5-27-2020 10:00 AM

Implementation Adherence and Perspectives of the PhysicaL ActivitY (PLAY) Policy Study: A Process Evaluation

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A thesis submitted in partial fulfillment of the requirements for the Master of Science degree in Health and Rehabilitation Sciences

Abstract

This study entailed a process evaluation of the Childcare PhysicaL ActivitY (PLAY) Policy. Early childhood educators (ECEs) in childcare centres (n = 5) delivered the policy (which included 8 recommendations) and documented adherence (i.e., dose) in daily implementation logs. Program evaluation surveys (n = 21) and interviews (n = 10) were completed post-intervention to assess barriers/facilitators, feasibility, enjoyment, and likelihood of future implementation. Descriptive statistics and thematic analysis were conducted. Adherence was highest for delivery of child-directed play (85.9%) and lowest for delivery of frequent outdoor periods (16.5%). Participants reported they were likely to continue policy implementation, excluding frequent outdoor periods (0 = not at all likely to 5 = extremely likely; M = 2.19; SD = 1.21). Noteworthy themes identified by ECEs included weather as a barrier, and verbal prompts as a solution for increasing physical activity. These findings suggest ECEs found the policy appropriate for implementing in childcare.

Keywords: Physical activity, policy, childcare, young children, early childhood educators

Lay Summary

Physical inactivity among young children (<5 years) is a serious health concern. Many children do not receive enough physical activity to obtain important health benefits, such as strengthening bones and muscles, developing motor skills, and maintaining a healthy bodyweight. Currently, a large number of toddlers and preschoolers receive care outside of their homes, and these types of childcare settings are recognized as vital in influencing young children's activity levels. Formal written physical activity policies within childcare centres may increase the amount of physical activity opportunities children are afforded; however, no study in Canada has examined the feasibility of such a policy. This study entailed a process evaluation (exploring feasibility and implementation adherence) of a Childcare PhysicaL ActivitY (PLAY) policy through an early childhood educator (ECE) lens.

Randomly selected childcare centres (n = 5) in London, Ontario delivered the physical activity-targeted policy for 8-weeks to toddlers and preschoolers (<5 years) in their care. Intervention group ECEs (n = 22) documented their adherence to following the policy and its components in a daily implementation log during the 8-week intervention period. In addition, ECEs were asked to complete a program evaluation survey and participate in telephone interviews post-intervention for the purpose of gaining a deeper insight into their perspectives of challenges faced (i.e., barriers and facilitators; context), feasibility, perceived effectiveness and enjoyment, communication, and future implementation of the policy.

Overall, ECEs followed the policy well; high adherence was found for delivering child-led/unstructured activity opportunities, using verbal prompts, and encouraging

fundamental movement skills development. Results from the program evaluation survey showed ECEs found the policy to be realistic and appropriate for implementation in childcare settings. ECEs reported that they were likely to continue implementing policy components once the intervention had ceased and identified effective communication between the research team and childcare staff. Prominent themes identified that weather and frequent transitions from indoors to outdoors were a barrier, and the use of verbal prompts was a suitable solution for involving children in physical activity. Overall, this study discovered that ECEs found the Childcare PLAY policy to be appropriate for implementation in centre-based childcare settings.

Acknowledgements

The following people were instrumental in the completion of this degree. I would like to pay my special regards to each and every one of you.

Dr. Trish Tucker – for taking me on as a student. I am so thankful to have joined your lab, and for everything you have taught me since day one. Without your encouragement, support, and kindness, none of this would have been possible. Your unwavering commitment to the success of your students does not go unnoticed – we are all so fortunate to call you our mentor and friend. I am looking forward to spending the next four years learning by your side!

Drs. Jen Irwin and **Leigh Vanderloo** – for serving as my advisory committee. Thank you for all of your expertise, feedback, and mentorship over the last two years. Your contributions not only strengthened this work, but also my research skills.

Dr. Andrew Johnson – for your constant eagerness to help. I would not have been able to complete this thesis if it was not for the many hours you spent with me. Your passion towards your work is highly appreciated and does not go unnoticed.

Drs. Shauna Burke, **Jacob Shelley** and **Jen Irwin** – for participating in my thesis defence as my examiners. I appreciate all of the time you spent reviewing my work, and the instructive advice that you provided.

To all the girls in my lab – **Molly**, **Steph**, **Bri**, and **Victoria**. I thank all of you for always cheering me on and keeping a smile on my face. Thank you for answering my millions of questions and making Elborn feel like home.

To my **friends** – for your never-ending encouragement and support, whether you were near or far. Thank you for always taking the time to listen.

And to **my family** – thank you for everything. I would not have been able to accomplish any of this if it was not for your constant reassurance that I could do anything I put my mind to. Your support will always mean the world to me. I would not be where I am today if it was not for you! Thank you.

And finally, to **Carter** – for always believing in me, and teaching me to never give up. I could not have succeeded without you by my side. Thank you for being my best friend.

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Chapter 1: Introduction and Literature Review

Physical activity, defined as "any bodily movement involving skeletal muscles which requires energy expenditure above resting levels" (Caspersen, Powell, & Christenson, 1985, p.126), is associated with a multitude of health benefits in early childhood (Hall et al., 2018; Kokkinos, 2012; Vazou, Mantis, Luze, & Krogh, 2017). Not only is physical activity important to maintain a healthy body weight, it is also associated with physical, psychological, social, and cognitive benefits (Carson et al., 2017). Physiologically, physical activity in young children has been linked to cardiovascular health and fitness (Strong et al., 2005), strengthened bones and muscles (Nogueira, Weeks, & Beck, 2014), improved blood pressure (Timmons, Naylor, & Pfeiffer, 2007), and the healthy development of motor skills (Zeng et al., 2017; Palmer, Chinn, & Robinson, 2018). Psychological and social health benefits for children include a decreased risk of depression (Strong et al., 2005; Timmons et al., 2007), more positive mood states (Dunton et al., 2014), increased self-esteem, and improved social skills (Carson et al., 2017; Lees & Hopkins, 2013). Finally, emergent research has examined the cognitive benefits of childhood physical activity, specifically exploring brain health and development (Lees & Hopkins, 2013). Studies in this field suggest that active children exhibit improved executive functioning (Timmons et al., 2012) and have a stronger memory (Bidzan-Bluma & Lipowska, 2018; Pontifex et al., 2014) than children who don't engage in activity. For these many reasons, physical activity plays an important role in supporting health and reducing the risk of chronic health conditions such as cardiovascular disease, hypertension, and type 2 diabetes (Hurt, Kulisek, Buchanan, & McClave, 2010).

Importance of Physical Activity among Young Children

Previous studies have shown that altering health behaviours is significantly easier in children than in adolescents or adults (Epstein et al., 2003), as evidence shows young children are very receptive to change (Goldfield et al., 2012). Unfortunately, when compared to several decades ago, children today are leading increasingly sedentary lifestyles, reducing their likelihood of obtaining the associated health benefits of physical activity (Bidzan-Bluma & Lipowska, 2018). Sedentary behaviour is defined as any sitting or reclining activity with energy expenditure below 1.5 metabolic equivalents (METS; Sedentary Behaviour Research Network, 2012), and has been noted as especially harmful for those under 5 years of age (LeBlanc et al., 2012; Kuzik et al., 2017). Specifically, engagement in sedentary behaviour among young children has been linked to increased adiposity, and decreased psychosocial health (LeBlanc et al., 2012). The observed increase in sedentary behaviour engagement among young children is concerning, as research shows that benefits from daily physical activity are seen in individuals as young as 2 years old (Marcus et al., 2000), and the development of healthy habits formed at a young age are shown to persist into adulthood (Jose et al., 2011; Malina, 2001).

Researchers have found that children tend to engage in *active play,* a common term used to describe physical activity of those under 5 (Truelove, Vanderloo, & Tucker, 2017), and this activity is frequently initiated by children themselves (Samuelsson & Carlsson, 2008). During active play, children can engage in movement by their own means through unstructured or child-led activities (Hinkley, Salmon, Okely, Hesketh & Crawford, 2012a), and this form of movement is an essential component of children's development (Ginsburg, 2007). Furthermore, active play is an exceptional way to

increase physical activity levels in children (Burdette & Whitaker, 2005). Considering that engaging in physical activity is widely recognized as a preventative measure for combatting chronic disease (Belton, O'Brien, Meegan, Woods, & Issartel, 2014; Warburton, Nicol, & Bredin, 2006), physical activity-promoting interventions targeting toddler and preschool-age children are important and represent a prime opportunity for establishing healthy movement behaviours (Bower et al., 2008), that will track into later life (Campbell et al., 2008).

Current Health Behaviour Guidelines for Young Children (0-4Years)

To support young children's positive growth and development, the *Canadian 24-Hour Movement Guidelines for the Early Years* (Canadian Society of Exercise Physiology [CSEP], 2017) provide daily recommendations for physical activity, sleep, and sedentary time to optimize children's health. Specific recommendations exist for infants (<1 year), toddlers (1-2 years), and preschoolers (3-4 years; CSEP, 2017), the latter two of which are the focus of this research. In detail, the guidelines recommend that toddlers and preschoolers engage in at least 180 minutes of total physical activity (TPA) per day and specify that both toddlers and preschoolers focus on achieving some time spent in "energetic play", or moderate-to vigorous-intensity physical activity (MVPA). Preschoolers should strive for 60 minutes of MVPA (Tremblay et al., 2017), and this can be achieved by activities including, but not limited to: hopping, running, and skipping (Dowda et al., 2009; Driediger, Vanderloo, Truelove, Bruijns, & Tucker, 2018). Importantly, MVPA is associated with increased health benefits when compared to light-intensity physical activity (LPA), and these results are more significant among preschool-aged children (Carson et al., 2017; Tremblay et al., 2017). Due to the association between

positive health outcomes and MVPA (Carson et al., 2017) it has been suggested that researchers consider intensity when measuring levels of physical activity among young children.

The guidelines also provide detailed recommendations concerning screen and sedentary time. Due to increased rates of digital exposure and electronic use among young children (Chang, Park, Yoo, Lee & Shin, 2018), the guidelines suggest children under 2 years receive no screen time, while children older than 2 be restricted to no more than 60 minutes per day. Finally, for all children in their early years, all prolonged sitting should be limited to no more than an hour at a time (CSEP, 2017). Similar recommendations (the integration of physical activity and sedentary time [and sleep] within the 24-Hour Movement guidelines) have since been adopted by several other countries (i.e., Australia, United Kingdom; Okely et al., 2017; Tremblay et al., 2017) as well as the World Health Organization (WHO; 2019a). To ensure children are engaging in appropriate movement behaviours for their health, a strong understanding of these new guidelines, and knowing how to adopt them, is important for those who care for young children (i.e., parents and/or guardians, early childhood educators).

Young Children's Physical Activity and Sedentary Behaviours

Research has found that the interaction between movement behaviours (i.e., physical activity, sedentary behaviour, and sleep) during a young child's regular 24-hour day has significant health implications; however, considerable variability exists regarding young children's participation in the abovementioned behaviours (Kracht, Webster, & Staiano, 2019). In fact, there is a common belief that preschool-age children are highly active (Goldfield et al., 2012), and some researchers have found that this cohort engages

in adequate amounts of physical activity (e.g., Obeid, Nguyen, & Gabel, 2011; Garriguet et al., 2016). Conversely, some literature has suggested that this may not be the case (e.g., Hinkley, Salmon, Okely, Crawford, & Hesketh, 2012; Tucker, 2008). Such discrepancies warrant further investigation regarding the activity levels of young children.

Physical activity levels. According to a recent meta-analysis exploring toddler's (*n* = 3,699) movement behaviours across daytime hours, researchers found that toddler-aged children engaged in approximately 246 minutes per day of TPA, of which 60 minutes were spent in MVPA (Bruijns, Truelove, Johnson, Gilliland, & Tucker, 2020). A similar meta-analysis including preschool-aged children (*n* = 6,309) reported overall engagement in MVPA to be 42.8 minutes daily (Bornstein, Beets, Byun, & McIver, 2011). According to these meta-analyses, preschoolers engage in nearly 20 minutes less MVPA than the toddler age group. Similarly, 2012-2013 data from the Canadian Health Measures Survey (CHMS) found that 84% of preschool-age children met CSEP's daily physical activity guideline (Garriguet et al., 2016); however, at 5 years of age, only 14% of children from the same CMHS cycle (2012-2013) were meeting the CSEP's guideline of achieving 60 minutes of higher intensity activity (MVPA) daily (Garriguet et al., 2016). This suggests that trends in meeting guidelines seemingly drop off at age 5, when intensity becomes more of a focus. Overall, it is important that children form healthy habits early on in life, as participation in physical activity has been shown to be negatively correlated with age (Garriguet et al., 2016) and research has found that rates of activity among young children decrease by almost 50% between 3 and 5 years of age (Taylor, Williams, Farmer, & Taylor, 2013).

Sedentary levels. Prevalence estimates suggest that toddlers and preschoolers are spending a large portion of their day sedentary (Bornstein et al., 2011; Bruijns et al., 2020; Reilly, 2010). As a result, a plethora of research has recently been conducted to measure the amount of time per day young children are spending engaged in sedentary behaviours. For toddlers, a recent meta-analysis conducted identified sedentary behaviours to comprise nearly 337 minutes of their typical day (Bruijns et al., 2020); while a 2019 systematic review and meta-analysis for preschoolers (n = 14,598) between ages 3 and 5, found 51.4% of their waking hours spent in sedentary behaviours (Pereira, Cliff, Sousa, Zhang, & Santos, 2019). These study findings suggest that a substantial number of young children are not meeting sedentary behaviour guidelines.

Screen-viewing behaviours. Screen-viewing is understood to be one of the most common sedentary behaviours for young children (De Decker et al., 2012). Screen-viewing, including engagement with smartphones, tablets, video games, televisions, or computers, is associated with low levels of energy expenditure. According to data from the CHMS, 75.6% of children ages 3-4 (n = 803) engage in more than 1 hour/day of screen viewing; while the average child spends 1.9 hours per day engaged in this behaviour (Chaput et al., 2017). Minimal evidence exists concerning the screen-viewing of toddlers; however, results from a nationally representative survey conducted in the United States found that 68% of children under 2 years of age partake in screen-viewing daily, with the average amount being 2 hours per day (Rideout, Vanderwater, & Wartella, 2003). Furthermore, studies in Australia and Canada have found 89% and 85% of toddlers partake in some sort of screen-viewing, respectively, even though the guidelines recommend no screen viewing among this age-group (Lee et al., 2017; Santos et al.,

2017). These findings are alarming, as the reported rates suggest children receive higher exposure to screen-viewing than what is recommended in the movement guidelines. Although inconsistencies are present concerning physical activity, sedentary, and screen-viewing levels of young children, it is important that interventions be targeted at those in their early years of life, specifically toddlers (1-2 years) and preschoolers (3-4 years), to promote early development of healthy habit formation and to deter children from engaging in sedentary behaviours that could lead to adverse health outcomes.

The Early Learning Environment

By virtue of an observed increase of women in the workforce (Bushnik, 2006), many children are being cared for outside of the home. In fact, in 2019, roughly two-thirds of Canadian children aged 1-4 were enrolled in childcare (Statistics Canada, 2019). The World Health Organization (2012) has identified centre-based childcare services as an important venue for the delivery of population-based interventions for preventing childhood obesity, as these settings have the ability to reach a substantial proportion of young children (Organisation for Economic Cooperation and Development, 2017). The large proportion of young children enrolled in early education programs, coupled with the number of hours they spend in these settings (~29 hr/week; Bushnik, 2006), suggest that childcare represents a crucial venue for many children to obtain a substantial amount of their daily physical activity (Hodges, Smith, Tidwell, & Berry, 2013). In fact, for some children, childcare venues may potentially be the only setting which holds opportunity for physical activity engagement, due to long hours spent in this type of care paired with the inability to play at home (Copeland, Khoury, & Kalkwarf, 2016).

When comparing different types of childcare settings, such as home-based care, or full-day kindergarten, to that of centre-based childcare, researchers have found that preschoolers enrolled in centre-based childcare accumulate the most sedentary time (Tucker, Vanderloo, Burke, Irwin, & Johnson, 2015). Furthermore, Geoffroy and colleagues (2013) noted that children enrolled in centre-based childcare are at greater risk for gains in adiposity and are 1.65 times more likely to have obesity in later childhood than those who receive parental care (Geoffroy et al., 2013). Findings like those by Tucker and colleagues (2015) and Geoffroy et al. (2013) suggest that centre-based childcare settings do not appropriately support active behaviours of young children, thus requiring further attention.

Children's physical activity levels in childcare settings. As researchers have acknowledged childcare settings as powerful in shaping young children's behaviours (Colley et al., 2013), a multitude of studies have been conducted to objectively measure if these settings are appropriately supporting physical activity among preschool-age children (e.g., Barbosa & de Oliveira, 2016; Berglind & Tynelius, 2017; Copeland et al., 2016; Kuzik et al., 2015; Tandon, Saelens, Zhou, & Christakis, 2018; Vanderloo et al., 2014). In short, results of these studies have not been promising. While attending centre-based childcare, Vanderloo and colleagues (2014) found that preschoolers (n = 31) engaged in an average of 1.54min/hr of MVPA. Similar findings were obtained by Copeland and colleagues (2016) and Kuzik and colleagues (2015), who found MVPA levels in childcare to be as low as 2.4min/hr (n = 338) and 4.2min/hr (n = 114), respectively. Finally, a 2018 systematic review including only objectively measured physical activity of children aged 2-5 during childcare hours, found children's MVPA to

range from 1.3 to 22.7 min/hour and sedentary time to range from 12.4 to 55.8 min/hour (O'Brien, Vanderloo, Bruijns, Truelove, & Tucker, 2018). It is noteworthy to mention that the wide range of movement behaviours observed is likely a consequence of differences in tools and assessments employed (e.g., direct observation, objective measures).

Children's levels of sedentary time in childcare settings. As evidenced thus far, children enrolled in centre-based childcare settings are not partaking in adequate amounts of physical activity. However, it is important to emphasize the sedentary behaviours that take place among these settings. As evidenced in O'Brien and colleagues' systematic review (2018), children's sedentary time has been found to reach levels as high as 55.8 min/hour in childcare (O'Brien et al., 2018). Also, Pereira and colleagues (2019) meta-analysis revealed sedentary time to comprise 63% of a child's day in childcare (Pereira et al., 2019). Although some sedentary behaviours, such as reading, serve important developmental roles for young children (Horváth & Plunkett, 2018), screen time has been found to be particularly damaging among this cohort (Vanderloo, 2014). In her systematic review on screen-viewing behaviours during childcare hours, Vanderloo (2014) reported that in over half of the studies included, preschoolers exceeded the recommended amount of screen-viewing allowance (60 minutes per day as referenced in CSEP, 2017). Therefore, it is important that researchers and important childcare stakeholders not overlook behaviours occurring during childcare hours that may be detrimental to children's development and poorly impact their movement levels.

Barriers and facilitators to children's physical activity within childcare. The extent to which young children are physically active is influenced by a multitude of

complex factors (Pradinuk, Chanoine, & Goldman, 2011). In fact, characteristics specific to each childcare environment have been found to account for nearly half of the variation in children's physical activity in this setting (Pate, Pfieffer, Trost, Ziegler, & Dowda, 2004); influential environmental characteristics include the surrounding environment (i.e., portability of equipment, availability of outdoor space; Dowda et al., 2009; Tucker et al., 2015); attitudes of childhood educators (Hesketh, Lakshman, & van Sluijs, 2017a); time spent outdoors (Tandon et al., 2018); and, policies supporting physical activity promotion (Vanderloo & Tucker, 2018).

Factors of the childcare environment that have been found to be positively associated with increased physical activity include open space, asphalt tracks, accessible portable equipment such as balls or hula hoops (Nicaise, Kahan, & Sallis, 2011), as well as fewer number of children permitted outdoors at a time (Dowda et al., 2009). In fact, research has confirmed a correlation between outdoor time and physical activity (Henderson, Grode, O'Connell, & Shwartz, 2015; Vanderloo, Tucker, Johnson, & Holmes, 2013). A recent systematic review and meta-analysis conducted by Truelove and colleagues (2018) reported that young children enrolled in centre-based childcare are more active when outdoors (e.g., 44% of time spent in TPA; Truelove et al., 2018). This is significantly higher when compared to that of indoor physical activity levels, where time spent in TPA was 20% among children enrolled in centre-based childcare measured via accelerometry (Vanderloo et al., 2013). Likewise, Vanderloo and colleagues reported that preschoolers were two times more active outdoors (31.7 minutes per hour) than indoors (14.4 minutes per hour; Vanderloo et al., 2013). With reference to play at higher intensity, a study of 3-5 year old children found that in order to achieve one minute of

MVPA, a preschooler needed to spend 9.1 minutes indoors versus 3.8 minutes outdoors (Tandon et al., 2018). Overall, engagement in outdoor play is a crucial factor which contributes to increased rates of physical activity among young children (Vanderloo et al., 2013), and thus should exist as a fundamental component of childcare centres' daily programming. In light of the many influencing factors noted above, it is important to consider characteristics of the childcare environment when examining children's physical activity levels within these settings (Pate et al., 2004).

Early Childhood Educators' (ECEs') Role in Physical Activity Promotion for Children

Due to the large influence of the childcare environment on young children's physical activity levels, ECEs are recognized as especially important on account of their significant impact on children enrolled in these settings (Bower et al., 2008; Vanderloo et al., 2014). ECEs (e.g., childcare staff, childcare educators, teachers) are responsible for planning children's daily programs. The personal opinions and attitudes of ECEs towards physical activity are imperative to increasing physical activity levels (Hesketh et al., 2017a). In addition to personal values and opinions surrounding physical activity, the level of training completed by ECEs also plays an important role in their ability to facilitate physical activity among young children, and researchers have reported low levels of physical activity training and knowledge among early childhood education students (Bruijns et al., 2019; Martyniuk & Tucker, 2014). This is problematic, as when providing activity opportunities for young children, practices are more successful when they are enhanced by adult facilitation (Timmons et al., 2007), and ECEs who use verbal prompts are shown to be more effective at increasing preschoolers' physical activity

(Gubbels et al., 2011). Concerning educator-facilitated play, a study by Bell et al. (2015) found that children had higher step counts when engaged in structured staff-led physical activities, resulting in a higher likelihood that children reach the recommended physical activity levels for their age group. Findings such as these highlight the importance of proper ECE facilitation and personal beliefs concerning physical activity.

Although a relatively new field of study, researchers have examined the relationship between ECE's education and children's activity levels. Simply put, ECEs are more likely to be capable of promoting higher intensity activity or MVPA when they are properly educated and trained to do so (Hesketh et al., 2017a). Unfortunately, a pilot study which assessed knowledge, training, and self-efficacy of early childhood education candidates (n = 1,113) in Ontario reported that 72.1% did not receive any form of physical activity education (Martyniuk & Tucker, 2014). Similarly, when exploring early childhood education candidates (n = 1,292) across Canada, only 32% and 27% reported receiving physical activity and screen-viewing training during their post-secondary training, respectively (Bruijns et al., 2019). Evidently, those who provide care to young children play an imperative role in promoting healthy physical activity behaviours. Proper training and education for these individuals is needed to ensure they understand the importance of outdoor time on children's activity levels, are well equipped to facilitate activity (i.e., through the use of verbal prompts), understand the detrimental effects of engaging in screen-viewing, and are able to encourage young children's healthy movement behaviours (i.e., teacher-led or structured physical activity).

How Policies and Practices Can Promote Movement

Policies are important for influencing active living at the population level (Sallis et al., 2006). Understanding how policy development can influence the amount of physical activity young children receive is crucial, as policies are intended to impact practices, which in turn, may have an effect on children's physical activity levels (Erinosho, Hales, Vaughn, Mazzucca, & Ward, 2016). In recent years there has been increased recognition of the importance of physical activity policy globally (Ajja, Beets, Chandler, Kaczynski, & Ward, 2015; Pogrmilovic et al., 2018); in 2002, WHO and the Centres for Disease Control and Prevention (CDC) together led an international consultation which resulted in the first global effort emphasizing the development of physical activity policy (Pogrmilovic et al., 2018; Shephard et al., 2004). Since then, efforts put forth by WHO have increased. Specifically, "*The Global Action Plan on Physical Activity 2018-2030*" outlines a prioritized plan of policy actions for addressing the multitude of determinants of physical inactivity, including increasing physical activity levels through inclusive solutions (WHO, 2018). Additionally, in 2019, WHO released guidelines for early years, specifically stating "children under 5 must spend less time sitting watching screens, get better quality sleep, and have more time for active play if they are to grow up healthy" (WHO, 2019b; para. 1). This recognition at a global level represents an appropriate approach for population behaviour change, and efforts by WHO are consistently encouraging countries to develop and implement policies pertaining to physical activity in children (Pate, Trilk, Byun, & Wang, 2011).

A recent systematic review found that varying definitions of "policy" exist, forwarding that a clearer conceptualization of "policy" is needed for future success in

facilitating reforms in health policy (Pogrmilovic et al., 2018). With regard to childcare specifically, Vanderloo and Tucker (2018; p. 3) have defined policy in the Canadian childcare context, as "documents or written statements that can transpire at the provincial or territorial level and are used to interpret regulations". However, institutional policies can also be enacted, should a childcare organization or childcare centre choose to implement one. What remains unknown, is which types of policies should be used in the promotion of physical activity in childcare and has been noted as one of the most pressing challenges for researchers in this area.

Current State of Accreditation in Canada – What Do We Know?

Although national guidelines exist in Canada, Australia, and the United Kingdom for daily physical activity do exist (Okely et al., 2017; Tremblay et al., 2017; Department of Health, 2011), mechanisms for implementing these guidelines in childcare settings are lacking (McWilliams et al., 2009). Canadian researchers have suggested that provincial/territorial legislation is needed to support optimal doses and higher intensity physical activity in childcare (Vanderloo & Tucker, 2018). However, at this time, not all childcare settings are equally supportive of physical activity (Vercammen, Frelier, Poole, & Kenney, 2020), and in Canada, regulations among provinces are considerably different (Vanderloo, Tucker, Ismail, & van Zandvoort, 2012). According to Ontario's *Child Care and Early Years Act*, childcare venues are required to provide at least 120 minutes of outdoor time per day; however, these are dependent on appropriate weather conditions, ratios, and time. Particularly, it is apparent that at the childcare level, legislation exists for outdoor time, but not for physical activity (Ontario Ministry of Education, Child Care and Early Years Act, 2014). Although outdoor play is an enabling factor of physical activity,

if poor weather conditions persist, children are not receiving opportunity to get active outside. In cases where inclement weather conditions exist for extended periods of time; physical activity policies could ensure that children are receiving sufficient physical activity opportunities while indoors.

At present, four Canadian provinces/territories (Nova Scotia, Northwest Territories, British Columbia and Nunavut) have physical activity mentioned in their regulations (Vanderloo & Tucker, 2018; Vercammen et al., 2020). Alberta and British Columbia have had the greatest advancements in regard to childcare standards, as their regulations exceed the minimum licensing criteria (Alberta Government, 2013; British Columbia Government, 2016). For example, Alberta's accreditation standard 2.2 states, "childcare programs promote physical wellness in all children and incorporate physical literacy in everyday programming" (Alberta Government, 2013, p. 2), and roughly 90% of childcare centres in the province are accredited (Carson, Clark, Ogden, Harber, & Kuzik, 2015). A study conducted after the implementation of these accreditation standards found that a small decrease in sedentary time (3.1min/hour), and moderate increase in MVPA (1.7 min/hour) were observed among toddlers and a small increase in sedentary time (1.9 min/hour) and small decrease in low physical activity (1.9min/hour) were observed among preschoolers (Carson et al., 2015). This suggests that standards such as those implemented in Alberta may be effective in increasing young children's MVPA levels; however, more research is still needed to confirm these findings. Finally, a recent review comparing licensing regulations across Canada reported that over half of provinces and territories failed to mention MVPA in their regulations; only Yukon and

British Columbia fully address this standard and provide examples of how it may be achieved (i.e., running or jumping; Vercammen et al., 2020).

In British Columbia, a Standard of Practice exists under the *Community Care and Assisted Living Act* and requires children in childcare settings to receive at least two hours per day of physical activity, and at least one hour of outdoor play time (British Columbia Government, 2016). Furthermore, dependent on the length of the preschool program, the required amount of active play varies (e.g., within a 3-4-hour preschool program, children are offered 40 minutes of active play). In addition, British Columbia is currently the only Canadian province to explicitly define screen time and to address limited exposure for young children (Vercammen et al., 2020). Although many provinces/territories provide general recommendations in regard to physical activity, such as those seen in Alberta and British Columbia, none are specific enough to support explicit physical activity opportunities. Moreover, a recent cross-sectional study exploring the effectiveness of the aforementioned Active Play standards put forward in British Columbia found that indoor and outdoor space were strong driving forces in childcare members' ability to implement these new standards, suggesting the importance of the surrounding childcare environment in policy adoption (McConnel-Nzunga et al., 2020). Furthermore McConnel-Nzunga and colleagues (2020) also found a large discrepancy between childcare managers' and childcare staffs' reported adherence to the Active Play standards (e.g., childcare managers had higher prevalence estimates of adherence) thus revealing the difficulty of monitoring policy adherence/impact. These regulatory gaps draw attention to the importance of potential policy intervention.

Physical Activity Policy Research

A growing amount of global research has explored the potential implications of physical activity policy in childcare centres (Carson et al., 2015; Bell et al., 2015; Erinosho et al., 2016; Gerritsen et al., 2016; O'Neill, Dowda, Neelon, Neelon, & Russell, 2017), and it has been suggested that the introduction of a written policy may be effective in the promotion of higher intensity play among children (Ward, Vaughn, McWilliams,& Hales, 2009). Despite this information, the impact of policy on children's physical activity levels have not been properly explored; additional research is needed in Canada to understand the role policies may have on supporting children's activity behaviours, specifically for those children enrolled in centre-based childcare.

To support physical activity policy development in Canada, it is important to consider policy research transpiring worldwide. A study exploring policy prevalence in New Zealand childcare centres (n = 237) found that only 35% of licenced childcares had a policy in place which addressed physical activity, though none mentioned screen-viewing. Moreover, when comparing private to public childcare centres, a greater proportion of private care centres had a physical activity policy in place; however, these authors concluded that an overall scarcity of written policies exists in New Zealand (Gerritsen et al., 2016). A cross-sectional study conducted in Australia reported that just 58% of childcare services had written physical activity policies (Wolfenden et al., 2015). The low prevalence of physical activity policies present within childcare settings is unfortunate, as a study conducted in North Carolina in 2008 found that young children attending childcare centres with an existing physical activity policy engaged in greater amounts of MVPA (15%) compared to children in childcare centres with no policy (9%;

Bower et al., 2008), suggesting a step in the right direction. Due to the high proportion of children who are currently enrolled in childcare (OECD, 2017; Statistics Canada, 2019), it is unfortunate that policies in these settings remain underdeveloped.

Policy interventions in childcare. Researchers have begun investigating the effects of centre-level policies and practices on children's movement behaviours (O'Neill et al., 2017; Stephens et al., 2014). A study conducted in North and South Carolina demonstrated the potential benefits of physical activity policies in childcare. Childcare centres in South Carolina (n = 34) adopted new physical activity standards incorporating a written physical activity policy, while centres in North Carolina (n = 30) were used as comparison. Examples of the implemented policy components included: two or more teacher-led/structured physical activity activities daily; active and outdoor play for 90-120 minutes daily; not withholding physical activity as punishment; teachers to encourage physical activity both indoors and outdoors; and, mandatory physical activity training at least once per year for teachers (O'Neill et al., 2017). Following intervention, childcare centres in South Carolina experienced an increase in physical activity practices, resulting in higher levels of physical activity among children enrolled in the childcare centres which complied with all mandatory physical activity obligations; however, it is important to note that physical activity levels were measured by observation, not accelerometry (Neelon et al., 2016). Moreover, New York City's Department of Health and Mental Hygiene (DOHMH) implemented physical activity-related regulations aimed towards childcare centres in 2007; these standards stipulate that children receive 60 minutes of activity with at least 30 minutes of structured physical activity, not engage in sedentary behaviour for more than 30 minutes at a time (unless during scheduled nap or

designated rest time) and limit screen time to no more than 60 minutes per day for children ≥2 years old (New York City Health Code Article 47, p.51). In 2009, a follow-up assessment was completed to assess compliance of the previously mentioned policy, with preschool-age children (n = 1,352) from childcare centres in New York (n = 110), and results showed that 87%, 86% and 30% of centres were compliant with the 60 minutes of required physical activity duration, the 30 minutes of structured physical activity regulation, and the screen time regulation, respectively (Stephens et al., 2014). Important to note, is that centre compliance with the 60-minute physical activity regulation was positively associated with time spent engaged in MVPA in children (Stephens et al., 2014).

Although a small body of research exists which explores the effects of physical activity and sedentary time policies, the findings of Stacey and colleagues (2017) systematic review state that evidence of potential effective interventions in centre-based childcare should be designed to focus on: modifying the physical environments of the childcare centre (reducing playground density, providing portable play equipment); providing opportunities for children to participate in structured physical activity; and ensure childcare staff have adequate training (Stacey et al., 2017). Finally, a difference may exist between policies mandated by a larger governing body (e.g., state-mandated policies or provincially accredited standards) compared to policies created by physical activity researchers. It is important to understand the value of including major stakeholders such as invested researchers in creating successful and tailored behaviour change interventions on behalf of the many young children enrolled in childcare settings.

Rationale and Purpose of Study

The 24-Hour Movement Guidelines (CSEP, 2017) are fundamental for the prescription of physical activity in the early years; however, these guidelines are not environment-specific (i.e., they do not stipulate physical activity affordances pertinent to appropriate within childcare settings versus at home). As such, this leaves significant autonomy to childcare centres to offer physical activity programming as they see fit, resulting in notable variability in physical activity affordances in this setting (Finn et al., 2002). To maximize the public health benefit of physical activity in childcare, widespread implementation of policies and best practices are needed; however, evidence to inform effective policy interventions is currently limited (Finch et al., 2019). The 8-week evidence-based Childcare PhysicaL ActivitY (PLAY) policy (Tucker et al., 2019) aimed to improve toddlers' and preschoolers' physical activity levels, specifically intending to achieve an increase in time spent in MVPA and a reduction in sedentary time. Research has suggested that policy can only be effective at influencing behaviour change if it is feasible to implement and suitable for the target environment and population (Bowen et al., 2010). Thus, the purpose of the present study was to conduct a process evaluation of the Childcare PLAY policy. This process evaluation was informed by Saunders et al. (2005) and Driediger et al. (2018), and implementation of the intervention included consideration of the following factors: the quality and extent of intervention implementation (i.e., adherence and dose delivered), ECEs' perspectives on the policy (i.e., feasibility, enjoyment and effectiveness, communication, and future implementation), and contextual factors such as barriers/facilitators regarding the policy's implementation (Saunders et al., 2005). For the purpose of this thesis, policy was defined

as a guidance document which encompasses specific information (i.e., explicit daily requirements) and expectations for those who are required to follow it.

Positioning Using a Theoretical Health Promotion Model

In order to design successful interventions, it is important to explore factors that may influence intervention effectiveness. Process evaluations are used to measure program implementation and incorporate "any combination of measurements obtained during the implementation of a program to control, assure, or improve the quality of performance and delivery" (McKenzie, Neiger, & Thackeray, 2009, p. 339). These types of evaluations help researchers understand why a program was, or was not successful (Bartholomew, Parcel, Kok, & Gottlieb, 2001), and whether program outcomes were achieved as intended (Saunders, Evans, & Joshi, 2005). In the case of a physical activity intervention, it is important to understand that the success of such interventions may vary based on program design, or even the level of implementation from personnel delivering the program (i.e., implementation fidelity; Saunders et al., 2005). As such, the present study is grounded in the PRECEDE-PROCEED planning model of health promotion (Green & Kreuter, 2005). Planning models, such as PRECEED-PROCEDE, provide structure and organization for those who are designing, implementing, and evaluating programs (McKenzie, Neiger, & Thackeray, 2009). Specifically, this study aligns with Phase 6, the process evaluation component of the model.

To conduct a comprehensive process evaluation, the program must be evaluated at various levels, through the use of various tools. Given the success of the intervention is dependent on the level of implementation, adherence and dose delivered must be explored. Furthermore, through the identification of the state of feasibility of the policy

(i.e., barriers and facilitators in regard to implementation through a childcare ECE's lens, perceived enjoyment and effectiveness, communication, and likelihood of future implementation) this study will provide important information about the feasibility of the implementation process. By exploring suggestions from ECEs in regard to modifying the currently existing evidence-based policy, this will assist to enable physical activity participation amongst preschoolers. Through the application of the presented process evaluation approach, the results of this study will offer valuable information pertaining to implementing policies at the childcare setting, and how the policy used in the present study can be modified in order to appropriately support active behaviours among the target population.

Chapter 2: Methods

Study Design and Procedures

The Childcare PLAY policy study was a pilot, single-blind, cluster randomized controlled trial (RCT). Due to the inability to offer a physical activity intervention to some children within one childcare facility and not others, childcare centres served as the unit of randomization. Centres allocated to the control group (n = 4) maintained their daily programming, and centres allocated to the intervention group (n = 5) implemented the evidence-based policy for 8-weeks. The current study is part of the larger Childcare PLAY Policy study; a detailed methodological account is outlined elsewhere (Tucker et al., 2019). The Health Sciences Research Ethics Board at the University of Western Ontario approved all study procedures and associated documents (REB #111890; Appendix A); the Clinical Trials Registry was provided by the US National Library of Medicine (NCT03695523).

Participants

Recruitment. Recruitment for the study took place between August 2018. Nine childcare centres were randomly selected from an online listing of eligible facilities (*n* = 55) in London, Ontario, Canada. Once a childcare centre was randomly selected, the project coordinator contacted the centre's director to explain the nature of the study and to invite participation (via email and telephone), or to arrange a face-to-face meeting, if preferred. Once the director of a centre agreed to participate, read the letter of information (Appendix B) and signed a consent form (Appendix C), the centres were randomly allocated to the intervention or control via a block randomization with a ratio of 1:1 using the Research Randomizer website (www.randomizer.org). The directors of the participating centres served as the gatekeepers to accessing the ECEs/staff. The directors were asked to invite ECEs from both toddler and preschool (children aged 18 months to 4 years) classrooms in their centres to participate in the study.

Inclusion criteria. For the purpose of this study, randomly selected childcare centres were included if they: a) were a centre-based facility in London, Ontario b) had at least one toddler or preschool-age classroom; c) had ECEs who were willing to participate; d) had at least 8 children per classroom who received parent/guardian consent and were willing to participate; e) had childcare staff who proficiently spoke/read English; and, f) did not currently have an institutional-level physical activity policy in place. The inclusion criteria for the ECEs were as follows: a) a full-time ECE in a toddler or preschool classroom at one of the randomly selected participating childcare centres; and, b) were proficient in English.

Exclusion criteria. Randomly selected childcare centres were excluded if they: a) provided home-based or after-school care only; b) were not located in London, Ontario or surrounding area; c) did not have a toddler or preschool-age classroom; d) did not have any ECEs or staff that were willing to participate in the study; e) did not have 8 children who obtained parental consent to participate in the study; f) were not an English speaking facility; and, g) already followed/had in place, an institutional-level physical activity policy. ECEs were excluded if they: a) they were not full-time employees of the centre; b) were not employed at one of the participating centres preschool or toddler classroom; and, c) did not read, write, or understand English.

Participant consent. A letter of information (Appendix B) and consent (Appendix C) were provided to all nine childcare directors. The letter of information outlined the purpose of the study, the study procedure, as well as the possible benefits and risks of participating. Once the director's consent was obtained, a letter of information (Appendix D) and consent form (Appendix E) were provided to all ECEs in participating toddler/preschool classrooms and they were asked to complete the form and provide consent prior to the start of the study.

Procedures

All data collection took place between September and December 2018. Once consent was obtained, ECEs were assigned a unique identifier code which was used to match participants to the various tools and questionnaires completed in the present study. Prior to implementing the policy, participating ECEs attended an intervention training session which elaborated on the study design, policy components and implementation, and study tools (e.g., questionnaires and implementation log).

Intervention condition. The evidence-based physical activity and sedentary behaviour policy was developed with guidance from the childcare community, physical activity/sedentary behaviour researchers, and policy experts. The Childcare PLAY Policy (Appendix F) encompassed 8 statements, was informed by the Canadian 24-Hour Movement Guidelines for the Early Years (CSEP, 2017; e.g., encourage children to engage in higher intensity energetic play often throughout the day with a goal of accumulating a minimum of 40 minutes each day, *and* expose children to a variety of indoor and outdoor physical activities, including both child-directed and teacher-facilitated active play daily). Particularly, this policy was created to be used as a guidance document to recommend appropriate sedentary practices and support physical activity participation among children enrolled in childcare.

Control condition. Centres randomly assigned to the control condition did not make any changes to their day-to-day activities for the duration of the study and were expected to continue with their normal daily routines. Upon the completion of the study, childcare centres in the control condition could request a copy of the written physical activity policy.

Instruments and Tools

Demographic information. During baseline assessments, ECEs completed a demographic questionnaire (Appendix G), which provided information on the following items: education level; years of experience working in childcare; income level; physical activity behaviours; perceived ability to positively role model for children in regard to physical activity behaviours; and, individual information (e.g., ethnicity, sex).

Daily implementation log (adherence and dose delivered). ECEs from intervention centres were asked to fill out a *Daily Implementation Log* (Appendix H) three times per week (i.e., Monday, Wednesday, and Friday) for each participating class for the duration of the 8-week intervention. Designed for this study, the 17-item log assessed implementation adherence ("yes/no/partly") to each of the policy items over the course of the 8-week period. ECEs reported their daily ability (or not) to implement each aspect of the policy. If components of the policy were unable to be achieved, ECEs were asked to indicate the reason (e.g., weather, ratios, no space, behaviour, other). While it would have been beneficial to have ECEs complete this log each day of the 8-week intervention, ECEs were asked to complete the log only three days of the week to reduce participant burden.

Program evaluation survey (feasibility, enjoyment, communication and future implementation). At post-intervention, all ECEs from the intervention condition were asked to complete a *Program Evaluation Survey* (Appendix I). This survey, developed by the research team, provided an understanding of the feasibility of policy implementation, as well as the appropriateness of the policy components. The 41-item tool prompted ECEs to rate their agreement with the policy components on a 5-point Likert scale. The survey was broken down into three sections: feasibility (20 items; i.e., ease of implementation; 0 = strongly disagree to 5 = strongly agree), future implementation (17 items; i.e., likelihood participants will continue implementing policy components; 0 = not at all likely to 5 = extremely likely), and communication (4 items; i.e., between research team and childcare staff; 0 = not at all effective to 5 = very effective). To ensure reliability of responses, and prevent response style bias, various

items from this survey were reverse scored. Finally, the *Program Evaluation Survey* included nine open-ended questions which gathered participants' general thoughts on the policy, barriers encountered, and solutions used by ECEs during the policy implementation period (e.g., "What did you like most about the policy?", "What part of the PLAY policy did you feel was most important?", "What challenges did you experience when implementing the Chilcare PLAY policy?").

Interviews (ECEs perspectives, barriers and facilitators). Following policy implementation, ECEs in the intervention group were invited to participate in a telephone interview to share additional perspectives regarding implementing the Childcare PLAY Policy. Participants were given a letter of information (Appendix J) and asked to sign a consent form (Appendix K). The telephone interviews, scheduled to last approximately 30 minutes, were conducted by a trained research assistant in accordance with a semi-structured interview guide (Appendix L). Two practice interviews were conducted by the research assistant with intervention-group ECEs who volunteered to participate. These practice interviews provided the researcher with the opportunity to explore clarity of questions, ensure proper language use, and gain aspects of active listening. Example interview questions included were: a) what has been your overall experience with implementing the physical activity policy?; b) what were the best parts of the policy?; c) did you experience any challenges or barriers when implementing the policy? and, d) which component of the policy did you find most effective at increasing children's physical activity levels? Credibility was achieved through member checking and was used during interviews to help improve the accuracy and trustworthiness of responses (Guba & Lincoln, 1989). Specifically, member checking provided interview participants

with the opportunity to correct errors and challenge wrong interpretations made by the research assistant. This ensured that the research assistant correctly understood all responses from participants. Moreover, during the interviews the researcher restated and summarized information and questioned the participant to determine accuracy. The main purpose of the interviews was to gain deeper insight regarding contextual factors of implementation such as the pros and cons, feasibility, suggestions for improvement, and overall appropriateness of the implemented physical activity intervention. Telephone interviews were conducted and were audio recorded and transcribed into written form. Saturation was reached after 8 interviews, and 2 additional interviews were conducted to confirm. All data obtained from the telephone interviews remained stored in secured computer files with password encryption to ensure responses remain confidential and secure.

Evaluation Components

The Childcare PLAY policy evaluation outcome variables (i.e., adherence, dose delivered), and corresponding data source and analysis can be found in Table 1.

Data Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) program (version 25). Means and standard deviations were calculated to describe ECEs demographic information. To explore ECEs' adherence and dose delivered of policy implementation, frequencies and percentage scores were derived from the implementation log (for 16 items). In order to assess adherence to each policy item (n = 8), composite scores were calculated by grouping items of the implementation log

Table 1. *Process Evaluation Outcome Variables of the Childcare PLAY Policy Intervention*

Evaluation Variable	Question	Participant	Tool or Procedure	Data Analysis
Adherence	To what extent was the policy implemented as intended?	ECE	Implementation log	% of classrooms offering all 8 policy components for 8 weeks
Dose delivered	To what degree (during intervention period) were policy items incorporated to daily curriculum?	ECE	Implementation log	% of classrooms offering all policy components (as derived from daily implementation log) 3x/week for 8 weeks
Context	What are the barriers/enablers of implementation?	ECE	Telephone interview; Program evaluation survey	Descriptive statistics; themes identified through inductive and deductive content analysis
Feasibility	To what extent was the intervention easy and convenient to implement?	ECE	Telephone interview; Program evaluation survey	Descriptive statistics; themes identified through inductive and deductive content analysis
Perceived effectiveness and enjoyment	To what extent was the policy (1) effective at increasing children's physical activity (b) enjoyable for both children and ECEs?	ECE	Telephone interview; Program evaluation survey	Descriptive statistics; themes identified through inductive and deductive content analysis
Communication	How effective was the communication?	ECE	Program evaluation survey	Descriptive statistics
Future Implementation	Are there any suggestions for future policy modification? What is the likelihood of future policy implementation?	ECE	Telephone interview; Program evaluation survey	Descriptive statistics; themes identified through inductive and deductive content analysis

Note. Process Evaluation Framework Adopted from Saunders et al. (2005). ECE = early childhood educators

together to represent specific policy components (i.e., combining items 2 and 3 from the implementation log depict score for policy item #1; see Appendix M and N). By measuring the number of days (Monday, Wednesday, Friday) all policy components were achieved during the 8-week intervention period, total adherence and dose delivered of policy implementation was calculated through composite scores. However, because multiple evidence-informed components were embedded within the items of the policy, all items of the implementation log were effectively separated and explored individually. Thus, adherence for individual components of the daily implementation log of the policy was also explored by calculating frequency and percentage scores. Overall implementation adherence was calculated by summing the number of days that policy components (and implementation log items) were offered, as intended, across the 8-week intervention period. A percentage score was calculated for each item of the policy on a weekly basis. Finally, an average across the sample was produced for the composite scores and for "yes" responses to the individual items of the daily implementation log. ECEs' perspectives of implementing the policy were assessed by calculating means and standard deviations for all 41 items in the program evaluation survey to assess ECEs' opinions of the feasibility, likelihood of future implementation, and communication of the policy. The qualitative questions of the Program Evaluation Survey were manually analyzed using inductive and deductive content analysis (Berg & Lune, 2017). The data collected from the telephone interviews were analyzed using QSR NVivo (version 12), and a thematic analysis was undertaken by two researchers to ensure confirmability (i.e., the degree to which research findings could be confirmed by other researchers; Guba &

Lincoln, 1989) and identify common responses (Anderson, 2010). Since interviews were conducted in a semi-structured fashion, ECEs' responses were organized and grouped based on each question for easier analysis. The data collected from the open-ended questions in the program evaluation survey and telephone interviews were used to identify recurring themes of contextual factors influencing policy implementation (barriers and facilitators of implementation), as well as ECEs' opinions of the overall feasibility, likelihood of future implementation, enjoyment and appropriateness of the policy.

Chapter 3: Results

Participant Demographics

In total, 49 ECEs participated in the Childcare PLAY study and 25 were allocated to the intervention group. ECEs were 34.73±12.04 years old, the majority were female (98.0%), Caucasian (73.5%), had a college degree (81.6%), and provided care for preschool-aged children (55.1%). All participants were full-time employees of their respective childcare centres. (Table 2).

In general, intervention group ECEs were not active; only 8% of ECEs reported engaging in at least 150 minutes of MVPA per week (the adult recommendation as per the Canadian Physical Activity Guidelines; CSEP, 2012b), while 36% participated in less than 60 minutes of MVPA per week. Exactly a quarter (25%) of intervention group ECEs felt that they were a strong physical activity role model for the children in their care, while the majority (75%) reported that they consider themselves to be a "somewhat" strong role model for the children in their care but report they "could be better". See Table 2 for full participant demographics.

Table 2. *Early Childhood Educators' Demographic Information (n = 49)*

Participant Characteristics	Intervention		Control	
	N	%	N	%
Sex				
Male			1	4.2
Female	25	100	23	95.8
Ethnicity				
Caucasian	15	60	21	87.5
Arab	3	12		
Latin-American			1	4.2
Asian	3	12		
Other	3	12	1	4.2
Prefer not to answer	1	4	1	4.2
Employment Status				
Full-time	25	100	24	100
Part-time				
Children's Age Group				
Toddler	12	48	10	41.7
Preschool	13	52	14	58.3
Years of Work Experience				
< 5 years	10	40	5	20.8
5-9 years	5	20	7	29.2
10-14 years	5	20	3	12.5
15-19 years	1	4	2	8.3
20+ years	4	16	7	29.2
Level of Education				
High school	2	8		
College	19	76	21	87.5
University	4	16	3	12.5

Note. Information is reported for participants who completed the demographic survey. All values shown may not add up to 100% or *n* = 25 (Intervention) or n = 24 (Control) due to missing data.

Adherence and Dose Delivered of Policy Implementation

Thirteen classrooms were included in the intervention condition and filled out the daily implementation log. Over the 8-week intervention period, 83.7% of ECEs reported that ≥80% of children in their care engaged in physical activity. Composite scores (Table 3) showed a range from 12% *for implementing more frequent (i.e., 3-4), outdoor periods* to 93%, for *ECEs appropriate modelling of screen-viewing behaviours*. Finally, adherence to individual implementation log items ranged from 16.5%, for *implementing more frequent (i.e., 3-4), outdoor periods* to 85.9% for *engaging children in unstructured or child-directed play*; as evidenced in Table 5. See Table 3 for composite scores (i.e., adherence to eight policy items) and table 4 for dose delivered (i.e., each item of the implementation log analyzed individually).

Table 3. *Intervention Group Early Childhood Educators' Reported Adherence to Childcare PLAY Policy Items (*n = *8)*

Policy Item	Adherence to Policy Item (%)								
	Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**	**Mean**
Encourage children to engage in higher intensity energetic play often throughout the day with a goal of accumulating a minimum of 40 minutes each day.	46	63	54	49	62	60	51	51	55
Expose children to a variety of indoor and outdoor PA, including teacher-facilitated play daily.	61	53	53	50	60	54	43	49	53
Outdoor time is offered for a minimum of 120 minutes each day unless extreme weather occurs. When extreme weather occurs, the opportunity exists for active play indoors.	13	18	13	10	15	17	14	5	13
Short, frequent outdoor sessions are most conducive to higher intensity PA among children; therefore, short bouts (e.g., 15-30 mins) of outdoor time are recommended often (e.g., 3-4 times a day).	5	3	12	2	15	19	22	14	12
Unstructured (i.e., child-directed) free play is predominant during outdoor time. When activity levels decline, childcare practitioners encourage continued energetic play through structured activity, participation alongside children, and use of verbal prompts.	67	63	63	66	69	75	68	42	64
Encourage children to develop physical literacy by practicing fundamental movement skills often throughout the day (e.g., running, skipping, hopping, or jumping).	82	88	73	73	95	87	87	78	83
†The appropriate use of screen-based technology is role modeled by childcare practitioners by avoiding it when children are present. Screen-based technology is not offered to children under 2 and is not recommended during childcare hours.	8	8	7	7	8	8	5	8	7
Programming is designed to break up sustained sedentary time using indoor movement-based activities.	33	38	44	51	54	43	51	38	44

Note. % reported corresponds to "complete" adherence (2.0). † represents reverse scored items. PA = physical activity.

Table 4. *Intervention Group Early Childhood Educators' Adherence to Childcare PLAY Policy Individual Components (*n = *16)*

Implementation Log Item	Adherence to Implementation Log Item (%)																								
	Week 1			Week 2			Week 3			Week 4			Week 5			Week 6			Week 7			Week 8			Mean
	Y	P	N	Y	P	N	Y	P	N	Y	P	N	Y	P	N	Y	P	N	Y	P	N	Y	P	N	
Children engaged in PA *frequently.*	85	13	3	71	29	0	71	29	0	73	22	5	77	23	0	73	27	0	74	20	6	65	35	0	74
Children achieved a *min of 40 mins* of heart-pumping energetic play	49	44	8	63	27	10	63	27	10	54	37	10	68	33	0	62	27	11	54	30	16	60	38	3	59
Children engaged in *indoor* PA	59	33	8	58	40	3	58	40	3	63	29	7	60	33	8	73	14	14	54	32	14	68	19	14	62
Children participated in *outdoor* PA	94	6	0	81	0	20	81	0	20	80	10	10	98	0	3	81	11	8	78	14	8	81	8	11	84
Children engaged in *unstructured* or child-directed PA	97	3	0	83	10	7	83	10	7	83	12	5	85	15	0	94	6	0	81	14	5	81	19	0	86
Children engaged in *structured* or teacher-facilitated PA	77	18	5	83	12	5	83	12	5	85	12	2	78	23	0	81	19	0	73	24	3	60	30	11	78
Children received a *minimum of 120 minutes (2 hours)* of outdoor time.	82	5	13	63	0	38	63	0	38	63	10	27	90	0	10	72	11	17	73	11	16	51	27	22	70
Children were offered indoor active play *instead* of outdoor time.	21	16	63	31	23	46	31	23	46	27	20	54	20	20	60	30	11	60	25	8	67	35	8	57	28

Shorter (15-30 min) outdoor periods were offered.	8	11	82	12	5	83	12	5	83	12	24	63	15	18	68	27	8	65	30	5	65	16	11	73	17
More frequent (more than 2) outdoor periods were offered.	21	0	80	27	0	73	27	0	73	15	5	81	25	0	75	25	3	72	22	3	76	16	3	81	22
Teachers participated in PA alongside children.	77	23	0	76	22	2	76	22	2	76	17	7	74	26	0	78	16	5	70	24	5	58	33	8	73
Teachers provided verbal prompts	97	3	0	76	20	5	76	20	5	78	15	7	92	5	3	89	11	0	89	5	5	84	16	0	85
Children practiced fundamental movement skills	82	15	3	73	20	7	73	20	7	73	17	10	95	3	3	87	14	0	87	5	8	78	16	5	81
†Children were exposed to staff using screen-based technology.	21	3	77	15	2	83	15	2	83	15	0	85	15	0	85	16	0	83	16	0	84	11	3	87	16
†Children used screen-based technology.	8	0	92	10	0	90	10	0	90	7	0	93	8	0	92	81	0	92	5	3	92	8	3	89	17
Staff intentionally interrupted children's time spent being sedentary (e.g., sitting, screen use).	33	28	39	44	15	42	44	15	42	51	17	32	54	15	31	43	24	32	51	14	35	38	22	41	45

Note. † represents reverse scored items. Y = yes; P = partial; N = no.

Feasibility, Future Implementation, and Communication

Via the program evaluation survey, 21 ECEs (42.9%) reported on the feasibility of the policy, future implementation, and effective communication. On average, mean scores in the *Effective Communication (*0 = not at all effective to 5 = very effective; M_{range} = 4.00 to 4.20) category suggest that ECEs believed communication in the study was very effective for all 5 items. Scores regarding *Feasibility (*0 = strongly disagree to 5 = strongly agree; M_{range} = 2.14 to 4.67) and *Future Implementation* (0 = not at all likely to 5 = extremely likely; M_{range} = 2.19 to 4.71) varied between items. The screen time components of the policy (*avoiding ECEs' use of screen-based technology during childcare hours* and *avoiding children's exposure to screen-based technology during childcare hours)*, showed high feasibility (*M* = 4.32, *SD* = 1.20; and *M* = 4.67, *SD* = .69) and likelihood of future implementation (*M* = 4.58, *SD* = .77; and *M* = 4.68, *SD* = .67), respectively. In contrast, *likelihood to provide children with shorter, more frequent outdoor periods* was scored much lower (*M* = 2.19, *SD* = 1.21) by ECEs compared to all other items in the *Future Implementation* category. Moreover, ECEs strongly agreed that feasibility of frequent outdoor sessions was difficult (*M* = 4.00, *SD* = 1.41) as seen in the item *it was **not** easy to provide shorter, more frequent outdoor play sessions.* Means and standard deviations for all 41 items in the survey are shown in Table 5. See Table 6 for prominent themes and sample quotes regarding ECEs' opinions of context, feasibility, and suggestions for future implementation from the program evaluation survey's written responses.

Table 5. *Descriptive Statistics for Intervention Group Early Childhood Educators' (n = 21) Responses to the Program Evaluation Survey*

Item	*M*	*SD*
Feasibility[a]		
When first approached to participate, I was very receptive to implementing the policy	3.76	.83
I felt adequately prepared to implement the policy	3.76	.83
The policy was easy to implement	3.70	.86
It was **not** easy to encourage children to engage in physical activity frequently throughout the day	2.43[†]	.93
It was easy to frequently encourage higher intensity play throughout the day	3.62	1.02
It was easy to provide children with at least 40 minutes of higher intensity play each day	3.95	1.05
It was **not** easy to expose children to a variety of indoor physical activities each day	2.95[†]	1.23
It was easy to expose children to a variety of outdoor physical activities each day	4.33	.66
It was easy to provide unstructured or child-directed free play each day	4.43	.60
It was **not** easy to provide structured or teacher-facilitated play each day	2.45[†]	1.36
It was easy to offer a minimum of 120 minutes of outdoor time each day	4.24	.62
It was easy to provide the opportunity for children to engage in active play indoors when outdoor play was not possible	3.43	1.08
It was **not** easy to provide shorter, more frequent outdoor play sessions	4.00[†]	1.41
It was easy to encourage continued energetic play through structured or teacher-led activities	3.81	.87
It was easy to encourage energetic play through teacher participation in physical activity	4.05	.86
It was **not** easy to encourage continued energetic play using verbal prompts	2.14[†]	.96
It was easy to support children's development of physical literacy through encouragement of fundamental movement skills	4.38	.59
It was easy to avoid using my own screen-based technology when the children were present	4.32	1.20
It was easy to avoid children's exposure to screen-based technology during childcare hours	4.67	.69
It was **not** easy to break up children's sedentary time by providing indoor active play opportunities	3.29[†]	1.15
Future Implementation (I plan to continue to …)[b]		
encourage children to engage in physical activity frequently throughout the day	4.29	.78
encourage children to engage in higher intensity energetic play often throughout the day	3.90	.99
provide children with the opportunity to achieve a minimum of 40 minutes of higher intensity energetic play each day	4.10	.94
expose children to a variety of indoor physical activities each day	3.81	.87
expose children to a variety of outdoor physical activities each day	4.62	.59
provide unstructured or child-directed free play each day	4.67	.48

provide structured or teacher-facilitated active play each day	4.33	.58
offer a minimum of 120 minutes of outdoor time each day	4.71	.46
provide the opportunity for children to engage in active play indoors when outdoor play is not possible	3.95	1.07
provide shorter, more frequent outdoor sessions	2.19	1.21
encourage continued energetic play through structured or teacher-led activities	3.95	.92
encourage continued energetic play through teacher participation in physical activity	4.19	.87
encourage continued energetic play through verbal prompts	4.38	.80
support children's development of physical literacy through the encouragement of fundamental movement skills	4.24	.83
avoid my own use of screen-based technology when children are present	4.58	.77
avoid children's exposure to screen-based technology during childcare hours	4.68	.67
break up children's sedentary time by providing indoor active play opportunities	3.60	1.14
Communication & Timing[c]		
How effective was the communication between the research team and your centre	4.20	.83
How effective was the communication between your director and the staff	4.00	1.07
How effective was the communication between and among staff members	4.25	.72
How effective was the communication between staff and/or the director and parents	4.10	.85

Note. Mean scored from 1 to 5; *SD* = standard deviation. Respondents were asked to rate the above statements from: [a]1 (strongly disagree) to 5 (strongly agree); [b]1 (not at all likely) to 5 (extremely likely); and [c]1 (not at all effective) to 5 (extremely effective). † represents reverse scored statements. All values shown may not add up to 100% or *n* = 21 as some individuals chose not to answer certain questions.

ECEs' Perspectives of the Policy: Themes, Context, and Enjoyment

Ten ECEs from the intervention condition agreed to participate in telephone interviews. Thirteen distinct themes were referenced by ECEs, representing feasibility (*n* = 4), challenges faced (*n* = 6), and solutions (*n* = 3) used during policy implementation. Overall, ECEs perceived the policy to be enjoyable and reported that having a set of statements to follow on a daily basis acted as a reinforcing factor regarding the importance of physical activity. Distinct themes include: *difficulty with transition periods moving from indoors to outdoors, lack of knowledge and training regarding teacher-led or structured physical activity,* and *contextual factors such as inclement weather acting as a barrier during policy implementation*. ECEs reported that role modelling and teacher facilitated/structured physical activity were effective solutions for the aforementioned challenges, specifically for children who exhibited behavioural issues and/or mood swings. In addition, having the opportunity and space to play indoors when inclement weather was present was also frequently noted. ECEs expressed that participating in the intervention made them aware of their unique childcare centre environments, and their influence on facilitating or hindering children's activity affordances. Finally, ECEs expressed that following the policy resulted in better sleep during naps among toddlers and preschoolers. See Table 6 for ECEs' perceptions regarding challenges, solutions and feasibility of policy implementation and Table 7 for their opinions regarding policy effectiveness, enjoyment, and suggestions for improvement.

Table 6. *Participants' Perspectives on Challenges, Solutions, and Feasibility of Implementing the Childcare PLAY Policy*

Question	**Theme**	**Example Quotes**	
		Program Evaluation Survey	Interview
Challenges	Transitions	• "the PLAY policy was asking for too many transitions"	• "To get them dressed, undressed, come up the stairs, in and out, they wouldn't understand coming back in so quickly and then going back out"
	Weather	• "When the weather got cold and there was snow on the ground it was harder for the toddlers to do physical activity in their snow suits and the ground was slippery"	• "I think the short outdoor sessions would be easier in warm weather like now when we don't have to put on snowsuits and boots"
	Behavioural issues	• "We have some very emotional children in our care that like that close contact with their providers"	• "Sometimes all those transitions would be hard, but it just depends on the day and the children's attitude"
	Other programming	• "Sometimes the children just need that time to develop other skills needed for growth"	• "It's our ministry, like we have so many other things that we have to do as well"
	Childcare environment	• "difficult when sharing spaces to accommodate"	• "And that's one of the challenges…it's not that we don't want them to be running, it's just the space wise it is hard"
	Lack of ECE training	• "It would have been nice to have similar training like the SPACE study"	• "For me, it was easy, but I have a lot of experience and training…I don't see much of an issue for myself trying to keep them active…but I know for other teachers, it could be"
Solutions	Indoor PA	• "I found that on days where weather was bad, and I would take the children inside to split up the time"	• "We're going to the gym. We're doing things in the hallways. So, instead of going outside and doing something active outdoors, we were doing something inside"
	ECE role modelling/ encouragement	• "I kept encouraging them to play..."	• "Because when they see you do things, they like to do them too, they like to be involved"

		• "In my opinion, it took a lot of encouragement to get them active and physical"	• "I think that if we're in a positive mood to encourage them to be active, then that was more encouraging"
	Structured PA	• "Small groups allow for more child and provider lead activities"	• "When it was structured, and we were building it up, when we were setting up activities, then they were more inclined to do something active"
Feasibility	More frequent outdoor sessions (15-30 min)	• "I don't know how it would be possible to do short, frequent outdoor sessions. It takes 30 minutes to get toddlers ready for outside in the winter. "	• "if we were to take them out in thirty-minute intervals, it would disrupt their play time" • "To get outside in thirty-minute increments… I don't think we have as much time as you think we do"
	Outdoor PA	• In the winter the outdoor time got reduced to 80 minutes and less from 120 minutes. As the children took more time to get ready (because of snowsuits).	• "I think that part of it was kind of a little bit easier for us because we have a yard that's kind of nice. It's these other centres that sometimes don't have those kinds of structures out there, right"
	Screen time	• "The children who attend our centre do not have any exposure to screen-based technology of any kind"	• "We don't have screen-based technology at all here, so that was easy"
	MVPA	• "It was not easy to implement 40 minutes energetic play as my group is too young (toddlers)."	• "It is hard to get them to move vigorously because their attention span is very short"

Table 7. *Participants' Perspectives on Childcare PLAY Intervention Effectiveness, Enjoyment, and Suggestions for Improvement*

Evaluation Component	Theme	Example Quote
Perceived effectiveness	Intervention	• "The policy made me see we put more value on brain activity over physical activity. This needs to change" • "Pushed me to encourage activeness of children" • "It reminded me to participate in active play alongside and with the children"
Enjoyment	ECE	• "It was nice to participate in this study and a good experience. Everything was well communicated from the research team"
	Children	• "A lot more energy/being more tired. A lot of smiles and fun!" • "Children were happy and active when they engaged in physical activity" • "Active toddlers make for better sleepers"
	Parents	• "The parents were actually asking those questions. Like "what have you been doing? Like why is this working and are you noticing a difference because we're noticing a difference at home."
Suggestion for improvement	# of outdoor periods	• "Not do shorter outdoor times especially in winter"
	ECE training	• "I would say to try to and help with the policy is to teach them [ECEs] how to interact and engage with the children in like a song or a dance" • "Brainstorm with providers to create sustainable and realistic ideas"

Chapter 4: Discussion

The purpose of this study was to explore the feasibility of an 8-week childcare-based physical activity policy intervention. Specifically, this research entailed a process evaluation of the Childcare PLAY policy study, examining ECEs' implementation fidelity (i.e., adherence and dose delivered), context, feasibility, enjoyment and effectiveness, and future implementation of childcare policy implementation. This is the first Canadian study to examine the implementation of a physical activity-focused policy in childcare settings through an ECE lens, and therefore, contributes to the literature by providing a comprehensive understanding of the various factors influencing policy implementation. Previous feasibility studies involving similar childcare physical activity interventions (e.g., Alhassan et al.,2016; Barber et al., 2016; Driediger et al., 2018) have highlighted this setting as acceptable for the delivery of such interventions. The findings suggest that this intervention was feasible and generally well-received, and there was clear support and acceptability from participating childcare staff, with some suggestions for future implementation. Various findings from this work are discussed below.

In the present study, participating ECEs had low self-reported levels of physical activity and emphasized they could be stronger role models to the children in their care. This is important as ECEs serve as the major driving force in childcare programming, and their personal attitudes and opinions regarding physical activity are proven to influence their daily curriculum for physical activity opportunities (Hesketh et al., 2017a). Given that the delivery of such interventions is dependent on proper implementation (i.e., high fidelity; Carroll et al., 2007), it is essential that factors influencing participants' adherence be explored.

ECEs' adherence varied across policy items; however, it is important to acknowledge that policy items (e.g., providing shorter, more frequent outdoor periods) that were more influenced by daily fluctuations (e.g., weather, child-to-ECE ratios) may have made full adherence difficult to achieve. In contrast, implementation of policy items not affected by daily fluctuations (e.g., children's use of screen-based technology) may have been easier to control and thus had higher, more consistent, rates of compliance. This finding is consistent with Lessard and colleagues policy study; these researchers found high compliance to limiting children's television exposure, and lower compliance in relation to physical activity components (i.e., offering structured physical activity opportunities) as providing these opportunities was influenced by variations between children and staff (Lessard et al., 2014). In the future, it may be beneficial to explore daily adherence (as opposed to weekly) and collect detailed reasons for why the policy items were not delivered, in order to further understand the nuances of implementing a physical activity/sedentary time policy. Finally, using more than one method of measuring adherence may also be advantageous for studies exploring implementation fidelity, such as pairing daily implementation logs with direct observation.

The integration of shorter and more frequent outdoor periods into weekly routines had the lowest adherence of all policy items. ECEs reported that it was very difficult to provide children with shorter and frequent outdoor periods; specifically expressing the increased number of indoor/outdoor transitions as a challenge. It is important to note this may have been due to the season of implementation, as it took place over the fall/winter months; weather has been noted to be an important factor influencing the delivery of physical activity interventions in childcare (Edwards et al., 2015; Tandon, Saelens, &

Copeland, 2017). This is consistent with other childcare-based studies that have found inclement weather as a barrier of implementing an intervention (Barber et al., 2016; Copeland et al., 2016; van Zandvoort, Tucker, Irwin, & Burke, 2010) During the cooler months, children are required to wear more clothing for outdoor periods (i.e., snow suits, winter boots) and participating ECEs reported that getting the children dressed during the winter months was very time consuming, especially to do so multiple times per day. As a result, researchers in the field should investigate whether ECEs' perspectives of this policy component (providing shorter, more frequent outdoor periods) would be different had the policy intervention taken place over the summertime, or if the policy should have different expectations based on season. This is important to consider as activity levels have been found to be higher during warmer months (Tucker & Gilliland, 2007), and due to globalization, technological development, and urban growth, opportunities for outdoor play are diminishing (Singer, Singer, D'Agostino & Delong, 2009). That being said, in other parts of the world (e.g., Scandinavian countries), time spent outdoors is highly valued and is an essential component of daily routines (Norðdahl and Einarsdóttir, 2015), regardless of weather/season and as a result, many childcare settings offer high quantities of outdoor play (Borge, Nordhagen, & Lie, 2003; Nilsen, 2008). These findings may warrant careful consideration from childcare centres and policymakers, as geographical- and seasonally-tailored policies may be needed.

ECEs reported finding it easy to provide children with at least 120 minutes of outdoor time per day; however, high rates of implementation adherence to this policy item may be due to Ontario's *Child Care and Early Years* act which stipulates this requirement (Ontario Ministry of Education, Child Care and Early Years Act, 2014).

Although ECEs were able to frequently implement this component of the policy, it is important to emphasize that outdoor time does not protect against sedentary activities such as sitting in a sandbox. Thus, although providing sufficient outdoor time is an important policy item, it must be paired with other policy items (such as sufficient time spent in MVPA) in order to reap its effectiveness in increasing children's activity levels. Additionally, this policy item could have important considerations if it were to be implemented in provinces outside of Ontario, where the same outdoor playtime mandate is not in place (Vercammen et al., 2020). Finally, ECEs expressed it was easy to follow policy items concerning use of screen-based technology; as a result, very high adherence was observed for these items. This may be attributed to previously existing policies in their individual childcare settings, as interview participants frequently noted that implementing this policy item was not novel to them, as they already follow centre-specific policies regarding use of screen-based technology. As no provincial legislation exits in Ontario regarding screen-use during childcare hours (Vercammen et al., 2020), this demonstrates that a portion of childcare centres in London, Ontario have already taken a step in the right direction concerning limiting the use of electronics.

It is important to consider that ECEs are required to follow other responsibilities and practices, such as planning the daily routines for the children in their care (i.e., programming/curriculum; Hesketh et al., 2017a). As such, adherence rates of policy implementation may have been affected by these continuously present responsibilities. Adopting multiple policies and practices (i.e., having a physical activity/sedentary time policy to follow paired with normal daily programming requirements) is an additional task added to an already stressful environment of managing young children. Therefore, it

is possible that the more tasks ECEs are asked to follow in their daily routines, the less likelihood there will be high compliance to all daily responsibilities, as task-load becomes too difficult, or overwhelming to manage. Despite this, ECEs were able to adhere to many of the policy items quite well (i.e., 83% full compliance for "encouraging children to develop physical literacy by practicing fundamental movement skills often throughout the day (e.g., running, skipping, hopping, or jumping)" and 93% full compliance for "the appropriate role modeling of screen-based by childcare practitioners by avoiding it when children are present, and not offering screen-based technology to children under 2 during childcare hours" while others were more challenging (i.e., 12% full compliance for "offering shorter, more frequent outdoor sessions(3-4 times per day) in short bouts"), as evidenced by composite scores. It is important that the perspectives and implementation adherence from this pilot study be considered in a review of the policy before future, wider implementation.

Overall, the Childcare PLAY intervention was well received by ECEs and viewed as appropriate for implementing in childcare centres. Considering that ECEs received minimal policy-specific training prior to implementing the Childcare PLAY policy, this may have influenced their ability to properly adhere, and deliver the intervention as intended. Pre-intervention training sessions are important, as training increases the self-efficacy and motivation of those assigned to implement such an intervention (Copeland et al., 2012). Furthermore, a lack of specific physical activity training was a common theme from both the program evaluation survey and interviews. Specifically, ECEs stated that having in-depth training would have been helpful during this intervention and may have influenced their ability to deliver it accordingly. During interviews, some ECEs who

reported previously receiving higher level physical activity-related training mentioned they experienced a greater deal of ease with policy implementation compared to their co-workers who may have not received such education (i.e., more recent ECE graduates). In the future, researchers or policy makers planning to deliver childcare-based interventions should focus on increasing the quality and type of training sessions (i.e., providing specific instructions, goal-setting) offered to ECEs prior to tasking them with the role of implementation.

ECEs identified that they would continue to implement the majority of physical activity/sedentary time policy components in their daily programming; however, they acknowledged modification of some of the policy components with regard to future implementation. For example, future implementation of shorter, more frequent outdoor periods was not likely to become a common practice due to ECEs' concern about difficulty with transition periods, specifically during the winter months. This is consistent with Alhassan and colleagues intervention which explored the feasibility of implementing shorter, more frequent outdoor periods within the childcare setting (Alhassan et al., 2016), and Driediger and colleagues intervention, which too explored future implementation of more frequent outdoor periods (Driediger et al., 2018). Context is an important factor to consider, as ECEs from the present study suggested that shorter, more frequent outdoor periods be a part of the policy during summer months, and not during winter months. However, because providing children with multiple outdoor periods daily has been proven effective at increasing physical activity (Alhassan, Nwaokelemeh, Lyden, Goldsby & Mendoza, 2013; Pate, Dowda, Brown, Mitchell, & Addy, 2013; Wolfenden et al., 2016), research needs to explore how this can be incorporated into

childcare centres daily routines in a feasible way, and if this can be adapted to become possible year-round (i.e., provide indoor physical activity sessions instead).

Previous studies have suggested that ECEs should be given the autonomy to decide at what point throughout the day these outdoor periods occur (Alhassan et al., 2016), and this was incorporated into the present study as ECEs were permitted to incorporate these outdoor periods when they saw fit. Additionally, in the present study, offering flexibility for those incorporating the outdoor periods did not seem to influence their adherence of integrating this into their schedules. Wolfenden et al (2016) and Tucker et al (2017) previously studied the implementation of more frequent outdoor periods and required the implementation of three and four outdoor periods, respectively. This suggests that increasing the number of outdoor periods is deemed effective by researchers in the field at improving young children's physical activity levels, but flexibility for ECEs is important for full delivery (Tucker et al., 2017; Wolfenden et al., 2016). In conclusion, there was clear support from ECEs for the acceptability of the Childcare PLAY intervention as a whole, and interview data indicated positive experiences with all other policy items excluding the shorter, more frequent outdoor sessions.

Given the young age of children in childcare settings, and their reliance on ECEs to offer sufficient activity opportunities, their personal opinions and feedback are crucial for future policy improvements. During interviews, ECEs commented on unique factors of their surrounding childcare environments (i.e., distinctive to their workplace), and noted characteristics such as space to be a barrier. Particularly, ECEs emphasized that due to lack of space in their classroom, they did not want to promote movement in fear that

children would “bump” or “knock” into things; however, ECEs from other centres reported they were thankful for having such a large outdoor play area, and indoor gym. These findings are consistent with a recent systematic review, which summarized the correlates of physical activity and sedentary behaviour among children in various childcare settings and found the presence of outdoor environments and large play spaces to be associated with higher levels of physical activity (Tonge, Jones, & Okely, 2016). Concerning the present study, it was promising to learn that ECEs had become aware of how their unique environments influence activity levels of the children whom they provide care for. Factors of unique childcare environments (i.e., centre-specific outdoor play areas, existence/absence of indoor gyms) should be considered and discussed with childcare staff prior to implementation of future studies to determine potential obstacles faced, and appropriate solutions.

An unexpected finding from the current study was that ECEs reported that the children in their care slept better during daily nap-time as a consequence of the policy. This is important, as healthy sleep patterns in young children serve an important role in the prevention of obesity (Bathroy & Tomopolous, 2017), stronger emotional regulation, and growth (Chaput et al., 2017). In addition, children who engage in high amounts of TV viewing (a form of sedentary time) have been shown to exhibit poorer sleep quality (Brockmann et al., 2016). As a result, the findings from this study are important, as sleep is extremely conducive to proper health and development in the early years (Chaput et al., 2017), and ECEs had very high adherence to the screen-based technology policy item. Thus, it makes sense that children receiving the policy experienced increased sleep. Future studies should focus on how policies may aid in promoting the successful

achievement of all 24-hour movement behaviours (sleep, screen time, and physical activity).

Strengths and Limitations

The present study adds to the literature by increasing our understanding of factors that influence ECEs adherence and perspectives (i.e., barriers and facilitators) of implementing a physical activity and sedentary time policy. A key strength of the present study is the diversity of the tools used to conduct the process evaluation (i.e., quantitative data from the implementation log and program evaluation questionnaire paired with qualitative data from phone interviews) and the RCT methodology employed. In addition, participating ECEs compliance with the data collection tasks was very good; the ECEs filled out the implementation logs consistently. Finally, because the Childcare PLAY intervention was delivered by ECEs, this afforded them the flexibility to adapt implementation of various policy components to the unique schedules and programming of their centre.

Despite these noted strengths, several limitations must be considered. First, the adherence to the policy components was based on self-reported data, and therefore, may have been influenced by social desirability bias. Second, because only one implementation log was provided per classroom, it was unclear whether the same ECE was completing the log each day; therefore, it is possible that not all ECEs in intervention condition were following the policy. Third, the intensity or success of policy implementation could have been affected by a variety of factors (e.g., varying socioeconomic status and professional education levels of childcare staff; differences in environmental factors such as indoor/outdoor space of childcare centres; effects of

weather during policy implementation; perceived importance of physical activity; quality of physical activity-related training; and unreported childcare staff turnover) that were not explored in the present study. Finally, although the sample consisted of randomly selected childcare centres, all nine centres were drawn from a limited geographic region within London, Ontario, Canada, which may have limited the generalizability of the findings.

Future Directions

With nearly half of Canadian children attending some form of childcare, it is imperative that further policy research be conducted to identify how these settings can provide adequate opportunities for physical activity participation. The reported rates of adherence to the Childcare PLAY policy paired with the positive feedback from participating ECEs illustrates the potential value of the policy for supporting and encouraging appropriate physical activity and sedentary time. As such, future directions should consist of policy modification, in collaboration with important childcare stakeholders (i.e., childcare centre directors, front line staff, and those with experience working in childcare settings) within the context of the feedback received in this pilot study. By incorporating major stakeholders' suggestions for modification, the policy can be revised for a more feasible implementation. Future studies should also examine how childcare directors, who are extremely important to the facilitation of new standards and regulations (Lyn et al., 2014; van Zandvoort et al., 2010), can be included in the policymaking processes at the provincial/territorial level. Directors may be more empowered to influence change at the childcare level as they have more say in the decision-making process and hold more authority in shaping daily practices at the centre

level, compared to ECEs. Finally, future studies should provide comprehensive resources (i.e., training or workshops) to support optimal knowledge and self-efficacy for ECE's delivering such interventions. As this was a small and short-term intervention, this pilot study offers important insight for larger scale policy interventions aiming at increasing physical activity and minimizing sedentary time among children enrolled in childcare.

Conclusion

This study highlights that implementing this type of policy is deemed appropriate by ECEs for the purpose of supporting physical activity among toddlers and preschoolers in centre-based childcare. Furthermore, the results from this study are helpful in determining areas for physical activity policy and program improvement and set the stage for a future outcome evaluation. More research is needed to build upon the evidence presented in this study to expand our collective understanding of the effects policies have on facilitating young children's optimal movement behaviours.

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Appendix A: Western University Research Ethics Board Approval Letter

Western Research

Date: 9 August 2018

To: Dr. Patricia Tucker

Project ID: 111890

Study Title: Examining a Childcare Policy to Promote Physical Activity among Young Children

Application Type: HSREB Initial Application

Review Type: Full Board

Full Board Reporting Date: 19/Jun/2018

Date Approval Issued: 09/Aug/2018

REB Approval Expiry Date: 09/Aug/2019

Dear Dr. Patricia Tucker

The Western University Health Science Research Ethics Board (HSREB) has reviewed and approved the above mentioned study as described in the WREM application form, as of the HSREB Initial Approval Date noted above. This research study is to be conducted by the investigator noted above. All other required institutional approvals must also be obtained prior to the conduct of the study.

Documents Approved:

Document Name	Document Type	Document Date
Appendix A - Email invitation to participate	Email Script	21/May/2018
Appendix B - Phone Script to Invite Director	Telephone Script	21/May/2018
Appendix C - Director LOI & consent_June 25	Written Consent/Assent	25/Jun/2018
Appendix E - Childcare Provider LOI & consent_June 25	Written Consent/Assent	25/Jun/2018
Appendix F - Verbal Assent Document_June 25	Assent Form	25/Jun/2018
Appendix G - Parent LOI & consent_June 25	Written Consent/Assent	25/Jun/2018
Appendix I - Thank you letter for parents and guardians_June 25	Other Data Collection Instruments	25/Jun/2018
Appendix J - Thank you letter for childcare staff_June 25	Other Data Collection Instruments	25/Jun/2018
Appendix K - Accelerometer log_June 25	Other Data Collection Instruments	25/Jun/2018
Appendix L - Parent Guardian Demographic Questionnaire_June 25	Paper Survey	25/Jun/2018
Appendix M - Childcare Provider Demographic Questionnaire_June 25	Paper Survey	25/Jun/2018
Appendix N - Anthropometric tracking sheet_June 25	Other Data Collection Instruments	25/Jun/2018
Appendix O - Staff General EPAO-SR Survey	Paper Survey	21/May/2018
Appendix P - Director EPAO SR_June 25	Paper Survey	25/Jun/2018
Appendix Q - Focus Group Guide_June 25	Focus Group(s) Guide	25/Jun/2018
Appendix R - Focus Group LOI & consent_June 25	Written Consent/Assent	25/Jun/2018
Appendix T - Master Tracking Sheet - Children	Other Data Collection Instruments	21/May/2018
Appendix U - Master participant tracking sheet - childcare staff	Other Data Collection Instruments	21/May/2018
Appendix S - Childcare Physical Activity Policy_July 27	Other	27/Jun/2018

No deviations from, or changes to, the protocol or WREM application should be initiated without prior written approval of an appropriate amendment from Western HSREB , except when necessary to eliminate immediate hazard(s) to study participants or when the change(s) involves only administrative or logistical aspects of the trial.

REB members involved in the research project do not participate in the review, discussion or decision.

The Western University HSREB operates in compliance with, and is constituted in accordance with, the requirements of the TriCouncil Policy Statement: Ethical Conduct for Research Involving Humans (TCPS 2); the International Conference on Harmonisation Good Clinical Practice Consolidated Guideline (ICH GCP); Part C, Division 5 of the Food and Drug Regulations; Part 4 of the Natural Health Products Regulations; Part 3 of the Medical Devices Regulations and the provisions of the Ontario Personal Health Information Protection Act (PHIPA 2004) and its applicable regulations. The HSREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 00000940.

Please do not hesitate to contact us if you have any questions.

Sincerely,

Karen Gopaul, Ethics Officer on behalf of Dr. Joseph Gilbert, HSREB Chair

Note: This correspondence includes an electronic signature (validation and approval via an online system that is compliant with all regulations).

Appendix B: Letter of Information for Childcare Centre Directors

PLAY (PhysicaL ActivitY) Policy Study:
Examining a Childcare Policy to Promote Physical Activity among Young Children

Letter of Information for Childcare Centre Directors

Investigators:
Trish Tucker, PhD, Faculty of Health Sciences, University of Western Ontario
Molly Driediger, PhD, Faculty of Health Sciences, University of Western Ontario
Leigh Vanderloo, PhD, Child Health & Evaluative Sciences, The Hospital for Sick Children
Shauna Burke, PhD, Faculty of Health Sciences, University of Western Ontario
Jennifer Irwin, PhD, Faculty of Health Sciences, University of Western Ontario
Andrew Johnson, PhD, Faculty of Health Sciences, University of Western Ontario
Jacob Shelley, PhD, Faculty of Health Sciences & Faculty of Law, University of Western Ontario
Brian Timmons, PhD, Child Health & Exercise Medicine Program, McMaster University

Invitation to participate:
This study aims to implement and evaluate the impact of an evidence-based physical activity policy on children's physical activity levels during childcare. You are being invited to participate because your centre provides licensed care to young children (age 1 months to 5 years). We plan to recruit approximately 8 childcare centre directors, 64 full-time childcare providers, and 212 children enrolled in the toddler and preschool classrooms of these centres.

Purpose of this letter:
The purpose of this letter is to provide you with the information needed to make an informed decision regarding your centre's participation in the present study.

Background:
Researchers have found that young children (0-4 years), can benefit from participating in daily physical activity; however, current research supports that young children engage in high levels of sedentary behaviours and low levels of physical activity while in childcare. As such, the need for effective approaches to improve physical activity engagement and participation among this population is evident. Consequently, our research team is conducting a study aimed at creating and evaluating a physical activity policy for centre-based childcare. The findings from this work will have implications for children enrolled

in childcare with regard to physical activity behaviours and health as it may lead to future examinations of policy to support physical activity engagement in early childhood.

What will happen in this study?
Your centre will be randomly assigned to either the *intervention* group or the *control* group. Should your centre be assigned to the *control* group, the children will continue their typical daily programming for the duration of the 8-week intervention. If your centre is assigned to the *intervention* group, for 8 weeks you will implement an evidence-based physical activity policy developed with guidance from the childcare community, physical activity researchers, and policy experts. The policy will be a guidance document to specify daily physical activity affordances in childcare. Regardless of the group to which your centre is assigned, if you agree to participate, the children in the toddler and preschool-aged classrooms whose parents have provided consent will wear an accelerometer (a small, motion sensor device) during childcare hours for 5 consecutive days at four different time points (pre-intervention, week 0; mid-intervention, week 4; post-intervention, week 9; and at 6-months follow-up). A pager-like device in size (please see picture below), the accelerometer would be worn on an adjustable elastic belt around the child's waist (over top of clothing) to collect information about the amount and intensity of his/her movements. While wearing the accelerometer, the children will still be able to participate in all normal activities. Upon arrival at childcare, your staff will be asked to fit the children with the accelerometers, with assistance from a research assistant, and to remove them at end-of-day prior to leaving for home. They will also be asked to record daily device ON/OFF times in a provided log. Prior to accelerometry data collection, two researchers will come to participating classrooms to take the preschool children's height, weight, and waist circumference measurements. Children will be individually measured by the researchers, and these measurements will be completed in a corner of the centre, to ensure the children's privacy.

In addition to this letter of information and consent form, you will be asked to complete a short survey at baseline to assess your centre's physical space, equipment, environment, and existing physical activity policy and practices. The participating staff and children's parents/guardians will be asked to complete a consent form, and demographic questionnaires at baseline. Staff will also be asked to complete a short survey to assess classroom environment and physical activity practices in general, and as it applies to "today" at four times: baseline, mid-intervention, post-intervention, and at 6-months follow-up. Staff will be asked to also complete a short survey to measure their confidence to engage children in physical activity prior to baseline and after baseline measures. They will be given one week to return completed materials. As centre Director, it would be appreciated if you could provide reminders to your staff and to the children's parents/guardians (via newsletters and/or email correspondence).

Inclusion and exclusion criteria:
In order for you to participate in this study, you must: a) be a Director of a childcare centre where there are one or more toddler or preschool classrooms, b) understand English (reading and writing), and c) must not have a written physical activity policy at your centre. You will not be able to participate if you: a) are not a Director of a childcare centre where there are no toddler or preschool classrooms, b) do not understand English (reading and writing), and c) if you currently have a written physical activity policy.

Alternatives and your right to withdraw from the study:
Your participation in this study is voluntary. You may refuse to participate, refuse to answer any questions, or withdraw from the study at any time. You may withdraw your data at any time up until the point of data analyses. Staff refusal to participate or withdraw from the study, at any time, will not affect their employment status.

Possible benefits and risks to you for participating in the study:
There are no known physical, social, or economic risks due to participation in this study. You do not waive any of the legal rights you would otherwise have as a participant in a research study. There are no personal benefits to you participating in this study.

Confidentiality:
We will keep your identity and survey data, as well as written records, confidential and secure.

All data obtained will be stored in secured computer files (password encrypted) and stored in locked filing cabinets at Western University. Only the research team (including graduate students) and Western University's Health Sciences Research Ethics Board will have access to these data. The data will be retained for 7 years after the results of the study have been published. After this period, all data will be destroyed (i.e., computer data will be erased, and written/paper data shredded).

Costs and compensation:
There is no cost to you for participating in the study.

Publication of the results:
When the results of the study are published, your name will not be used. If you would like to receive a copy of the overall results of the study, please tick the appropriate box on your consent form.

For further information on this study, you can contact the Principal Investigator, [redacted] at [redacted] ext. [redacted] or [redacted]

* If you have any further questions regarding your rights as a study participant, please contact Western University's Office of Research Ethics at [redacted] or [redacted]

This letter is for you to keep

Appendix C: Consent Form for Childcare Centre Directors

PLAY (PhysicaL ActivitY) Policy Study
Examining a Childcare Policy to Promote Physical Activity among Young Children

I have read the Letter of Information, have had the nature of the study explained to me, and I agree to participate. All questions have been answered to my satisfaction.

Date	Director's Name (please print)	Director's Signature
Date	Name of Researcher Obtaining Informed Consent (please print)	Signature

Do you wish to obtain a copy of the study results?

- ☐ Yes
- ☐ No

If YES, please provide your email address below.

- ☐ Email: _____

Appendix D: Letter of Information for Childcare Providers

PLAY (PhysicaL ActivitY) Policy Study
Examining a Childcare Policy to Support Physical Activity among Young Children

Letter of Information for Childcare Providers

Investigators:
Trish Tucker, PhD, Faculty of Health Sciences, University of Western Ontario
Molly Driediger, PhD, Faculty of Health Sciences, University of Western Ontario
Leigh Vanderloo, PhD, Child Health & Evaluative Sciences, The Hospital for Sick Children
Shauna Burke, PhD, Faculty of Health Sciences, University of Western Ontario
Jennifer Irwin, PhD, Faculty of Health Sciences, University of Western Ontario
Andrew Johnson, PhD, Faculty of Health Sciences, University of Western Ontario
Jacob Shelley, PhD, Faculty of Health Sciences & Faculty of Law, University of Western Ontario
Brian Timmons, PhD, Child Health & Exercise Medicine Program, McMaster University

Invitation to participate:
This study aims to implement and evaluate the impact of an evidence-based physical activity policy on children's physical activity levels during childcare. You are being invited to participate because you provide care to children (age 1 months to 5 years) enrolled in a childcare centre where the director has agreed to participate. We plan to recruit approximately 8 childcare centre directors, 64 full-time childcare providers, and 212 children enrolled in the toddler and preschool classrooms of these centres.

Purpose of this letter:
The purpose of this letter is to provide you with the information needed to make an informed decision regarding your participation in the present study.

Background:
Researchers have found that young children (0-4 years), can benefit from participating in daily physical activity; however, current research supports that young children engage in high levels of sedentary behaviours and low levels of physical activity while in childcare. As such, the need for effective approaches to improve physical activity engagement and participation among this population is evident. Consequently, our research team is conducting a study aimed at creating and evaluating a physical activity policy for centre-based childcare. The findings from this work will have implications for the children enrolled in childcare with regard to physical activity behaviours and health as it may lead

to future examinations of policy to support physical activity engagement in early childhood.

What will happen in this study?
Your centre will be randomly assigned to either the *intervention* group or the *control* group. Should your classroom be assigned to the *control* group, the children will continue their typical daily programming for the duration of the 8-week intervention. If your centre is assigned to the *intervention* group, for 8 weeks you will implement an evidence-based physical activity policy developed with guidance from the childcare community, physical activity researchers, and a policy expert. The policy will be a guidance document to specify daily physical activity affordances in childcare. Regardless of the group to which your classroom is assigned, if you agree to participate, the children in your classroom whose parents have provided consent will wear an accelerometer (a small, motion sensor device) during childcare hours for 5 consecutive days at four different time points (pre-intervention, week 0; mid-intervention, week 4; post-intervention, week 9; and at 6-months follow-up). A pager-like device in size (please see picture below), the accelerometer would be worn on an adjustable elastic belt around the child's waist (over top of clothing) to collect information about the amount and intensity of his/her movements. While wearing the accelerometer, the children will still be able to participate in all normal activities. Upon arrival at childcare, you will be asked to fit the children with the accelerometers, with assistance from a research assistant, and to remove them at end-of-day prior to leaving for home. You will also be asked to record daily device ON/OFF times in a provided log. Prior to accelerometry data collection, two researchers will come to your classroom to take the participating children's height, weight, and waist circumference measurements. Children will be individually measured by the researchers, and these measurements will be completed in a corner of the centre, to ensure the children's privacy.

In addition to this letter of information and consent form, you will find a brief demographic questionnaire, and a general and specific (your practices as of today) classroom environment and physical activity practices survey that you will be asked to complete four times (i.e., at baseline, mid-intervention, post-intervention, and at 6-months post-intervention). You will also be asked to complete a survey that assesses your confidence to engage children in physical activity at two times; prior to baseline, and immediately following baseline. You will be asked to complete these forms and return them to the research team as soon as possible. If your centre is assigned to receive the intervention, you will be asked to complete a log to record your adherence for three days per week during the 8-week intervention period. At the conclusion of the intervention period, if you are assigned to the intervention group, you will be given the opportunity to

volunteer to participate in focus groups to provide feedback on the feasibility of the policy for use in childcare.

Inclusion and exclusion criteria:
In order for you to participate in this study, you must: a) be a full-time childcare provider for a classroom of a participating childcare centre, and b) understand English (reading and writing). You will not be able to participate if you: a) are not a full-time childcare provider for a classroom of a participating childcare centre and b) do not understand English (reading and writing).

Alternatives and your right to withdraw from the study:
Your participation in this study is voluntary. You may refuse to participate, refuse to answer any questions, or withdraw from the study at any time. You may withdraw your data at any time up until the point of data analyses. Refusing to participate or withdrawing from the study (at any time) will not affect your employment status.

Possible benefits and risks to you for participating in the study:
There are no known physical, social, or economic risks due to participation in this study. You do not waive any of the legal rights you would otherwise have as a participant in a research study. There are no personal benefits to you participating in this study. Tokens of appreciation will be distributed to all participants to acknowledge their contributions to the study.

Confidentiality:
We will keep your identity and survey data, as well as written records, confidential and secure.

All data obtained will be stored in secured computer files (password encrypted) and stored in locked filing cabinets at Western University. Only the research team (including graduate students) and Western University's Health Sciences Research Ethics Board will have access to these data. The data will be retained for 7 years after the results of the study have been published. After this period, all data will be destroyed (i.e., the computer data will be erased and all written/paper data will be shredded).

Costs and compensation:
There is no cost to you for participating in the study. To acknowledge your contribution to the study, you will receive a $5 gift card to a local grocery store at the end of each period of data collection (baseline, mid-intervention, post-intervention, and 6-months follow-up).

Publication of the results:
When the results of the study are published, your name will not be used. If you would like to receive a copy of the results of the study, please tick the appropriate box on your consent form.

For further information on this study, you can contact the Principal Investigator, [redacted] at [redacted] ext[redacted] or [redacted]

* If you have any further questions regarding your rights as a study participant, please contact Western University's Office of Research Ethics at [redacted] or [redacted]

Appendix E: Consent Form for Childcare Providers

PLAY (PhysicaL ActivitY) Policy Study
Examining a Childcare Policy to Support Physical Activity among Young Children

I have read the Letter of Information, have had the nature of the study explained to me, and I agree to participate. All questions have been answered to my satisfaction.

Date	Participant's (Childcare Provider's) Name (please print)	Participant Signature
Date	Name of Researcher Obtaining Informed Consent (please print)	Signature

Do you wish to obtain a copy of the study results?

- ☐ Yes
- ☐ No

If YES, please provide your email address below.

- ☐ Email: _____

Appendix F: Childcare PLAY Policy

PLAY (PhysicaL ActivitY) Policy Study
Examining a Childcare Policy to Promote Physical Activity among Young Children

Childcare PLAY Policy

Childcare programs encourage all children to engage in physical activity frequently throughout the day, with a focus on outdoor energetic free play, and deliberate interruption of sustained periods of sedentary behaviour.

Directed by the Canadian 24-Hour Movement Guidelines for the Early Years*, childcare programs are expected to:

1. Encourage children to engage in higher intensity energetic play (i.e., activities that induce sweating and heavy breathing) often throughout the day with a goal of accumulating a *minimum of 40 minutes each day*. More is better.
2. Expose children to a variety of *indoor* and *outdoor* physical activities, including both child-directed and teacher-facilitated active play daily.
3. Outdoor time is offered for a *minimum of 120 minutes each day* unless *extreme* weather (i.e., heat or cold alert) prevents it. When extreme weather occurs, the opportunity exists for children to engage in active play indoors.
4. Short, frequent outdoor sessions are most conducive to higher intensity physical activity among children; therefore, short bouts (e.g., 15-30 minutes) of outdoor time are recommended often (e.g., 3-4 times a day).
5. Unstructured (i.e., child-directed) free play is predominant during outdoor time. When activity levels decline, childcare practitioners encourage continued energetic play through structured activity, participation alongside children, and use of verbal prompts.
6. Encourage children to develop physical literacy by practicing fundamental movement skills often throughout the day (e.g., running, skipping, hopping, or jumping).
7. The appropriate use of screen-based technology is role modeled by childcare practitioners by avoiding it when children are present. Screen-based technology is not offered to children under 2 and is not recommended during childcare hours.
8. Programming is designed to break up sustained sedentary time using indoor movement-based activities.

* These guidelines recommend that children over 1 year engage in 180 minutes of physical activity at any intensity each day, and by age 3, at least 60 minutes of this time is spent in higher intensity physical activity, known as energetic or active play.

Appendix G: Childcare Provider Demographic Questionnaire

PLAY (PhysicaL ActivitY) Policy Study
Examining a Childcare Policy to Promote Physical Activity among Young Children

Childcare Provider Demographic Questionnaire

About you

What is your sex? What is your age? _____

- ☐ Male
- ☐ Female

What is your racial background/ethnicity?

- ☐ Caucasian
- ☐ African Canadian
- ☐ Native/Aboriginal
- ☐ Arab
- ☐ Latin-American
- ☐ Asian
- ☐ Other (please specify): _____
- ☐ Prefer not to answer

What is your employment status?

- ☐ Full-time
- ☐ Part-time

What age group are you responsible for?

- ☐ Toddler
- ☐ Preschool

How many years of experience do you have as a childcare provider?

- ☐ Less than 5 years
- ☐ 5-9 years
- ☐ 10-14 years
- ☐ 15-19 years
- ☐ 20+ years

What is your highest level of education?

- ☐ High school
- ☐ College

- ☐ University
- ☐ Graduate school
- ☐ Prefer not to answer

On average, how many minutes <u>per week</u> do you spend engaged in moderate-to-vigorous physical activity (e.g., brisk walking, jogging, bike riding, cross-country skiing, etc.)?

- ☐ Less than 30 minutes
- ☐ 30-59 minutes
- ☐ 60-89 minutes
- ☐ 90-119 minutes
- ☐ 120-149 minutes
- ☐ 150 minutes or more

With regard to physical activity, do you feel that you are a strong role model for the children in your care?

- ☐ Yes, very much
- ☐ Somewhat, I could probably be a better role model
- ☐ Not at all
- ☐ Do not know

Thank you for completing this questionnaire.

Appendix H: Daily Implementation Log

PLAY (PhysicaL ActivitY) Policy Study

Examining a Childcare Policy to Promote Physical Activity among Young Children

Daily Implementation Log

To help us gain a better understanding of your classroom's adherence to the PLAY policy, please complete this short report ***3 times per week*** (e.g., Monday, Wednesday, Friday) for the duration of the 8-week intervention period.

Instructions: Please place a check mark (✓) in the column to the right of each PLAY policy statement to indicate if you achieved that aspect of the policy **today** (yes, partially completed, or no). If you were unable to achieve a task, please place a check mark (✓) in the boxes provided to indicate the reason why it did not happen.

WRITTEN PHYSICAL ACTIVITY POLICY IN CHILDCARE

DATE: MONDAY/WEDNESDAY/ FRIDAY _____	**Adherence**			**WEEK: _____**
PLAY Policy Statement	**Yes**	**Part**	**No**	**Reason, if unable to achieve:**
The ***majority*** (80% or more) of children engaged in physical activity.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children engaged in physical activity ***frequently.***				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children achieved a ***minimum of 40 minutes*** of heart-pumping energetic play (i.e., high intensity activity).				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children engaged in ***indoor*** physical activity.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children participated in ***outdoor*** physical activity.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children engaged in ***unstructured*** or child-directed (e.g., tag) active play.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children engaged in ***structured*** or teacher-facilitated (e.g., exercises) active play.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children received a ***minimum of 120 minutes (2 hours)*** of outdoor time.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children were offered indoor active play ***instead*** of outdoor time.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Shorter (15-30 min) outdoor periods were offered.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
More frequent (more than 2) outdoor periods were offered.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Teachers participated in energetic play alongside children.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Teachers provided verbal encouragement (e.g., "keep running") of physical activity.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children practiced fundamental movement skills (e.g., kicking, throwing, catching).				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other

Children were exposed to staff using screen-based technology.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Children used screen-based technology.				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other
Staff intentionally interrupted children's time spent being sedentary (e.g., sitting, screen use).				☐ Weather ☐ Ratios ☐ No space ☐ Behaviour ☐ Other

Appendix I: Program Evaluation Survey

PLAY (PhysicaL ActivitY) Policy Study
Examining a Childcare Policy to Promote Physical Activity among Young Children

Program Evaluation Survey

We appreciate the time and effort you have put into implementing the childcare physical activity policy. To gain a better understanding of the feasibility of policy implementation, as well as the appropriateness of the policy components, please respond to the following questions. It should take approximately 10 minutes to complete this survey. Your feedback will serve as an important first step in the evaluation of the PLAY childcare physical activity policy. More specifically, your comments will inform potential modifications to the PLAY policy for use in the future. All results collected from this survey will remain confidential and anonymous.

Instructions: Please ***circle*** the number that best corresponds with your response to the following questions.

SECTION 1: FEASIBILITY (i.e., ease of implementation) OF POLICY IMPLEMENTATION

1. Please, rate the degree to which you agree or disagree with the following statements about the PLAY policy.

	Strongly Disagree		**Neither Agree or Disagree**		**Strongly Agree**
a. When first approached to participate, I was *very* **receptive** to implementing the PLAY policy.	1	2	3	4	5
b. I felt adequately **prepared** to implement the PLAY policy.	1	2	3	4	5
c. The PLAY policy was **easy** to implement.	1	2	3	4	5

d. It was ***not*** **easy** to encourage children to engage in physical activity *frequently* throughout the day.	1	2	3	4	5
e. It was **easy** to encourage children to engage in higher intensity energetic play *frequently* throughout the day.	1	2	3	4	5
f. It was **easy** to provide children with the opportunity to achieve a *minimum of 40 minutes* of higher intensity energetic play each day.	1	2	3	4	5
g. It was ***not*** **easy** to expose children to a *variety of indoor* physical activities each day.	1	2	3	4	5
h. It was **easy** to expose children to a *variety of outdoor* physical activities each day.	1	2	3	4	5
i. It was **easy** to provide unstructured or *child-directed* free play each day.	1	2	3	4	5
j. It was ***not*** **easy** to provide structured or *teacher-facilitated* active play each day.	1	2	3	4	5
k. It was **easy** to offer a *minimum of 120 minutes* of outdoor time each day.	1	2	3	4	5
l. It was **easy** to provide the opportunity for children to engage in active play *indoors* when outdoor play was not possible.	1	2	3	4	5
m. It was ***not*** **easy** to provide shorter, more frequent outdoor play sessions.	1	2	3	4	5
n. It was **easy** to encourage continued energetic play through *structured or teacher-led activities*.	1	2	3	4	5
o. It was **easy** to encourage continued energetic play through *teacher participation* in physical activity.	1	2	3	4	5
p. It was ***not*** **easy** to encourage continued energetic play using *verbal prompts*.	1	2	3	4	5

q. It was **easy** to support children's development of *physical literacy* through encouragement of fundamental movement skills (e.g., running, skipping, hopping, or jumping).	1	2	3	4	5
r. It was **easy** to avoid using my own screen-based technology when the children were present.	1	2	3	4	5
s. It was **easy** to avoid children's exposure to screen-based technology during childcare hours.	1	2	3	4	5
t. It was ***not*** **easy** to break up children's sedentary time by providing indoor active play opportunities.	1	2	3	4	5

SECTION 2: FUTURE IMPLEMENTATION

1. Although the formal implementation of the PLAY policy has come to an end, how likely are you to continue to adopt the following aspects of the policy within your classroom?

I plan to continue…	**Not at all Likely**		**Somewhat Likely**		**Extremely Likely**
a. to encourage children to engage in physical activity *frequently* throughout the day.	1	2	3	4	5
b. to encourage children to engage in *higher intensity* energetic play often throughout the day.	1	2	3	4	5
c. to provide children with the opportunity to achieve a *minimum of 40 minutes* of higher intensity energetic play each day.	1	2	3	4	5
d. to expose children to a *variety of indoor* physical activities each day.	1	2	3	4	5

e. to expose children to a *variety of outdoor* physical activities each day.	1	2	3	4	5
f. to provide unstructured or *child-directed* free play each day.	1	2	3	4	5
g. to provide structured or *teacher-facilitated* active play each day.	1	2	3	4	5
h. to offer a *minimum of 120 minutes* of outdoor time each day.	1	2	3	4	5
i. to provide the opportunity for children to engage in active play *indoors* when outdoor play is not possible.	1	2	3	4	5
j. to provide shorter, more frequent outdoor sessions.	1	2	3	4	5
k. to encourage continued energetic play through *structured or teacher-led activities*.	1	2	3	4	5
l. to encourage continued energetic play through teacher participation in physical activity.	1	2	3	4	5
m. to encourage continued energetic play through *verbal prompts*.	1	2	3	4	5
n. to support children's development of physical literacy through the encouragement of fundamental movement skills (e.g., running, skipping, hopping, or jumping).	1	2	3	4	5
o. to avoid my own use of screen-based technology when children are present.	1	2	3	4	5

p. to avoid children's exposure to screen-based technology during childcare hours.	1	2	3	4	5
q. to break up children's sedentary time by providing indoor active play opportunities.	1	2	3	4	5

SECTION 3: COMMUNICATION & TIMING

1. With regard to the planning and implementation of the PLAY policy, how effective did you feel the communication was between the following?

How effective was the communication…	**Not at all Effective**		**Somewhat Effective**		**Extremely Effective**
a. between the research team and your centre?	1	2	3	4	5
b. between your director and the staff?	1	2	3	4	5
c. between and among staff members?	1	2	3	4	5
d. between staff and/or the director and parents?	1	2	3	4	5

SECTION 4: GENERAL THOUGHTS ABOUT THE PLAY POLICY

1. What did you like most about the PLAY policy?
2. What part of the PLAY policy did you feel was most important?
3. What challenges did you experience when implementing the PLAY policy?
4. What solutions helped you to resolve these challenges?
5. During the intervention period, were there any aspects of the policy that you modified? Please describe.
6. If you made modifications, were they successful?
7. If you could modify the PLAY policy in any way, what would you change? Why?
8. Did you observe any changes in the children's moods, or behaviour when implementing the PLAY policy?
9. What else do you want us to know about your experience with the PLAY policy?

Thank you for completing this survey. Your feedback is valuable.

Appendix J: Letter of Information for Childcare Providers – Telephone Interviews

PLAY (PhysicaL ActivitY) Policy Study
Examining a Childcare Policy to Support Physical Activity among Young Children

Letter of Information for Childcare Providers – Telephone Interviews

Investigators:
Trish Tucker, PhD, Faculty of Health Sciences, University of Western Ontario
Molly Driediger, PhD, Faculty of Health Sciences, University of Western Ontario
Leigh Vanderloo, PhD, Child Health & Evaluative Sciences, The Hospital for Sick Children
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Andrew Johnson, PhD, Faculty of Health Sciences, University of Western Ontario
Jacob Shelley, PhD, Faculty of Health Sciences & Faculty of Law, University of Western Ontario
Brian Timmons, PhD, Child Health & Exercise Medicine Program, McMaster University

Invitation to participate:
This study aims to evaluate an evidence-based physical activity policy intervention for young children attending centre-based childcare. You are being invited to participate because you provide care to children in a toddler- or preschool-aged classroom assigned to the experimental condition. We are seeking participation from a minimum of eight childcare providers to participate in a telephone interview lasting approximately 30 minutes.

Purpose of this letter:
The purpose of this letter is to provide you with the information needed to make an informed decision regarding your participation in the present study.

Background:
Researchers have found that young children (0-4 years), can benefit from participating in daily physical activity; however, current research supports that young children engage in high levels of sedentary behaviours and low levels of physical activity while in childcare. As such, the need for effective approaches to improve physical activity engagement and participation among this population is evident. Consequently, our research team is conducting a study aimed at creating and evaluating a physical activity policy for centre-based childcare. The findings from this work will have implications for the children enrolled in childcare with regard to physical activity behaviours and health as it may lead

to future examinations of policy to support physical activity engagement in early childhood.

What will happen in this study:
Now that the 8-week intervention has ceased, you are being asked to participate in a semi-structured telephone interview with a member of the research team. You will be asked to reflect on the pros and cons of the implemented physical activity policy intervention. Participants will also be asked to comment on the feasibility of the intervention. This session will last approximately 30 minutes in length. All responses will be audio recorded (so that no comments are missed) and then transcribed into written form.

Individuals may express views during this interview that may be considered confidential; therefore, the interviewer will be alone in the office (located at Western University) where the telephone interview will take place. Member-checking which involves ensuring the research team has understood participants' comments correctly, will be used throughout the interview. This will be done by one of the researchers, who will verify participants' comments between questions, and then at the end of the interview, by repeating participants' general thoughts and suggestions. After reading this letter, please complete the consent form and return it to the research team.

Inclusion and exclusion criteria:
In order for you to participate in this study, you must: a) be a childcare provider for a toddler or preschool classroom who implemented the policy intervention, and b) understand English (reading and writing). You will not be able to participate if you: a) are a childcare provider at a centre who did not implement the policy intervention, and/or b) do not understand English (reading and writing).

Alternatives and your right to withdraw from the study:
Your participation in this study is voluntary. You may refuse to participate, refuse to answer any questions, or withdraw from the study at any time. You may withdraw your data at any time up until the point of data analyses. Refusing to participate or withdrawing from the study at any time will not affect your employment status.

Possible benefits and risks to you for participating in the study:
There are no known physical, social, or economic risks due to participation in this study. You do not waive any of the legal rights you would otherwise have as a participant in a research study. There are no personal benefits to you participating in this study. Tokens of appreciation will be distributed to all participants to acknowledge their contributions to the study.

Confidentiality:
We will keep your identity and responses confidential and secure. A professional transcriptionist will have access to the interview audio recordings, which may include use of participants' first name. However, no names will appear on any publications or presentations generated during this study.

All data obtained will be stored in secured computer files (password encrypted) and stored under a double-locked system – locked filing cabinets in a locked office at Western University. Only the research team (including graduate students) and Western University's Health Sciences Research Ethics Board will have access to these data. The data will be retained for seven years after the results of the study have been published. After this period, all data will be destroyed (i.e., computer data will be erased, and written/paper data will be shredded).

Costs and compensation:
There is no cost to you for participating in the study. To acknowledge your contribution to the study, you will receive a $5 gift card to a local grocery store.

Publication of the results:
When the results of the study are published, your name will not be used. If you would like to receive a copy of the overall results of the study, please tick the appropriate box on your consent form.

For further information on this study, you can contact the Principal Investigator, [redacted] at [redacted] ext. [redacted] or [redacted]

* If you have any further questions regarding your rights as a study participant, please contact Western University's Office of Research Ethics at [redacted] or [redacted]

This letter is for you to keep.

Appendix K: Consent Form for Telephone Interviews

PLAY (PhysicaL ActivitY) Policy Study
Examining a Childcare Policy to Support Physical Activity among Young Children

I have read the Letter of Information, have had the nature of the study explained to me, and I agree to participate. All questions have been answered to my satisfaction.

Date	Participant's Name (please print)	Participant Signature
Date	Name of Researcher Obtaining Informed Consent (please print)	Signature

Do you wish to obtain a copy of the study results?

- ☐ Yes
- ☐ No

If YES, please provide your email address:

- ☐ Email: _____

Appendix L: Semi-Structured Interview Guide for Telephone Interviews

PLAY (PhysicaL ActivitY) Policy Study
Examining a Childcare Policy to Promote Physical Activity among Young Children

Semi-Structured Interview Guide

Thank you for volunteering to participate in this interview. We are here today to discuss your thoughts on the pros and cons of the recently implemented childcare policy intervention; a physical activity policy targeting toddlers and preschoolers in centre-based childcare. Specifically, we are looking to gather your feedback on the feasibility of introducing this policy into childcare facilities. Your feedback on this topic is important. The information collected today will serve as an important first step in the evaluation of the childcare physical activity policy. More specifically, your comments will be used to inform potential changes and modifications to future versions of the policy.
There are no right or wrong answers. Everything discussed here today will be kept confidential, and all names will be removed from the transcripts and publications.
Are there any questions before we start?

1. Overall, what has been your **overall experience** with implementing the physical activity policy?
    a. How feasible (i.e., convenient and easy) was this policy to implement?
    b. How receptive were staff to implementing this policy?
    c. Does anyone have anything else to add?

2. What were the **best** parts of the policy?
    a. What made those parts/characteristics so beneficial?
    b. What are some examples of these?
    c. Tell me more about that.

3. What characteristic(s) of the policy do you feel was/were **most** appropriate for increasing physical activity participation among the children in your care?
    a. What made it/them so appropriate?
    b. What are some examples?
    c. Who else experienced something similar? Who experienced something different/in contrast?
    d. How 'effective' would you consider this policy in increasing children's physical activity levels during childcare hours?

4. What characteristic(s) of the policy do you feel was/were **least** appropriate for increasing physical activity participation among the children in your care?
    a. What made it/them so inappropriate?
    b. What are some examples?
    c. Who else experienced something similar? Who experienced something different/in contrast?

   d. How do you think this aspect of the policy could be tweaked so that it is more appropriate for the childcare environment?

5. What **challenges** did you experience when implementing the policy?
   a. Please expand.
   b. In what ways did this impact the implementation of the policy?
   c. How well did you implement the policy?

6. What **solutions** did you undertake to deal with these challenges?
   a. Please expand.
   b. Tell me more about that.
   c. How much time and effort did these solutions require?

7. Anything else you would like to mention about this study?

Appendix M: Colour Coded Physical Activity Policy Used for Composite Scoring

PLAY (PhysicaL ActivitY) Policy Study
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1. Encourage children to engage in higher intensity energetic play (i.e., activities that induce sweating and heavy breathing) often throughout the day with a goal of accumulating a *minimum of 40 minutes each day*. More is better.

2. Expose children to a variety of *indoor* and *outdoor* physical activities, including both child-directed and teacher-facilitated active play daily.

3. Outdoor time is offered for a *minimum of 120 minutes each day* unless *extreme* weather (i.e., heat or cold alert) prevents it. When extreme weather occurs, the opportunity exists for children to engage in active play indoors.

4. Short, frequent outdoor sessions are most conducive to higher intensity physical activity among children; therefore, short bouts (e.g., 15-30 minutes) of outdoor time are recommended often (e.g., 3-4 times a day).

5. Unstructured (i.e., child-directed) free play is predominant during outdoor time. When activity levels decline, childcare practitioners encourage continued energetic play through structured activity, participation alongside children, and use of verbal prompts.

6. Encourage children to develop physical literacy by practicing fundamental movement skills often throughout the day (e.g., running, skipping, hopping, or jumping).

7. The appropriate use of screen-based technology is role modeled by childcare practitioners by avoiding it when children are present. Screen-based technology is not offered to children under 2, and is not recommended during childcare hours.

8. Programming is designed to break up sustained sedentary time using indoor movement based activities

Appendix N: Colour Coded Daily Implementation Log

PLAY Policy Statement	Yes	Part	No	Reason, if unable to achieve:
The ***majority*** (80% or more) of children engaged in physical activity.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐Other
Children engaged in physical activity ***frequently***.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Children achieved a ***minimum of 40 minutes*** of heart-pumping energetic play (i.e., high intensity activity).				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Children engaged in ***indoor*** physical activity.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Children participated in ***outdoor*** physical activity.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Children engaged in ***unstructured*** or child-directed (e.g., tag) active play.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Children engaged in ***structured*** or teacher-facilitated (e.g., exercises) active play.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Children received a ***minimum of 120 minutes (2 hours)*** of outdoor time.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Children were offered indoor active play ***instead*** of outdoor time.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Shorter (15-30 min) outdoor periods were offered.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
More frequent (more than 2) outdoor periods were offered.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Teachers participated in energetic play alongside children.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Teachers provided verbal encouragement (e.g., "keep running") of physical activity.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Children practiced fundamental movement skills (e.g., kicking, throwing, catching).				☐Weather ☐Ratios ☐No space ☐ Behaviour ☐ Other
Children were exposed to staff using screen-based technology.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Children used screen-based technology.				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other
Staff intentionally interrupted children's time spent being sedentary (e.g., sitting, screen use).				☐Weather ☐Ratios ☐No space ☐Behaviour ☐ Other