating disorders (Reilly, Methven, & McDowell, 2003; Whitaker et al., 1997). Additionally, the pulmonary complications associated with excessive weight during childhood contributes to the onset of asthma and exercise intolerance that can limit physical activity and thus, increase weight gain and retention with aging (Figueroa-Munoz, Chinn, & Rona, 2001; Reybrouck, Mertens, Schepers, Vinckx, Gewilling, 1997). In fact, children aged 8 years or older belonging to the 85th or greater BMI percentile are substantially likelier to develop these conditions and to maintain them throughout adulthood (Ogden, Kuczmarski, Flegal, Mei, Guo, Wei, & Johnson, 2000).

Moreover, the psychosocial consequences of being obese or overweight during childhood have been associated with negative stereotypes like being “academically unsuccessful, socially inept, unhygienic, and lazy” which can perpetuate high-risk behaviors, and negative self-perceptions in children as young as five years old (Hill & Silver, 1995; deOnis & Blossner, 2000). Almost all of these risk factors are modifiable or preventable, however the prevalence of overweight and obesity in Canadian children continues to rise.

Emerging Technology & Increasing Sedentary Lifestyles

The rise in Canadian children who are overweight and obese is coupled with a larger proportion of today’s youth being highly sedentary and with greater exposure to television and social media outlets. In fact, the American Academy of Pediatrics (AAP) has reported that children today are spending more than seven hours per day accessing social media, watching television, using their phones, and engaging in other electronic based activities. The AAP

suggests that children and adolescents older than two be exposed to no more than two hours of television per day, however only 59% of American children are fulfilling this recommendation. Furthermore, studies have found significant associations between increasing exposure to television and higher BMI percentile, level of adiposity, and waist circumference amongst children as young as three years of age (Harris & Bargh, 2009). Current guidelines suggest that children should engage in at least 120 minutes of moderate-to-vigorous physical activity (MVPA) per day to reduce the risk factors associated with physical inactivity (NAPSE, 2009 as cited in Beets et al., 2011). However, of these recommended 120 minutes at least 60 minutes of MVPA should be structured (2011). Research on physical activity levels among children have been shown to decline with age, and acquiring gross motor skills during preschool years is critical for predicting future weight status (D'Hondt et al., 2013).

Intervening at the Daycare Level

In order to increase physical activity engagement among young children, exploring the feasibility of daycare interventions with children and providers is an emerging and exciting new field of research. According to the 2002-2003 National Longitudinal Survey of Children & Youth, 54% of Canadian youth aged 6 months to 5 years old spend an average of 22.5 hours per week (Lyn, Maalouf, Evers, Davis, & Griffin, 2013) More recently, initiatives to increase the number of women in the workforce have likely increased the proportion of Canadian youth in non-parental childcare today. Previous studies have explored and conducted randomized control trials aimed to increase physical activity and improve curriculum guidelines in preschool environments, however no research has evaluated the feasibility of daycare provider interventions in a Canadian setting. The Activity Begins in Childhood (ABC) trial aims to intervene with daycare providers in order to increase the total time devoted to physical activity,

reduce sedentary time, improve staff attitudes & engagement, and improve the overall daycare environment across the greater Ottawa, Ontario region. The ABC trial featured a highly comprehensive intervention with daycare providers and evaluated the effectiveness of the intervention using a well-validated tool called the Environmental Policy Assessment & Observation (EPAO). Results from other physical activity interventions conducted in daycare environments suggest that the EPAO is an adequate instrument for daycare provider and structural evaluation (Benjamin, Neelon, Ball, Bangaliwala, Ammerman, & Ward, 2007)

The present study evaluated whether the *Activity Begins in Childhood* intervention was effective in increasing physical activity minutes over time, reducing sedentary time, and improving the overall daycare environment. We expected that both Intervention groups will have significantly increased their total observed physical activity minutes from baseline to 6 months compared to the control group. We hypothesized that “Sedentary Behavior” & “Staff Behaviors & Engagement” subscale scores would significantly differ by group at 6 months. Lastly, we expected overall EPAO-Physical Activity (PA) scores to significantly differ at 6 months between groups.

Method & Design

Protocol and Procedures for the ABC trial have been referenced from the “Activity Begins in Childhood (ABC) – inspiring healthy active behavior in preschoolers: study protocol for a cluster randomized controlled trial. ISRCTN94022291”

Study Objectives

The primary objective of this study was to evaluate the feasibility and effectiveness of daycare-based interventions for increasing physical activity in preschool children aged two to

five years old. The trial evaluated whether direct intervention with daycare providers significantly increased the total minutes of physical activity between intervention groups, and a standard daycare curriculum-based control group. The present study evaluates the overall effectiveness of the ABC intervention using the Environmental Policy Assessment and Observation (EPAO).

ABC Trial Design. The Activity Begins in Childhood (ABC) trial was a single site, three-arm, cluster-randomized controlled trial by individual daycare center. Each center that agreed to participate in the trial was randomized to one of three study groups: 1) ABC program to Daycare Providers (center only) termed Intervention 1, 2) ABC program to Daycare Providers & Parents, with a parental education component termed Intervention 2, or 3) continuation of regular daycare curriculum, termed the control group. The intervention trial was conducted for six months with EPAO evaluations taken at baseline, 3 months, and 6 months during the trial.

Daycare Center Enrollment. A total of fifteen ($N = 15$) daycare centers were enrolled from the greater Ottawa, Ontario area. Daycare center recruitment was facilitated by ABC trial information mailings to all daycare directors. Directors expressing interest in trial enrollment were asked to contact an ABC trial research coordinator for more information on enrollment eligibility. To be enrolled, directors agreed to modify their curriculum according to their randomization status, and consent to the three EPAO observation days. Inclusion criteria was met with these agreements, and a daycare center population of more than 20 children two to five years old preschool aged children.

Preschool Subjects. Children aged 2 to 5 years old ($N = 181$ children, 81 males, 101 females, $M_{\text{age}} = 3.62$, age range: 2.58-5.62) were enrolled in the trial upon consent from parents or guardians. The Comparison group (standard daycare curriculum) enrolled 53 children ($M_{\text{age}} =$

3.55, age range: 2.58-4.99), Intervention 1 enrolled 45 children ($M_{\text{age}} = 3.42$, age range: 2.73-4.32), and Intervention 2 enrolled 84 children ($M_{\text{age}} = 3.77$, age range: 2.70-5.62). Involvement in the trial was not limited to any physical or mental disabilities and children speaking French or English were eligible to participate. Parents included in Intervention 2 (Providers + Home) were incentivized with a \$50 local grocery store gift card. Table 1 summarizes the descriptive characteristics of each study group by gender.

Study Randomization. At enrollment, all fifteen daycares agreed to be randomized to one of the three trial arms. Randomization was stratified by language delivery (French vs. English) and variation in season to alleviate any potential confounding. Daycare randomization was computer generated and ABC researchers were blinded to the daycare group status in order to prevent observation bias during EPAO assessments.

Intervention Components. Daycare centers randomized to the Control group were advised to continue their standard daycare curriculum and make no changes to their existing daycare center policies. Daycare providers from centers randomized to Intervention 1 or Intervention 2 were required to attend two 3-hour workshop training sessions facilitated by an exercise physiologist specialized in promoting physical activity (PA) in youth populations. The first workshop provided a broad introduction to the intervention tools and emphasized the importance of increasing PA, reducing sedentary play time, and understanding the critical differences between unstructured and structured play. The second workshop addressed the key goals of the trial, i.e. “providing light, moderate, and vigorous PA for at least 15 minutes per hour while the children are in care” (Adamo et al., p.13). The final training workshop emphasized increasing self-efficacy and problem solving skills amongst the providers. Providers discussed how to overcome barriers to facilitating PA, the importance of developing gross motor

skills, and how to use practical materials to incorporate daily PA into childcare. Intervention providers were given an ABC training manual, an activity program with daily logging sheets, starter equipment, and an outlined guidebook for PA activities. Intervention providers were given weekly schedules that suggested an array of activities from the ABC manual to promote PA engagement. All daycare providers were required to log their physical activities on the provided templates. Bi-monthly support (“booster”) sessions were provided to the intervention groups during regular daycare hours. These visits included an ABC staff-led PA session for both participating children, provider goal setting exercises increase PA in children, and a feedback component to help providers overcome any barriers they’ve experienced. In addition to intervention with the daycare providers, Intervention 2 included an at-home component to promote active engagement in PA beyond the daycare center. Parents involved in the trial were required to participate in either 2-online webinar series and provided with a training manual.

Measures

EPAO Assessment of Daycare Provider & Structural Evaluation. Daycare environments were evaluated using the Environmental Policy Assessment & Observation (EPAO) tool that has been used extensively in daycare environment studies (i.e. Grubbels, Van Kann, & Jansen, 2012). The EPAO serves to “objectively and effectively describe the nutrition and physical activity environment and practices of child care facilities” (EPAO Protocol & Procedure Manual). The nutritional component of the EPAO was omitted from the assessment for this study due to discrepancies between centers providing meals or snacks to their children. Data collectors were trained to complete the EPAO evaluation during a required one-day intensive workshop facilitated by an experienced observer. EPAO observations were collected at baseline, 3 months, and 6 months over a full day. EPAO reports were not shared with the

providers and the data was kept confidential. ABC EPAO observers were required to review any documented changes in each participating daycare's curriculum or policies, as well as to conduct an interview with the providers. The ABC trial only included the physical activity component of the EPAO and a total of eight subscales were used to evaluate the daycare environment and providers attitudes'. These subscales included: the daycare environment, active opportunities, sedentary opportunities, sedentary environment, fixed play environment, portable play environment, staff physical activity behaviors, physical activity training & education, and physical activity policy. Figure 1 contains a sample item from each of the eight EPAO subscales that in conjunction produce the total EPAO-PA score.

EPAO Scoring. The average of all of eight subscales was totaled to provide the total EPAO-PA score which was the primary outcome measure of comparison between study groups. EPAO items were scored using a point system. Each item was assigned a score of 0, 1, or 2 points, where each subscale contained 10 total items for a maximum subscale score of 20 points. Higher EPAO subscales scores and total EPAO - PA scores indicated higher quality daycare environments, and therefore more conducive to physical activity.

Main Outcomes

Total EPAO –PA Score. All eight EPAO subscales were totaled and averaged to determine each group's total EPAO-PA score. Higher EPAO-PA scores indicated greater quality daycare environments and changes in score were assessed at baseline, 3 months, and 6 months.

Positive Statements from Daycare Providers. One specific item from the EPAO subscale "Staff Behaviors & Physical Activity" was independently analyzed to determine whether the intervention was successful at improving positive staff behaviors. The scored item

was, “Did staff provide prompts to increase physical?”, where 0 statements was scored as 0, 1-3 statements was scored as 1, and ≥ 4 statements was scored as 2. Observers were required to record each positive statement provided by staff that prompted the subjects to increase their physical activity. Differences in total scores for positive statements were evaluated from baseline to 6 months to evaluate the effectiveness of the intervention at improving staff behaviors.

Total Observed Physical Activity (PA) Minutes. Research assistants assigned to daycare centers were required to record all active play minutes during their observations. Two research assistants were assigned to each center for EPAO evaluations and reports were compared for accurate data collection. Active play was defined by any unstructured or structured physical activity that occurred indoors or outdoors during the observation. The EPAO evaluation featured writing boxes where ABC observers could record all observed specific physical activities. Total activity minutes were tallied to provide the total time the children were active during the full day observation at each daycare center. These totals were averaged by study group and compared at each time point of the trial to evaluate the effectiveness of the intervention at increasing total physical activity minutes. Appendix 2 summarizes the procedure for calculating total physical activity minutes. Figure 4 highlights the changes in total physical activity minutes across all groups and time points of the ABC trial.

Body Mass Index WHO Percentile. Body Mass Index (BMI) Percentile. Body Mass indices were calculated for each participant at baseline. Each parent or guardian consented to allowing research assistants to measure each subject’s height (cm), weight (kg), birth date, and gender. From this data, BMI percentiles were calculated and assigned using the World Health Organization’s calculator and guidelines. BMI percentiles ranged from 1st percentile (leanest) to 99th percentile (obese). At baseline according to CDC guidelines, children assigned to the <5th

percentile category were underweight, children between $>5^{\text{th}}$ percentile and $<85^{\text{th}}$ percentiles were categorized as normal weight, and children $\geq 85^{\text{th}}$ percentile were categorized as obese. Data for height and weight measurements were not available for participants at 3 months and 6 months. Table 1 summarizes the proportion of subjects in each BMI percentile for each arm of the trial.

Statistical Analysis. All data was analyzed using IBM SPSS statistical software. Mean and standard deviations were calculated to describe the study sample's baseline characteristics. A one-way ANOVA was used to evaluate the mean differences in age, height, and weight between groups by gender. Post hoc analyses amongst female subjects were conducted to determine which trial groups significantly differed by female participant age. A Kruskal-Wallis test was conducted to determine whether the proportion of subjects in each BMI percentile significantly differed by group. A one-way ANOVA analyzed whether significant differences existed in the mean total EPAO –PA scores and subsequent EPAO subscales between groups at each time point. Age was not controlled for in the analysis due to missing data for these parameters at 3 and 6 month EPAO evaluations. One-way ANOVAs analyzed differences between groups for the mean scoring of positive prompts delivered by a provider at 6 months. Kruskal-Wallis analyses evaluated whether there were significant group differences in the total number of positive prompts offered by providers at 6 months. A follow-up Mann-Whitney U test was used to determine which specific trial groups differed by total number of positive statements at 6 months. One-way ANOVAs analyzed whether significant differences in mean physical activity minutes differed by group across each trial time point. An alpha of 0.05 indicated statistical significance for these analyses.

Results

Subject Demographics. A total of $N = 188$ children were enrolled in the ABC trial cohort. The mean age of enrolled preschoolers was $M_{\text{age}} = 3.62$ years old, where the gender distribution was $n = 81$ males and $n = 101$ females. By gender, the average age of males in the trial was $M = 3.70$ years and there was no significant difference between groups for the average male age in the trial, $F(2,96) = 0.991, p = 0.375$. The mean female age in the trial was $M = 3.52$ years and a significant difference between the mean age of the females in the trial was found between groups, $F(2,75) = 4.42, p = 0.015$. Post hoc analyses indicated that the mean female subject age in Intervention 2 was significantly older than the mean age of female subjects in Intervention 1, $p = 0.008$. The male sample did not statistically differ by height in centimeters, $F(2,97) = 1.482, p = 0.375$ or by weight in kilograms, $F(2,97) = 1.140, p = 0.324$. A Kruskal-Wallis test indicated that BMI percentiles did not differ significantly by group at baseline, $F(2) = 1.722, p = 0.423$. Table 1 summarizes the descriptive characteristics of the study population by group and gender.

EPAO-PA & Subscale Analysis. Intervention 2 descriptively had the highest total EPAO – PA score at 6 months ($M = 11.15, SD = 2.30$), followed by Intervention 1 ($M = 9.81, SD = 1.09$), and the Control group ($M = 9.52, SD = 0.93$). However, no significant differences in total EPAO – PA scores between groups at 6 months were found, $F(2,12) = 0.738, p = 0.499$. At 6 months, the EPAO subscale scores for “Staff Behaviors & Physical Activity” were significantly higher in the Intervention Group compared to the Control group, $p = 0.014$. Post hoc analyses indicated a trending significance in “Staff Behaviors & Physical Activity” at 6 months between Intervention 1 & Intervention 2, $p = 0.054$. Table 2 summarizes the means and standard deviations for total EPAO – PA and subscales scores for each trial group at 6 months.

Total Physical Activity Minutes. A one-way ANOVA at 6 months for total physical activity minutes between groups was not significant, $F(2,12) = 0.511, p = 0.613$. Surprisingly, at 6 months, descriptively the Control group had the most observed physical activity minutes ($M = 170.4, SD = 88.9$), followed closely by Intervention 2 ($M = 170.2, SD = 56.0$), and Intervention 1 ($M = 133.0, SD = 50.8$). Figure 4 summarizes the changes in total PA minutes from baseline to 6 months for all three study groups.

Positive Statements from Daycare Providers. At 6 months, the item score for the number of positive statements prompted by providers significantly differed between groups, $F(2,12) = 4.778, p = 0.030$. A Kruskal-Wallis test indicated that there was a significant difference in positive prompts from providers by group at 6 months, $X^2 = 6.264, p = 0.044$. A follow-up Mann-Whitney U indicated that the number of positive prompts offered by the providers statistically differed between the Control group and Intervention 2 at 6 months, $U = 3.5, p = 0.041$.

Discussion

The present study evaluated the effectiveness of the Activity Begins in Childhood (ABC) cluster-randomized control trial at increasing physical activity levels and opportunities by intervening with providers. The present investigation compared fifteen daycare centers, equally randomized to one of three study groups: Intervention 1 (Providers only), Intervention 2 (Providers + Parents), and a Control (standard curriculum). Evaluations of daycare centers were carried out with a well-validated daycare evaluation instrument called the Environmental Policy & Assessment Observation (EPAO). Overall, the study aimed to increase total physical activity minutes, improve staff self-efficacy, and reduce sedentary time amongst children attending non-parental facilitated daycare centers.

At baseline we found that female subjects in Intervention 2 were significantly older than female subjects enrolled in Intervention 1. The ABC intervention had no significant effect over time between groups on the total EPAO-PA score. However; as expected, at 6 months the total EPAO-PA scores were descriptively highest in Intervention 2, followed by Intervention 1, and the Control group. These results are supported by previous research findings from Bower and colleagues whom reported no significant differences in EPAO subscale scores between groups over time using a similar intervention (2008). Notably, both the aforementioned intervention and the present study lacked sufficient sample size and statistical power. Therefore, future inclusion of more daycare centers might establish significant EPAO score differences over time between groups.

Next, there was a significant difference between groups at 6 months for the EPAO subscale – Staff Behaviors & Physical Activity. Therefore, at 6 months providers from Intervention 2 were significantly more positive and engaged than those in the Control group. However, Intervention 1 and the Control did not differ on the “Staff Behavior & Physical Activity” subscale. This result may be confounded by the “evaluation apprehension” theory. This theory postulates that people change their actions and behaviors when being evaluated by others (Blascovich, Mendes, Hunter, & Salomon, 1999; Cottrell, Wack, Sekerek, & Rittle, 1968; Seta & Seta, 1992). Given that the EPAO tool is subjective to the perceptions of the observers, the presence of researchers evaluating the providers and their daycare environments might have encouraged Intervention 2 providers to appease the observers.

Surprisingly at 6 months, the total observed physical activity minutes were descriptively highest in the Control group, however total observed physical activity minutes did not significantly differ between groups at 6 months. Therefore, this result is likely due to chance.

Limitations

Several of the null and significant findings in the present study can be challenged and justified by a plethora of limitations and shortcomings in the study's design and facilitation.

First, the one-day EPAO has not been investigated as an accurate representation of the daycare's environment. The present study omitted the nutritional component of the EPAO despite its studied validity in accessing the daycare provider, environment, and nutritional quality of non-parental care facilities. Although, a similar observational study conducted in North Carolina evaluated the effectiveness of an intervention called "NAP SACC" also had null findings despite including the nutritional component (Ward, 2008). In addition to this shortcoming – the 0, 1 or 2-point scoring method for EPAO items requires more investigation. This scoring methodology allows for very small variation in EPAO scores that might diminish the impact of the intervention. Additionally, the EPAO is a subjective instrument that is limited to the observations of the providers. Thus, the results of the present study might be skewed by the one-day assessment nature of the EPAO.

Secondly, a large body of missing data was not included in the analysis which may have impacted the overall study analysis and contributed to considerable confounding. For instance, no end point BMI data was available and therefore no analyses on the effect of the intervention and BMI reductions could be conducted. Furthermore, no descriptive data on the socioeconomic status (SES) or education level was collected from providers. Therefore, varying levels of education and SES might have confounded the effectiveness of the trial. Perhaps, the Control providers were better educated and therefore had greater baseline knowledge about the importance of physical activity and reducing sedentary time to prevent childhood obesity in preschool aged children.

Another limitation of the present study was that females in the Intervention 2 group were significantly older than female subjects in the Intervention 1 group. Age could not be controlled for in the analysis due to inaccessible data, and therefore might have impacted the implementation of the intervention by providers belonging to the Intervention 1 group. However, there were no overall group differences in age and therefore, we might conclude that this variation in age between intervention groups was not of substantial concern.

Fourthly, enrollment in the trial was conducted by daycare directors expressing interest in ABC mailings. Null findings in this study might be due to the presence of self-selection bias. It is likely that daycares only interested in the intervention and motivated to improve their daycare environment enrolled in the trial. The impact of this self-selection bias would diminish the effect of the intervention compared to the control and therefore, might explain the null findings for EPAO score differences.

Lastly, all trial groups significantly increased their total EPAO-PA scores with time but the intervention appeared to have no significant effect. Perhaps, the ABC intervention was not of adequate length and strength to facilitate significant changes

Future Directions

The present study was a well-designed cluster-randomized intervention that featured strong epidemiologic techniques, however few significant findings were established from the trial. It is likely that the intervention's effect was limited by the shortcomings of the EPAO, samples size and statistical power, and inaccessible data. The trial is currently collecting data on a final cohort expected to enroll three to six more daycare centers in the greater Ottawa area. Perhaps, the addition of more daycare centers might increase the statistical power of the study and establish significant findings for total mean EPAO-PA scores between groups. Future alike

interventions might consider more interaction with daycare providers, and collecting data on potentially confounding variables like daycare provider education level and socioeconomic status. Overall, the present study indicates the importance of daycare interventions as a potential mechanism for improving provider self-efficacy, positive behaviors, and reducing overall sedentary time amongst preschool aged children.

Conclusions

Interventions in the preschool, non-parental environment are a feasible approach to increasing physical activity and improving provider behaviors & engagement. The present study showed that increasing the knowledge and self-efficacy of providers through an interactive intervention has the capacity to impact the overall sedentary behavior of children, and significantly improve staff behaviors over time. Findings from the present studies support the implementation of comprehensive policies to significantly improve the physical activity environment in daycare centers. In conclusion, future research on the impact of daycare policies combined with a provider intervention might reduce the burden of obesity and overweight in Canadian children.

Appendices

Figure 1. *Eight EPAO Subscales & Subscale Sample Items*

EPAO Subscale	EPAO Subscale Sample Item
Active Play	“How many minutes of total active play time was observed?”
Sedentary Behavior	“Did you observe children seated for more than 30 minutes at a time?”
Sedentary Environment	“Is a TV present in the room?”
Portable Play Environment	“Is ball play equipment present at site?”
Fixed Play Environment	“Is a basketball hoop present at site?”
Staff Behaviors & Physical Activity	“Did staff join in play?”
Physical Activity Training & Education	“Was any PA education for kids observed?”
Physical Activity Policy	“Does the center have documented PA curriculum for kids?”

Figure 2. *Sample Calculation for Total Physical Activity Minutes during EPAO Evaluation*

9:15-10:30 outdoor play → 5 min structured activity while outside (75 min)
11:00-11:08 circle time active songs (8 min)
3:15-5:00 outdoor play (105 min)
Total play time: 188 minutes

Figure 3. Changes in total EPAO PA scores over time by trial group.

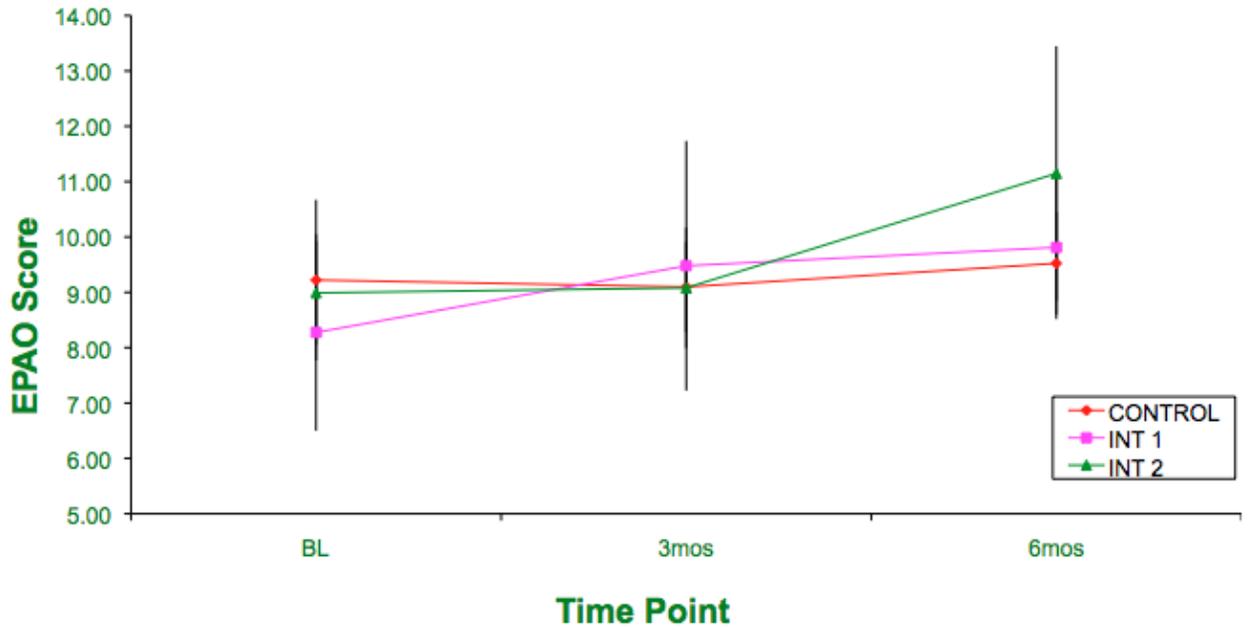


Figure 4. Changes in EPAO Observed Total Physical Activity Minutes by Group from Baseline to 6 months

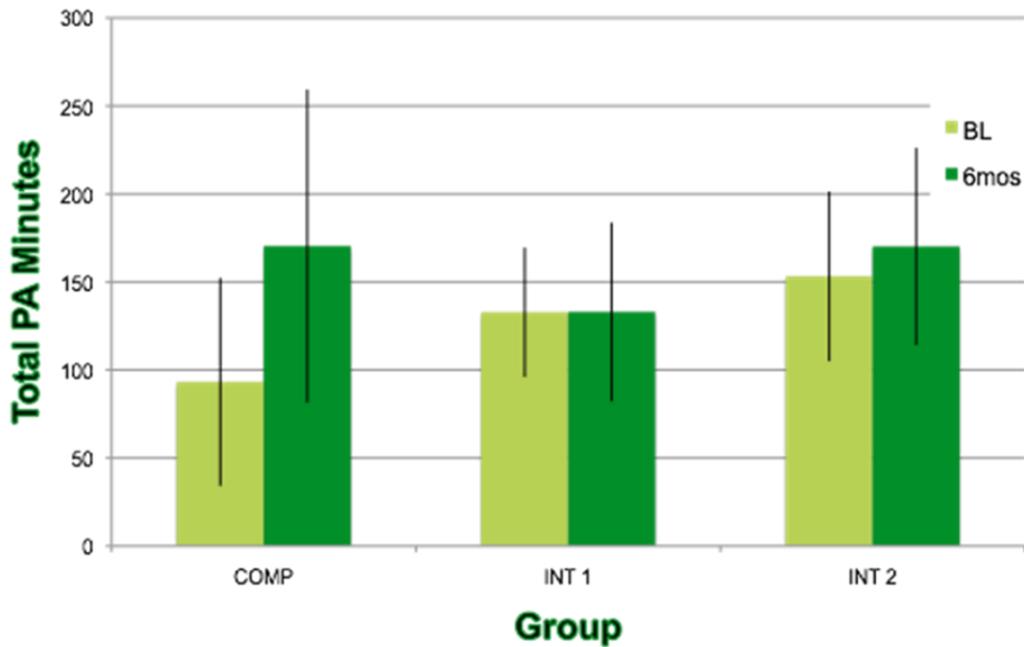


Table 1. *Descriptive Characteristics by Group and Gender*

	COMPARISON (n=53)		INTERVENTION 1 (n=56)		INTERVENTION 2 (n=84)		ANOVA P-values	
	Males n = 23	Females n = 30	Males n = 17	Females n = 28	Males n = 61	Females n = 23	Male s	Females
Age (yrs.)	3.67 ± 0.48	3.46 ± 0.55	3.53 ± 0.44	3.35 ± 0.43	3.76 ± 0.67	3.80 ± 0.64	0.375	0.015*
Height (cm)	100.6 ± 4.99	98.2 ± 5.81	98.8 ± 5.36	96.7 ± 5.62	101.8 ± 6.93	100.2 ± 5.46	0.232	0.099
Weight (kg)	16.0 ± 1.90	15.3 ± 1.78	15.8 ± 2.10	14.9 ± 2.04	16.7 ± 2.92	15.52 ± 0.48	0.324	0.569
BMI %tile*								
❖ 1st	0(0.0)	1(3.3)	0(0.0)	0(0.0)	2(3.3)	0(0.0)		
❖ 3rd	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(5.0)		
❖ 5th	1(4.3)	1(3.3)	0(0.0)	0(0.0)	2(3.3)	0(0.0)		
❖ 15th	2(8.7)	1(3.3)	2(12.5)	3(11.1)	2(3.3)	2(10.0)		
❖ 25th	0(0.0)	4(13.3)	1(6.3)	6(22.2)	10(16.4)	6(30.0)		
❖ 50th	10(43.5)	7(23.3)	5(31.3)	5(18.5)	12(19.7)	5(25.0)	0.742	0.423
❖ 75th	6(26.1)	9(30.0)	3(18.8)	5(18.5)	14(23.0)	2(10.0)		
❖ 85th	3(13.0)	1(3.3)	2(13.5)	4(14.8)	6(9.8)	1(5.0)		
❖ 95th	1(4.3)	5(16.7)	1(6.3)	2(7.4)	7(11.5)	1(5.0)		
❖ 97th	0(0.0)	1(3.3)	1(6.3)	1(3.7)	1(1.6)	1(5.0)		
❖ 99th	0(0.0)	0(0.0)	1(6.3)	1(3.7)	5(8.2)	1(5.0)		

*n(%) denotes the number and percentage of males/females within each BMI percentile as per WHO guidelines

Table 2. EPAO Subscale and PA Total Scores for each group at 6 months

EPAO Subscale	Control	Intervention 1	Intervention 2
Active Play	14.0 ± 2.85	14.5 ± 2.09	15.5 ± 4.11
Sedentary Behavior	16.0 ± 3.65	17.3 ± 3.65	17.3 ± 3.65
Sedentary Environment	9.3 ± 3.65	12.0 ± 2.98	12.0 ± 5.58
Portable Play Environment	14.9 ± 2.39	16.0 ± 4.33	11.4 ± 7.00
Fixed Play Environment	9.0 ± 4.45	7.0 ± 3.81	7.3 ± 2.85
Staff Behaviors & Physical Activity*	6.0 ± 5.96	10.7 ± 3.65	16.7 ± 4.71
Physical Activity Training & Education	3.0 ± 2.74	1.0 ± 2.24	5.0 ± 5.00
Physical Activity Policy	4.0 ± 5.48	0.0 ± 0.00	4.0 ± 5.48
EPAO PA Total	9.52 ± 0.93	9.81 ± 1.09	11.2 ± 2.30

1 Mean ± SD for each group at 6 months EPAO observation

2 EPAO scores range from 0 to 20 points.

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