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Racial Difference in Children's Physical Activity and Psychosocial Beliefs in Physical Education

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Abstract Few studies have explored the moderating effects of race on children's physical activity (PA) and psychosocial beliefs, particularly in physical education (PE) setting. The purpose of this study was to investigate whether children's PA behaviors and PA-related psychosocial beliefs differed as a function of race, as well as to explore any racial differences in the relationships between PA and PA-related beliefs. A total of 174 fourth and fifth grade children from two elementary schools in Minnesota participated in this cross-sectional study. During three PE sessions, children's percentages of time spent in sedentary behavior, light PA, and moderate-to-vigorous PA (MVPA) were measured via ActiGraph GT3X+ accelerometers. A number of validated questionnaires were used to assess the children's PA-related psychosocial beliefs (i.e., self-efficacy, outcome expectancy, social support, and enjoyment) at the end of the last (third) session. Our data suggested that African American children spent significantly less percentage of time in sedentary behavior than their white counterparts, F (2, 171) = 3.33, p = 0.04. African American children's light PA, F (2, 171) = 1.99, p = 0.14, and MVPA percentage, F (2, 171) = 2.76, p = 0.06, were slightly higher than those of the other two groups; however, the differences did not reach the significance level. This study suggests that African American children are less sedentary and hold higher PA-related outcome expectancy and social support beliefs than white children.

Keywords: *accelerometers; underserved children; moderate-to-vigorous physical activity; sedentary behavior*

1. Introduction

As childhood obesity can continue into adolescence and adulthood with associations to comorbidities such as cardiovascular, and metabolic diseases; sleep apnea; musculoskeletal impairments; and psychosocial issues (Reilly & Kelly, 2011); it has become one of the largest public health concerns in the U.S. (Baranowski, 2019; Palmer, Chinn, & Robinson, 2019). Furthermore, health disparities in obesity rates, such as racial and ethnic differences in childhood adiposity, is another pertinent issue that has been raised (Love, Adams, Atkin, & van Sluijs, 2019). For example, African American children and adolescents experience higher risk of developing childhood obesity in comparison with their white and Asian counterparts (Oglen et al., 2020; Isong et al., 2018; Leadership for Healthy Communities, 2014).

There are also racial differences in physical activity (PA) intensities these children engage in (i.e., light PA, moderate-to-vigorous PA [MVPA], and sedentary behaviors) (National Physical Activity Plan Alliance [NPAPA], 2018). However, past literature reporting the racial differences in children's PA participation is mixed. For example, according to 2017 Youth Risk Behavior Surveillance System (YRBSS) data (Centers for Disease Control and Prevention [CDC], 2017), white youth were reported being the most active compared to African American and Hispanic youth (NPAPA, 2018). Accelerometry-based PA among 6-19 year old youth in National Health and Nutrition Examination Survey (NHANES), however, showed that African Americans are the most active (NPAPA, 2018). The contrasting findings may be due to the measurement used (i.e., surveys or PA monitors), sample characteristics and time of the data collection. Nonetheless, the presence of the racial/ethnic disparities in children's PA behaviors can be explained by other factors such as socioeconomic status (Love et al., 2019), parental support and encouragement (Barr-Anderson et al., 2017).

One of the prominent ways to promote children's PA is through physical education (PE). PE plays a critical role in children's PA promotion by allowing a structured and supervised setting for children to learn and develop their fundamental motor skills (Gao, Zeng, Pope, Wang & Yu, 2019; Sallis, Mckenzie, & Beets, 2012). In addition, PE settings may facilitate in children's adherence to recommended guidelines for them to engage in MVPA for

at least 60 min/day (Alderman, Benham-Deal, Beighle, Erwin, & Olson, 2012; Butte et al., 2017; Chen et al., 2014). It has been also recommended that at least 50% of PE class time be spent in MVPA to promote children's active participation in PE (Gao, Oh, & Sheng, 2011; Wood & Hall, 2015). However, research has revealed that children fail to meet these PA guidelines (Dumith, Gigante, Domingues, & Kohl, 2011; Wood, & Hall, 2015). Furthermore, the importance of PA behaviors in PE settings in explaining ethnic health disparities remain underexplored. As such, it is paramount to investigate whether a similar pattern of disparities would be reflected in PE setting because PE plays a critical role in children's PA promotion, and development of their fundamental motor skills in structured settings (Cheung, 2017; Sallis et al., 2012).

Other essential factors that have been noted to influence children's PA behaviors are their PA-related psychosocial beliefs (Lee, & Gao, 2020). Social Cognitive Theory-based beliefs such as self-efficacy, outcome expectancy, social support and enjoyment have been widely used to predict children's PA behavior (Bandura, 1986; Gao, Huang, Liu, & Xiong, 2012; Gao, 2012). Past literature has reported that higher self-efficacy and social support consistently resulted in smaller declines in children's PA participation over time (Craggs, Corder, van Sluijs, & Griffin, 2011). Evidence also suggests that the age-related decreases in PA into adulthood are more pronounced in African American children than their counterparts (Love et al., 2019). It is, therefore, important to investigate whether racial differences in these psychosocial beliefs to PA would exist. A few studies have found that specific correlates of PA might be evident in different ethnic group. For example, while self-focused beliefs such as self-efficacy and enjoyment are reported as important PA determinants among white children, social support seemed to be the prominent determinant in African and Hispanic children (Barr-Anderson et al., 2017; Bean, Miller, Mazzeo, & Fries, 2012)

Therefore, the current study sought to examine whether children of different racial/ethnic background would manifest similar patterns of PA behaviors and beliefs in the PE setting in particular, as it provides critical environment in which children acquire fundamental PA knowledge and motor skills in absence of their primary social supporters -- parents or caregivers. The findings of this study will provide insights into offering PE curricular content that are tailored to students' PA-related beliefs, which will ultimately support children's PA engagement in PE classes. Based upon the theoretical framework and previous literature, it was hypothesized that African American children in PE classes would 1) have a significantly higher PA levels compared to the White children; 2) demonstrate significantly higher sedentary behavior than White children; 3) have significantly greater PA-related social support than White children; and 4) demonstrate different psychosocial beliefs as significant factors to their total PA (the sum of light PA and MVPA) than other children would.

2. Method

2.1. Design and Participants

The study was approved by University of Minnesota Institutional Review Board (IRB approval number: 1603P85518) and the school district. A cross-sectional design was employed for this study in 2016 with convenience sample recruitment. A total of 174 fourth and fifth grade children (86 girls; 49% African American, 32% White; $Mean_{age}$ = 10.37 years, SD = ± 0.77) were recruited from two public elementary schools in the state of Minnesota. One school was a Title I school in which African American students made up 88% of the student body, followed by 10% of either American Indian or Hispanic students, and 92% of students eligible for free or reduced-price lunch (Venture Academy, 2016). The other school was also a Title I school where 40% of the student body was African American, followed by 35% White American students, with 66% received free or reduced-price lunch in 2016 (StartClass, 2016). Parental consent forms were waived by IRB as the study was considered presenting no more than minimal risk and assent forms from children were obtained prior to the study.

2.2. Procedures

Procedures followed were in accordance with the ethical standards of the responsible institutional committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. As advised by the university institutional review board, consent forms were sent home one week before the start of the data collection, asking caregivers to send the form back only if they disallowed their children from participating in the study. All participants completed assent forms at the beginning of all the assessments. A total of seven PE classes, size of 20 to 30 students each, in two elementary schools participated and each PE class were scheduled for 50 minutes per session and led by two certified PE teachers in total. Children's PA levels were measured for three PE sessions that took place over two weeks for each student. Each participant was assigned an identification number that matched his/her accelerometer number, and accelerometers were distributed to the children at the beginning of each PE session and collected at the end of each PE session. Accelerometers were attached to an elastic belt and researchers assisted putting them on to each participant to ensure they were properly worn over participants' right hip. The psychosocial belief questionnaire assessment, which took approximately seven minutes to complete, was taken onsite at the end of the third PE session. All assessments for the children's psychosocial beliefs and demographic variables were self-reported with aid from PE teachers and researchers. Both schools had similar lesson plans, and the curriculum consisted of warm-up, fitness training, and practice of a sport skill drill, followed by a game (Table 1).

Table 1. *Sample Curriculum for Physical Education Classes, Minnesota, USA, 2016*

School A		School B	
Duration	**Curriculum**	**Duration**	**Curriculum**
5 min	Warm-Up: Walk around the gym	5 min	Warm-Up
7 min	Muscular Strength Fitness: Push-ups, Sit-ups, Jumping Jack, Squats, Lunges	10 min	Enhancing Cardio Fitness: Relay running
8 min	Cardiorespiratory Fitness: Jog and walk around the gym	15 min	Learning a Sport Skill: Football catch and throw
15 min	Learning a Sport Skill: football, catch and throw	15 min	Skill Component Learning: Catch while you run
10 min	Playing mini football games	5 min	Wrap-up
5 min	Wrap-up		

2.3. Measures

2.3.1. Physical activity and sedentary behavior

Children's PA levels and sedentary behavior in each PE session was assessed by ActiGraph GT3X+ accelerometers (ActiGraph Co., Pensacola, FL, USA). Accelerometers are small devices that collect PA data in three planes, which allows us to collect information on PA levels at different intensities. Activity counts were measured in 1-second epoch and PA levels were quantified as average counts per second for activity intensities. Using established Evenson's cut-points, counts were classified as sedentary behavior (0 –100), light PA (101–2295), and MVPA (≥ 2296) (Evenson et al., 2008). This cut-point was used as it is known to be significantly more accurate than other types of cut-points in terms of classification for MVPA among children who are between 5 and 15 years old (Trost, Loprinzi, Moore, & Pfeiffer, 2011). The outcome variables were children's mean percentage of time spent in sedentary behavior, light PA, and MVPA in PE. In order to test the fourth hypothesis, relationship between children's belief and PA, we used total PA, which was the sum of light PA and MVPA, instead of MVPA. Past literature has used total PA rather than MVPA because MVPA counted for only a small portion, and it did not accurately reflect children's whole PA behavior.

2.3.2. Demographic and psychosocial variables

Demographic information obtained from the children included age, gender, grade level, and race/ethnicity. The children self-reported this information prior to the psychosocial assessment with the guidance of the researchers and teachers. A number of validated questionnaires were used to measure children's self-efficacy, outcome expectancy, social support, and enjoyment (Gao, Lee, Kosma, & Solmon, 2010; Gao et al., 2012; Gesell et al., 2008; Ommundsen, Page, Ku, & Cooper, 2008; Saunders et al., 1997). As suggested by Gesell et al. (2008), the response scores for surveys were revised to dichotomous choices from the original 3-, 4- or 5-point Likert scales, because dichotomous responses were easier to understand and respond to for fourth and fifth-grade underserved children from low-income families. The children were asked to respond to each item, and the sum of the item scores for each survey was used for each of their psychosocial belief score.

For self-efficacy, a six-item questionnaire used in a study by Gao et al. (2010) was used to assess the children's beliefs in their ability to be physically activity in PE classes. Gao et al. demonstrated acceptable validity and reliability for the questionnaire ($\alpha > 0.70$) (Gao et al. 2010). To assess the children's outcome expectancies, an adjusted form of a validated 16-item Beliefs Scale by Saunders et al. was used (α = 0.58—0.75; test-retest = 0.51—0.69). The 12-item adjusted Beliefs Scale by Gesell et al. (2008) consisted of two subscales, physical outcomes and social outcomes (α = 0.98). A scale was adapted from Gao et al. (2012) to measure the children's social support (α = 0.76). The original 11-item scale (α = 0.76) by Ommundsen et al. (2008) comprised four subscales of parental support, parental encouragement, peer support, and teacher support, however our adapted scale included only the subscale of peer and teacher support. To measure the children's enjoyment from participating in PE class, an adjusted scale from the eight-item Enjoyment-Competence Scale by Ommundsen et al. (2008) was used (α = 0.51—0.62).

2.4. Statistical Analyses

Race was classified into three categories: White, African American, and Other which included Hispanic, Asian, Native American, and Pacific Islander. Then data were screened for missing values, normality, outliers, and errors. To examine the children's PA levels, data from each accelerometer were processed using ActiLife software 6.13 (ActiGraph Co., Pensacola, FL, USA). The percentages of time spent in sedentary behavior, light PA, and MVPA were used as children's PA outcomes.

To analyze our first and second hypotheses, a series of one-way ANOVA were conducted to examine the differences in children's PA by race. To examine the racial differences in children's psychosocial beliefs (third

hypothesis), a one-way multivariate analysis of variance (MANOVA) was conducted to explore any racial differences in children's beliefs. Partial eta squares were used to indicate the effect sizes, where 0.01 is considered small, 0.09 medium, and 0.25 large. Finally, to test our fourth hypothesis, a series of Pearson correlation and stepwise regression analyses were used to examine the predictive strengths of children's beliefs on total PA (sum of light PA and MVPA) in each racial group. For the ANOVA analysis, the significant level was set at 0.05; and for MANOVA analyses, it was set at 0.01. SPSS (version 21.0, IBM Inc., Chicago, IL) was used for the data analyses.

3. Results

The average PE duration (i.e., the actual time children wore the accelerometers) was 41.7 minutes. Findings indicated that African American children's accelerometer wearing time was significantly shorter than their counterparts. This may be partially due to the fact some African American students had to leave the class early for legitimate reasons and thus turned in their accelerometers slightly before the end of the class without hampering the valid wearing time. A series of one-way ANOVA results indicated that race significantly influenced children's sedentary behavior, F (2, 171) = 3.33, p = 0.04, η^2 = 0.04; but not their light PA, F (2, 171) = 1.99, p = 0.14, η^2 = 0.02 nor MVPA, F (2, 171) = 2.76, p = 0.06, η^2 = 0.03. Post-hoc analysis showed that African American children (41%) spent significantly less percentage of time in sedentary behavior than their white counterparts (46%). African American children's light PA and MVPA percentage were slightly higher than those of the other two groups, however the differences did not reach the significance level. Mean percentages of PA and standard deviations are presented in Table 2.

The mean scores of the children's psychosocial beliefs and standard deviations are presented in Table 3. MANOVA showed that children's outcome expectancy, F (2, 171) = 5.23, p < 0.01, η^2 = 0.06, and social support, F (2, 171) = 4.74, p = 0.01, η^2 = 0.05, were significantly different between groups. The outcome expectancy and social support of African American children and children of other ethnicities were significantly higher than those of white children, respectively.

Pearson correlation analyses among African American children revealed that all beliefs were significantly associated with their total PA: self-efficacy (r = 0.27, p < 0.01), outcome expectancy (r = 0.18, p = 0.05), social support (r = 0.28, p < 0.01), and enjoyment (r = 0.19, p < 0.05). However, regression analyses indicated that social support was the only significant predictor of African American children's total PA, F (1, 83) = 7.11, p < 0.01, R^2 = 0.08. However, no significant predictor of PA was found for White children or children of other ethnicities.

4. Discussion

This study sought to examine whether children's PA behavior and their PA-related psychosocial beliefs in PE settings differ by race. The findings suggest that children from different races had varying levels of sedentary behavior, outcome expectancy, and social support. African American children were less sedentary and had higher beliefs (i.e., outcome expectancy and social support) than their white counterparts. In terms of the relationship between children's total PA and beliefs, social support was the only significant predictor of African American children's total PA.

The results did not support our first and second hypotheses that African American children would be significantly more active and demonstrate more sedentary behavior than white children. The results are not in line with some previous literature as according to several past literatures that have used accelerometer, African American children demonstrate greater MVPA than white children (Gortmaker et al., 2012). In terms of sedentary behavior, our findings indicate that African American children were significantly less sedentary than white children. Findings from past literature on this topic are mixed; either no difference was found between white and African American children (Casazza, Dulin-Keita, Gower, & Fernandez, 2009; Casazza, Gower, Willig, Hunter, & Fernandez, 2009)

Table 2. *Descriptive and Inferential Statistics on Mean Percentage of Time Spent in Different PA Intensity in PE, Minnesota, USA, 2016*

	White (n = 56)	Black (n = 85)	Other (n = 33)	*F*	*p*
SB[b] in percentage	45.7 (10.7)	40.9 (11.4)	43.9 (9.7)	3.33	0.04*
LPA[c] in percentage	26.3 (4.1)	27.9 (5.2)	27.8 (4.1)	2.00	0.14
MVPA[d] in percentage	28.0 (8.8)	31.2 (9.1)	28.4 (7.3)	2.76	0.06
Mean Steps	1495 (377.4)	1622 (473.9)	1560 (358.5)	1.52	0.22
Wearing Time in minutes	42.5 (1.7)	40.9 (2.2)	42.3 (1.7)	13.4	0.00*

Note. a. * means p value is less than 0.05. b. SB= Sedentary behavior, c. LPA = Light physical activity, d. MVPA = Moderate-to-vigorous physical activity, PA = Physical activity, PE = Physical Education.

Table 3. *Descriptive and Inferential Statistics on Mean Percentage of Time Spent in Different PA Intensity in PE, Minnesota, USA, 2016*

	White (n = 56)	Black (n = 85)	Other (n = 33)	*F*	*p*
Self-efficacy	5.34 (.82)	5.49 (.70)	5.42 (.71)	0.74	0.48
Outcome Expectancy	9.27 (1.92)	10.0 (1.74)	10.39 (1.17)	5.23	0.01*
Social Support	4.18 (.83)	4.48 (.84)	4.70 (.64)	4.74	0.01*
Enjoyment	4.02 (1.0)	4.19 (.96)	4.24 (.97)	0.73	0.46

Note. a. * means *p* value is less than 0.05. b. SB = Sedentary behavior, c. LPA = Light physical activity, d. MVPA = Moderate-to-vigorous physical activity, PA = Physical activity, PE = Physical Education.

or African American children were more sedentary (Gortmaker et al. 2012; Owen et al., 2009). It has not been reported extensively as to why African American children are more active than their white counterparts, however we speculate that African American children's less sedentary behavior in the current study may be associated with their immigrant status. Most of the African American children was from immigrant parents from an East African country and it has been documented that immigrant children of certain race/ethnicity encompass different culture and norms compared to the same race children who are U.S. born (Kimbro, & Kaul, 2016). African American children in the present study were residing in a challenging residential area, small apartment units with insufficient outdoor playground in their neighborhood. These less opportune physical and emotional challenges might have led the children to be less sedentary and fidgety in the gym as a means to relieve and reduce their stress (Gavin, 2018). Future studies are warranted to further investigate the influence of cultural and environmental factors on children's PA behavior in PE, as different subgroups within the same race/ethnicity might encompass a stretched spectrum of cultural differences that contribute to their PA differently.

Concerning psychosocial beliefs, our findings indicated that African American children had higher outcome expectancy and social support than their white counterparts, which partially support our third hypothesis. To date, there are limited number of studies that examined the differences in children's psychosocial beliefs across race/ethnicity. Individuals differ in how outcome expectancy influences PA behavior and vice versa, as each has different needs and interests in engaging in the behavior (Wójcicki, 2009) and our results clearly suggest that African American and other children had higher beliefs that engaging in PA during PE will be fun, help them gain energy and make new friends. We speculate that the needs of African American children were more adequately met through PE classes compared to white children's need. One of possible needs could have been related to lack of English language proficiency among African American students and PE classes allowing these students to bond with their peers and expressing themselves out of realm of spoken language. This may also explain why perceived social support of African American children was higher than that of white children. These findings suggest the importance of other PA opportunities (e.g., recess, free outdoor play) which may be financially- and developmentally- accessible to these underserved children.

In terms of the relationship between children's total PA and their beliefs, social support was the only predictor of African American children's PA, while no significant predictor was evident in either group of white children or children of other ethnicities. These findings support our fourth hypothesis, and echo past literature reporting social support as an important predictor of PA in underserved children (Elmore & Sharma, 2014). Barr-Anderson et al. (2017) examined multi-level factors influencing 643 youth's PA behavior and it was noted that African American youth did not share any common predictors of change in PA over time with white or Hispanic children. That is, some of the significant factors associated with African American children's total PA were parental sport participation and parental support for their child's PA, while among white youth the factors were number of active friends and child's enjoyment of PA (Palmer et al., 2019). The findings indicate that parental support for African American youth at younger age may be more important than it is for white youth in their PA participation throughout the day.

The strength of the current study is the use of objectively assessed PA outcome variables, and a relatively large sample with diverse children, examining constructs associated with Social Cognitive Theory. However, the current study is not without limitations. The study implemented a cross-sectional design with the sample only from two elementary schools in low SES communities, which hampers the generalizability of the findings. There was also unequal ratio of children from different race/ethnicity, which may have been the reason why we did not see any significant predictors of PA in either white children or other children. More future studies need to incorporate a longitudinal design with assessment of various cultural, social, environmental correlates that may be associated with children's PA in PE.

5. Conclusion

This study indicates that children of different ethnicities have varying levels of PA behaviors and PA-related beliefs in PE classes. This study suggests that African American

children are less sedentary and hold higher beliefs of outcome expectancy and social support than white children and that social support may be critical in promoting PA among immigrant African American children who might be undergoing a stressful adjustment period to a new culture. Therefore, these African American children can benefit as PE classes are more geared to accommodate their needs by incorporating games and activities that are easy to comprehend and require a minimum level of motor skills.

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