MATERNAL AND PATERNAL SUPPORT, EFFICACY, AND OBJECTIVELY MEASURE PHYSICAL ACTIVITY AMONG PRESCHOOL-AGED CHILDREN

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A Senior Honors Project Presented to the

Honors College

East Carolina University

In Partial Fulfillment of the

Requirements for

Graduation with Honors

By

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April, 2019

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Abstract

Introduction

Less than half of children ages 3 to 5 years met the physical activity (PA) guideline of roughly three hours of PA daily, which can lead to adverse health effects throughout life. Parental self-efficacy and parental support for promoting PA might be associated with higher child PA levels. The purposes of this study are as follows: (a) compare parental support and parental efficacy between mothers and fathers; (b) examine relationships between parental PA, parental support for child PA, and parental self-efficacy for promoting child PA; and (c) examine relationships among child PA levels with parental self-efficacy and PA support.

Methods

Nine parent-child triads, with children ages 2 to 5 years, participated in data collection. Anthropometric measurements were obtained for all triad participants, then parents individually completed a demographic information and the Support for Physical Activity Questionnaire and the Parental Self-Efficacy for Healthy Dietary and Physical Activity Behaviors in Preschoolers Scale. PA participation for all participants was objectively measured using accelerometers for 7 days and then time spent in moderate-to-vigorous PA (MVPA) was calculated for the parents and child and total PA (light, moderate and vigorous) was calculated for children only.

Results

The mean age of the children was 3.9$\pm$1.0 years. Two-thirds of the children were male. Maternal and paternal self-efficacy levels were similar for facilitating and inhibiting circumstances and

parental support for child PA (p>.05). No relationships occurred between maternal and paternal MVPA and parental support for child PA. Further, no significant relationships were observed between both maternal and paternal MVPA and parental self-efficacy for promoting child PA in situations facilitating activity (e.g., purchasing sports equipment) (r = .487 and r = .285, respectively). There were also no significant relationships between maternal and paternal PA and parental self-efficacy for promoting child PA in situations inhibiting activity (e.g., bad weather) (r = .1772 and r = .234, respectively). There were non-significant correlations between child MVPA and maternal self-efficacy for promoting PA under both circumstances-facilitation and inhibition (r = -.180 and r = -.110, respectively). A significant negative relationship was found between child MVPA and paternal self-efficacy for promoting PA in facilitating circumstances (r = -.805); however, no relationship was found among child MVPA and paternal self-efficacy in inhibiting situations (r = -.497). Finally, no significant relationships occurred between maternal and paternal support for child PA and child PA (both total and MVPA) levels.

Conclusions

In conclusion, mothers and fathers were similar in their self-efficacy to promote PA and provide support for their child's PA. For the most part, parental MVPA was not related to either their self-efficacy for promoting PA in their child or their perceived ability to give PA support to their child. The only significant relationship was higher paternal self-efficacy in facilitating situations being associated with decreased child MVPA. Even though it appears parental self-efficacy and parental support is not associated with child PA levels, limited research exists examining these relationships in the preschool population and among fathers. These findings, in addition to the small sample size of the study, encourage additional studies examining these relationships.

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Introduction

In 2016, 39.8% of U.S. adults and 18.5% of children were classified as obese ("Overweight and Obseity", 2018). While other lifestyle factors can contribute to these rates, physical inactivity is known to have a significant role in the onset of obesity (Mavrovouniotis, 2012). Although there were no previously established guidelines for preschool-aged children, the 2018 physical activity guidelines for children ages 3 to 5 years states that three hours of activity at all intensities-light, moderate, and vigorous, is recommended daily ("Physical Activity", 2018). In 2015, less than half of children ages 3 to 5 years met the rough recommendation of three hours of daily physical activity (Pate, 2015). Similarly, only 42% of children ages 6-11 years met the national physical activity guidelines of 60 minutes per day (Troiano et al., 2007). Children should meet these recommendations to promote early adherence to physical activity that results in both long- and short-term benefits.

Physical inactivity increases the risk of developing health-related problems. Physical inactivity at a young age promotes the onset of physiological dysfunction and chronic diseases such as coronary heart disease, hypertension, and hyperlipidemia-all of which contribute to an increased risk of mortality (Mavrovouniotis, 2012). Physical inactivity in early childhood has also contributed to a decrease in motor skill development among individuals (Kantomaa et al., 2011). Promoting physical activity at an early age is important because evidence suggest that individuals who have displayed a low preference for active play in their youth demonstrated decreased physical activity levels and a lack of cardiorespiratory fitness in their adolescence (Kantomaa et al., 2011). Physical inactivity and obesity are associated with low levels of health-related quality of life (Pinhaus-Hamiel et al., 2006). Therefore, it is crucial that meaningful interventions for increasing physical activity among young children are developed. In order for

such interventions to exist, the underlying factors associated with promoting child physical activity must first be established; two such factors include: parental physical activity support and parental efficacy for promoting activity among children.

Parental support may be a crucial factor for encouraging participation in physical activity among young children. There is mixed evidence for the direct association between parent and child physical activity (Trost et al., 2003). Rather, the relationship between parental support and child physical activity may be a greater predictor of a child's participation (Trost et al., 2003; Brustad, 1996). For example, the importance of active parental involvement in child activity has been observed as children ages 3 to 5 years have shown higher levels of physical activity engagement during times that they are likely to be with their parents (Van Cauwenberghe, Jones, Hinkley, Crawford, & Okely, 2012). Another study found that the higher the parents' intention to provide support for physical activity, the more likely their child will participate in physical activity (Rhodes et al., 2013; Brustad, 1996; Rebold, Lepp, Kobak, McDaniel, & Barkley, 2016). The reported effects of parental support on child physical activity levels support the idea that parental involvement is crucial to influencing a child's physical activity habits.

Parents play an important role in the promotion of physical activity among children, especially young children. Because parent involvement must occur among preschool-aged children, parental self-efficacy-the confidence in one's ability to carry out a specific task- for promoting physical activity among children is an important variable to consider among parents. Positive correlations have been shown between parental efficacy for promoting child physical activity behaviors (Bohman, Rasmussen, & Ghaderi, 2016; Wright, Adams, Laforge, Berry, & Friedman, 2014; De Leperleere, De Bourdeaudhuij, Cardon, & Verloigne, 2015). In some ways, self-efficacy of parents for promoting child health-related behaviors is impacted by their ability

to perform the behaviors themselves before promoting them to their children (Gunnarsdottir, Njardrik, Olafsdotir, Craighead, & Bjarnason, 2011); positive correlations have been shown between parents' confidence in their own abilities to complete treatments and child weight loss and activity levels once parents began encouraging the same treatments for their children (Gunnarsdottir et al., 2011). In other situations, parental self-efficacy and confidence have also been driven by their children's behaviors-when children positively respond to their parents' effort, parental self-efficacy shows a dramatic increase (Arsenault, Xu, Taveras, & Hacker, 2014; De Leperleere et al., 2015). Efficacy, whether it be parental self-efficacy for physical activity or parental efficacy for promoting physical activity behaviors among children, has been shown to have positive relationships with child physical activity levels. Thus, it is important to observe the relationships between both maternal and paternal efficacy with child activity levels to use this knowledge in the development of future interventions.

Over time, the roles of mothers and fathers have changed a great deal: fathers are assuming the role of the primary caregiver more frequently, mothers are more present in the workforce, and the number of households with two working parents has increased in comparison to the past several decades ("History 90.01", 2016). Given these changing roles, it is important to understand both maternal and paternal factors that are related with child health behaviors, however, fathers are underrepresented in research observing parenting and obesity-related behaviors (Davison, Li, Baskin, Cox, Affuso, 2011). This causes discrepancies when creating family-based interventions for child health. While a lack of participation from fathers in research may attribute to varying findings regarding gender difference and physical activity related efficacy, there have been identified trends among the general population (DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham, 1998; Hosseinzadeh, Niknami, & Hidarnia, 2014). Mothers have

been shown to have a positive influence on physical activity levels when they demonstrate self-efficacy for promoting child activity; however, fathers-when considered, have demonstrated higher self-efficacy levels for promoting activity and have shown a greater influence on their children's activity habits than mothers (DiLorenzo et al., 1998). Based on current studies that have included fathers, they often have a role in active participation in the physical activity with their children, rather than primarily providing indirect support (Walsh et al., 2017; Zahra, Sebire, & Jago, 2015). Based on the few cases in which both mothers and fathers have participated, fathers have been seen more as the role model for when it comes to physical activity behaviors for their children (Walsh et al., 2017; Zahra et al., 2015). In these same situations, mothers have reported themselves to still be actively involved in their children's physical activity habits, but the extent to which they are varies; mothers have considered themselves to be more integral to the organization of the activity rather than the activity itself (Zahra et al., 2015). In some cases, mothers have been shown to discourage child activity-this may result from assuming the primary role of child care provider in which mothers are consistently spending time with their children (Pesch et al., 2015). While it is understandable that mothers can be affected by children's high activity levels and may wish to 'calm' their children down for a time-being, that may inhibit a child's potential to reach recommended guidelines (Pesch et al., 2015). Fathers have been shown to demonstrate greater effort in supporting physical activity on the weekends; this finding has been attributed to their role in the household (Solomon-Moore et al., 2018). Parental influence cannot just be limited to the amount of support provided, however, as children have been shown to be more physically active if at least one of their parents is physically active as well, with even more time spent being active should both parents be active (Rodrigues, Padez, & Machado-Rodrigues, 2018). It has been shown that parents who share similar styles in promoting said

behaviors experience the greatest results-children with concordant parents have demonstrated less opposition to healthy behaviors (Harris, Jansen, Mallan, Daniels, & Thorpe, 2018). Thus, it is essential to understand the levels of support, self-efficacy, and physical activity for mothers and fathers and their relationship with child physical activity.

Parents are important influences on child physical activity; thus, the overall purpose of this study is to examine maternal and paternal factors associated with child physical activity. An emphasis is placed on the following: (a) comparing the levels of parental physical activity support and physical activity promotion self-efficacy between mothers and fathers; (b) examining relationships among parental PA, parental self-efficacy for promoting child physical activity, and parental support for mothers and fathers; and (c) examining the relationships among child physical activity with parental self-efficacy and physical activity support for mothers and fathers. These purposes and their possible relationships with one another are visualized in Figure 1.1.

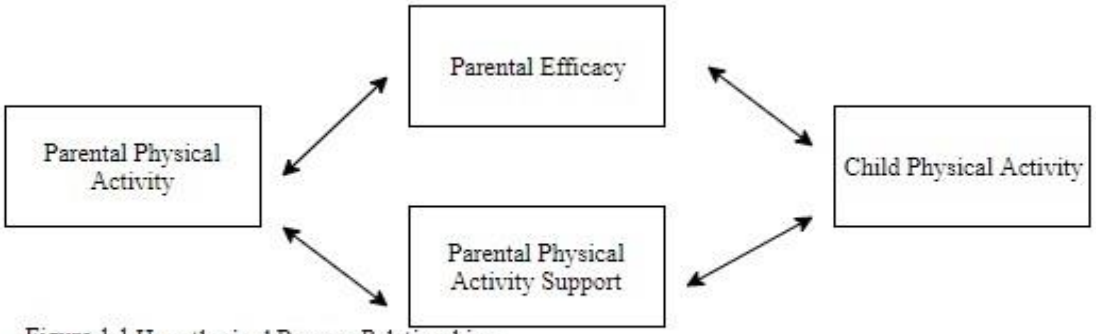

Figure 1.1 Hypothesized Purpose Relationships

When children fail to meet recommended physical activity guidelines, their risk for adverse health effects increases. Parental support has been shown to increase child physical

activity levels. Along with support, parental efficacy for promoting child physical activity has also correlated with increased levels in child activity. As mothers and fathers have shown to have different influences on child activity, specifically in the role they play, it is important to consider both parental figures and their relationship with child physical activity. To make the most of family interventions, it is crucial to understand the relationship between parental factors (self-efficacy and support) and child physical activity.

Literature Review

Rates of Physical Activity among Young Children

Pate et al. (2015) explored compliance with physical activity guidelines for children ages 3-5 years; they based their criteria off of the Institute of Medicine's recommended 3 hours of physical activity per day for this age group. To do so, cross-sectional analyses were conducted on children ages 3-5 and used both the Children's Activity and Movement in Preschool Study (CHAMPS) for one sample and the Study of Health and Activity in Preschool Environments (SHAPES) for the second sample; the sample sizes were 286 children and 337 children, respectively. In the CHAMPS sample, children wore accelerometers for a two-week period while the SHAPES sample had children wearing the accelerometer for 5 consecutive days; to create consistency, only data from Monday to Friday of the first week for the CHAMPS sample was considered. Descriptive statistics were used for demographics and total PA was calculated; logistic models were used to observe differences among demographics and PA levels. The results showed that only 41.6% and 50.2% of children met guidelines for the CHAMPS and SHAPES samples, respectively. Trends for both samples included more males meeting the guidelines than females and more overweight children meeting the guidelines than normal weight children. No differences among racial/ethnic and parent education groups were found. This study shows that

many young children do not participate in enough physical activity. Therefore, it is important to determine factors that correspond with physical activity among young children.

For many, physical activity may occur in different settings. These setting may have an influence on physical activity rates among young children. Van Cauwenberghe et al. (2012) observed both physical activity and sedentary behavior among preschool-aged children. Children (N=703) ages 3-5 years wore accelerometers for eight consecutive days; physical activity and sedentary time were calculated as time per hour; information comparing weekdays to weekends and boys to girls was displayed as ratios. The highest levels of sedentary time were from the morning to the early afternoon and from the morning to midday for weekdays and weekends, respectively. Alternatively, participation in physical activity was highest from the mid-afternoon to the evening for both weekdays and weekends. There was little variation between sedentary time and physical activity from the weekdays to the weekends. Similar to prior research, this study confirmed that boys participated in more physical activity than girls, with a ratio of participation of .88:.75-the differences were not large, but still statistically significant. The researchers observed higher physical activity levels and less sedentary behavior on the weekends as opposed to weekdays. This research highlights some times where children may be more vulnerable to participating in sedentary behavior; this can be an effective tool used in physical activity interventions. While not explicitly stated, it is important to note that increased physical activity times occurred when children are usually home and not in a child care setting, which may emphasize the importance of parents in physical activity of children.

Consequences of Physical Inactivity

In regards to health-related consequences of physical inactivity in early years, Mavrovouniotis (2012) compiled some of the most adverse effects of inactivity on health. In the

beginning of this literature review, the fact that children today are less active is heavily emphasized. The bulk of this literature review revolves around the consequences of inactivity in children and adolescents. Mavrovouniotis mentions that many chronic diseases that are present in adults begin in childhood; recognized among these chronic diseases are coronary heart disease, hypertension, and dyslipidemia-all of which are amplified with inactivity. Noted is the correlation between physical inactivity and obesity and the cyclic behavior between the two. The correlation between inactivity and fat mass was also considered as well as the negative relationship between aerobic fitness and adiposity. Mavrovouniotis emphasizes the risk factors of both coronary heart disease and metabolic syndrome-obesity, dyslipidemia, and hypertension-and how these risk factors are reinforced with a lack of physical activity early in childhood. Final discussions in this literature review observed the well-developed relationship between physical inactivity and obesity. While this literature review draws information from numerous sources, knowing that physical inactivity can have several health-diminishing effects emphasizes the importance of encouraging physical activity and promoting its adherence in early childhood and adolescence.

Maillane-Vanegas and colleagues (2017) determined the potential effects that sports participation in childhood has on physical activity in adulthood. A sample of 743 adults in Sao Paulo, Brazil filled out two ‘questionnaires’: one that initially determined whether or not the individual was active-through participation in sport-during childhood and adolescent years and the Baecke questionnaire, which classifies the intensity and frequency of the individual’s physical activity, as well as their previous engagement in sport. Covariates such as age, sex, BMI, job, and educational level were also collected. The results showed that sports participation in childhood and adolescence was 26.1% and 27.6%, respectively. In regards to adulthood,

14.4% of the sample actively participated in sports; 24.5% of the sample was classified as 'insufficiently active' in their adult years. There was a positive correlation between a lack of sports participation in childhood and a lack of sports participation in adulthood. While sports participation is only one way to be physically active, this study demonstrates the possible relationship of a physically inactive childhood on the habits in later years. Should the individual fail to participate in physical activity in their youth, they run the risk of maintaining that inactive lifestyle as they continue to age. Establishing a physically inactive lifestyle early may be detrimental to leading a physically active lifestyle in the future.

Consequences of physical inactivity are not reserved for adult populations; children are capable of developing adverse health effects associated with physical inactivity as well. However, Kantomaa and colleagues (2011) delved deeper into the effects that physical inactivity may have on the developments experienced throughout childhood and adolescence. Participants consisted of about 9,000 mother-child dyads, with two surveys conducted when the children had reached 7-8 years and 15-16 years of age. At the 7-8 year checkpoint, parents filled out the survey inquiring about their children's health and behavior, as well as their familial situation. At the 15-16 year checkpoint, the survey was instead presented to the adolescent themselves inquiring about their health, while parents filled out a survey regarding family conditions. At this same age, the adolescents also received individual health examinations. The survey that parents completed when their child reached 8 years of age consisted of questions regarding the child's gross motor skills, fine motor skills, and preference for active play. When the participants reached age 15-16 years, the survey consisted of questions regarding their physical activity habits; the health examination measured their cardiorespiratory fitness. The results showed that at age 8, boys had more gross and fine motor problems than girls, but girls had a lower

preference for active play. At age 16, the results showed that the boys were more physically active than the girls and had a higher cardiorespiratory fitness as well. The results showed that low preference for active play while younger was associated with both lower levels of physical activity and cardiorespiratory fitness during the adolescent years. It was concluded that children with suspected motor problems and low preference for active play face a higher chance of being physically inactive in during adolescence. Thus, participation in physical activity in early childhood is important because it can decrease the likelihood of inactivity throughout adolescence and adulthood.

Inactivity during childhood can significantly impact one's health and habits in adulthood. A lack of physical activity during childhood can lead to a copious amount of adverse health conditions later on. Inactivity throughout childhood also has the potential to set the pace for activity throughout adulthood as studies show that many who are inactive during their childhood continue their inactive habits during their adult years. These consequences help emphasize the importance of having established physical activity habits in the early years of childhood.

Influence of Parents on Child Physical Activity Levels

Several factors contribute to a child's participation in physical activity, with parents playing a critical role as one. Brustad (1996) chose to observe the role of parental socialization on physical activity attraction among children, as well as explore the impact of gender influences on this concept. To do so, 107 children in fourth, fifth, and sixth grade responded to the Children's Attraction to Physical Activity scale, which assessed children's attraction to exercise, games and sports, and physical exertion; three dimensions assess these items, with additional fourth and fifth dimensions look at both children's feelings of acceptance or rejection by peers related to physical activity and whether or not children enjoy physical activity because of the

benefits it reaps or not. The children also responded to the Perceived Physical Competence Scale for Children. To assess the influences of parental socialization, children completed a questionnaire focusing on parental encouragement provided, parental enjoyment of activity as perceived by children, and parental role-modeling. Focusing strictly on the influence of parental socialization, the results showed that perceived parental encouragement (α=.74) and perceived parental enjoyment of activity (α=.71) showed internal consistency. Taking into consideration the genders of the children, there was a positive association between boys' enjoyment of activity and perceived parental enjoyment (r=.34). Girls also experienced a positive association between their physical activity enjoyment and perceived parental enjoyment (r=.68) and parental encouragement (r=.53). This study shows the positive relationships between parental factors and children's views of physical activity. This is relevant to the current study as it shows the effects of children's perceptions of their parents' physical activity 'habits' and the impact of them on their own activity patterns and opinions.

Initially, it was thought that parental physical activity levels would have a direct positive correlation with child physical activity levels. After realizing this could not be assumed, Trost and colleagues (2003) pursued a new model in order to try and explain parental influence on child physical activity levels. In doing so, they focused on parental support for child physical activity and children's self-efficacy with their own physical activity. A total of 380 parent-child triads participated in the study. The parents filled out a questionnaire focused on their physical activity levels, their beliefs regarding physical activity, and their methods for supporting their child's physical activity if they did so at all. The children filled out a questionnaire regarding their physical activity levels over a week, as well as a 5-item physical activity self-efficacy scale. From this study, it was concluded that parents reported higher levels of support for boys

compared to girls and that parental support had a positive correlation with child physical activity. Rather than maintaining a direct route from parent physical activity to child physical activity, Trost et al. created a pathway in which parental physical activity was associated with parental support (β=.17-.25, $p<.0001$), parental support was associated with parental self-efficacy (β=.21, $p<.0001$) and parental self-efficacy was associated with child physical activity (β=.25, $p<.0001$). In adjusting the previously formed model to the results of this study, there was a deletion of the path between parent physical activity and child physical activity and instead, a direct path was formed between parental support and child physical activity. These findings are significant to this study because they show that parents can directly and indirectly promote physical activity through numerous forms of support; the encouraging of child physical activity and the ability to be self-sufficient in promoting these behaviors can influence a child's participation in physical activity.

In more recent years, Rhodes et al. (2013) built upon the parental support model through the integration of the Theory of Planned Behavior. For this study, 663 mothers, with a child age 5-11 years, were selected and filled out questionnaires regarding the following information: their child's participation in moderate-to-vigorous physical activity, the value they place on their child's participation in physical activity, their attitudes regarding their child's physical activity, their attitudes about supporting their child's physical activity, their perceived behavioral control over their child's physical activity support, their intention to provide support for their child's physical activity, and their perceived physical activity participation of their child. In regards to their own physical activity habits, 43.6% of mothers reported that they met the national guidelines. On the topic of the importance of child participation in physical activity, 58% of mothers ranked physical activity as a first or second priority when compared to homework,

music/arts, socializing, and family time; 34.5% of mothers listed homework as top priority, with 25.5% of mothers choosing physical activity. In making correlations among parent physical activity support, significant correlations between parent perceived physical activity of her child and intention to provide support were displayed. The following factors all significantly predicted intention: attitude about child physical activity, attitude about support of child activity, and perceived behavioral control of support-this explained 77% of the variance among intention to provide physical activity support. The prediction of parent-perceived child activity was also predicted by perceived behavioral control over support. The higher the intention to provide support for child activity, the more frequently the child participated in physical activity. In showing that mothers are willing to provide support and have intention to support their child's physical activity endeavors, we can continue to focus on building their self-efficacy for promoting these behaviors. Having the intention of doing so is a crucial step, but being able to carry out the action itself also needs to be emphasized.

How much support a parent provides for their child can be the result of their parenting style, which can play a crucial role in the development of a child. In 2013, Langer, Crain, Senso, Levy, and Sherwood explored associations between parental support for child physical activity and how certain parenting styles may determine the amount of support provided and the effects that support produces. To do so, 421 parent-child dyads were selected; children had to be between ages 5-10 years and with a BMI that placed them in the 70-95th percentile range for their age and gender. Children wore an accelerometer to monitor their activity for a week. Parents filled out the Parenting Styles and Dimensions Questionnaire (Robinson, Mandleco, Olsen, & Hart, 2001). The parents also answered questions regarding their frequency of providing support for their child's physical activity, such as encouraging their child or direct participation in the

activity as well. Focusing on the aspect of the results that directly pertain to this study, the mean support for physical activity was 2.53 on a 0-4 scale. When it came to the prediction of physical activity, the variance ranged from 18-21%, with a significant amount of variance stemming from demographic and anthropometric variables. The higher the BMI of the child, the lower the physical activity levels; girls were also less likely to participate in physical activity than boys. Langer et al. (2013) also found that parenting styles were not significant in their association with physical activity; however, support for physical activity was positively associated with physical activity- physical activity increased 4-5 minutes each day for every unit increase in support. Making conclusions based on parenting style, support for activity, and activity levels, for those at the mean level of permissiveness parenting, there was a positive correlation between parental support and child physical activity. This study is significant because it suggests that parenting style itself does not necessarily predict physical activity, but that support has a greater influence on physical activity levels.

Taking on this concept from a different point of view, Rachele, Cuddiny, Washington, and McPhail (2017) approached the idea of parental support for physical activity from the perspective of children themselves. To do so, 146 parent-child dyads participated in the study- children had to be between the age range of 12-15 years. The adolescents completed in International Physical Activity Questionnaire for Adolescents to measure and classify their physical activity. Also completed was the Children's Physical Activity Correlates Questionnaire, which focuses on the perception of parental role modeling, the perception of parental support, and the perception of parental encouragement. Positive correlations were found between child physical activity and perception of parental role modeling (p=.83), perception of parental support (p=.76), and perception of parental encouragement (p=.74). However, the perception of parental

support was the only factor associated with the self-reported MVPA of the adolescents; this explained 7.6% of the variance in physical activity. This study is significant because it not only emphasizes the importance of parental support in promoting physical activity behaviors among children, it also demonstrates the idea that children are aware of how much support they receive from their parents in regards to physical activity. This is a crucial concept because these observations can be made early in childhood as well; although recall may not be as good in younger children as opposed to adolescents, recognizing that children do take notice of their parents' behaviors can contribute to the encouragement of developing pro-physical activity behaviors among parents.

Physical activity varies between weekdays and weekends as children have less potential time to be active during the week as the result of school. To observe trends associated with differences among child physical activity and parental support for both week and weekend days, Vander Ploeg and colleagues (2013) composed a study to address their hypotheses that the association is different between those classifications. Parent-child dyads (N=1,355) participated in this study— all children were in fifth grade. Parents filled out a survey with the following questions: "how much do you personally care about staying fit and exercising", "to what extent do you encourage your grade five child to be physically active", and "how often do you or another parent/guardian usually engage in physical activity together with your child". Children wore pedometers for nine days and these days were divided into school days and weekend days. According to the results, daily step count was higher on school days than weekend days ($12,868 \pm 4,006$ vs. $11,763 \pm 6,636$ steps/day; $p<.001$); boys were more active than girls and parents reported encouraging boys to be active more than girls. For girls, increased parental encouragement and engagement were positively correlated with step count on school day and it

was reported that girls whose parents encouraged them to be active on higher levels took an additional 997 steps per day. The boys' results were similar to the girls' in the sense that positive correlations occurred between increased encouragement and daily step count. Boys whose parents encouraged them more took an average 1373 steps more than those who were considered to be 'less encouraged'. Boys whose parents claimed that they cared a lot about physical activity were found to be more active —this association was not found among girls as there were no distinctions between the different parental behaviors. This study is relevant because it displays what needs to be prioritized for interventions in regards to which days should be focused on and what methods are best for the promotion of physical activity among children as well as emphasizing the importance of understanding these relationships among parents and young children. In knowing that providing support is the action that produces the most results in regards to child physical activity, this approach can be utilized accordingly.

Focusing more on the desired population for the current study, Loprinzi and Trost (2010) explored the direct influence of parental activity and their perception of competence on child physical activity. Parent-child dyads (N=156) completed the study in which parent physical activity was addressed using the International Physical Activity Questionnaire and parental enjoyment of activity was assessed using a parental enjoyment scale developed by Trost and other colleagues in a previous study. Parents' perceptions of their child's physical competence, frequency of parental support for child activity, and child physical activity levels were also assessed in the study. To measure child physical activity, the Physical Activity and Exercise Questionnaire for Children and accelerometer data were used. According to the results, parental activity and perceptions of competence were positively associated with parental support for child activity (β=.23 and .18, respectively, $p<.05$). Parental support for activity and perception of

competence had direct relationships with child physical activity (β=.16 and .20, respectively, $p<.05$). These results showed that perception of competence had both a direct and indirect, through increased support, effect on child activity. This study explored the direct relationships between parental efficacy and parental support for physical activity and parental support and child physical activity levels. This study is relevant to the current study in its conclusion that parental efficacy has some influence on child physical activity levels.

Rebold et al. (2016) focused on the effects of parental involvement on child physical activity levels by placing children in three different situations: being alone, having a parent watch their activity, and having a parent participate in physical activity with them. Children (N=20) ages 3-6 years old, participated in the study. The children were placed in a gymnasium with equipment such as jump ropes, balls used in sport, hurdles, and obstacle course. "Sedentary alternatives" such as dolls, action figures, board games, art supplies, and books were also present. Accelerometers were placed on children to measure their physical activity levels for 30 minutes and direct observation was also used to record the amount of time spent in each form of activity. At the conclusion of the session, children were asked to rate the enjoyment of their activity and which situation was their favorite. The results showed that children showed a greater amount of physical activity when their parent was participating with them than both alone and with their parent watching ($t\geq2.53$, $p\leq.02$). Having their parent watch also produced more physical activity than being alone ($t=2.80$, $p=.1$). It was also concluded that when children were alone, they were more likely to participate in the sedentary activity than when their parent was either watching or participating ($t\geq2.97$, $p\leq.008$); the least amount of time spent in sedentary activities was when parents were participating in the activity with their child. In regards to enjoyment, children enjoyed having their parent participate than having them watch or being

alone ($z \geq 2.4$, $p \leq .02$). There was not a significant difference in enjoyment between being alone and having a parent watch. Children were also more likely to participate in an additional 10-minute bonus period if their parents were also participating in the activity than compared to watching or being alone. This study is important because it not only shows that a simple presence can significantly impact one's likelihood of being active, but that having a parent participate in activity with their child increases both the time spent being active and the enjoyment of the activity. This is relevant to the current study because parent awareness can build parental efficacy and lead to an increase in activity among children.

Zabinski, Saelens, Stein, Hayden-Wade, and Wilfley (2003) explored barriers related to child physical activity, many of which were perceived by the children themselves. This study also approached the concept and influence of parental support on children's physical activity habits. Overweight youth (N=84) ages 8-16 years old and 95 non-overweight youth ages 10-14 years old were selected to participate in the study. The youth filled out a questionnaire relating to their personal physical activity habits and their opinions regarding certain forms of activity, body confidence, resources, and inconvenience-all of which could be interpreted as possible barriers to activity. The support for physical activity measure consisted of social support from different sources for physical activity. The youth were asked how frequently they received support and in what forms that support occurred, as well as who they received it from. According to the results, perceived support for physical activity did not differ among overweight girls or boys. Comparing the overweight and non-overweight groups, overweight youth were less likely to receive adult support compared to non-overweight youth ($F=6.5$, $p < .013$); this trend was especially prominent among girls ($p < .001$). This information is important to the current research because it acknowledges that the 'at-risk' populations are less likely to received support, which is

counterintuitive to what should occur. While activity should be used in the prevention of obesity, knowing what populations receive less support can guide proper interventions for promoting activity.

In some situations, parents' beliefs about their child's weight may influence how much they encourage living a healthy lifestyle, Sylvetsky-Meni , Gillespie, Hardy, and Welsh (2015) approached this concept by interviewing 1,811 parents of children ages 4-15 with varying weight statuses. Parents were asked to report their perception of their child's weight and proceeded to fill out a questionnaire regarding their attitudes and practices for promoting a healthy lifestyle for their children-the scale used was a 10-point Likert scale. Ninety-five percent of children who met BMI criteria for 'normal weight' were properly classified by their parents; however, only 42.2% of children who were considered overweight/obese were properly classified by their parents. Parents (94.8%) recognized that child obesity could lead to serious health problems in the future. Parents who perceived their child to be overweight were more likely to report that obesity in children is a problem (53.5%, $p<.001$). Parents who perceived their child as overweight were more likely to agree that child obesity runs in families and that little can be done about it (12.1%, $p=.034$). In regards to physical activity specifically, parents who perceived their child to be overweight reported to be more concerned about how much physical activity their child participated in (83.1%, $p<.001$). Parents who also perceived their child to be overweight were more likely to believe that technology had a great influence for why their children were less physically active (54.3%, $p<.001$). This information is relevant to the current study because it demonstrates that parental perceptions about their child's health and weight status may contribute to how driven they are to promote a healthy lifestyle among their children. This research suggests that parents may be less likely to promote a healthy lifestyle if they personally

believe their child is healthy, which could cause some discrepancies between how active their child is and how active their child should be.

Influences of Varying Forms of Parental Support

Parental support for physical activity can be provided in several different forms, such as verbal encouragement, providing transportation, or directly participating in the physical activity itself. In 2014, Brunet and colleagues explored these different modes of support and their effects on children's physical activity levels, observing the differences in the amount of support for children with varying BMIs and the differences among mothers and fathers when it comes to providing these forms of support. The participants consisted of 630 parent-child triads, with children ages 8-10 years. The children provided their perceptions of parental support using the Parent Support Scale; the perceptions were considered for both the child's mother and father and consisted of items regarding both tangible and intangible forms of support. The children also wore accelerometers to assess their physical activity levels for a 7-day period. The following ranking order was observed for most-to-least participation in physical activity: normal weight boys, overweight boys, normal weight girls, and overweight girls. In regards to support, boys perceived more parental tangible support for physical activity than girls ($F=11.95$; $p=.001$). Overweight children perceived more maternal intangible support than normal-weight children ($F=6.17$, $p=.002$). Comparing maternal and paternal support for physical activity behaviors, boys perceived more paternal tangible support than maternal while girls perceived more maternal intangible support than paternal. For all children, more maternal intangible support was perceived compared to paternal intangible support. This research is pertinent to this study as it demonstrates the idea that there may be differences between support provided by parents. This study also showed significant differences in support provided by both mothers and fathers, which

could be used for intervention in the future. In recognizing that these gaps exist among provided support for physical activity, active changes can be made to see if they have a significant impact on children, which can be a topic of interest for future studies.

Observing the differences among instrumental and emotional support, Siceloff, Wilson, and Van Horn (2013) chose to further venture into that field and try to determine the impact that certain forms of support have on physical activity levels on children. To build a foundation for this research, Siceloff et al. chose to act through the Active by Choice Today (ACT) trial, which tests the efficacy of motivational plus behavioral skills intervention on increasing MVPA in underserved adolescents. Sixth grade students (N=1,422) participated in the study, which consisted of several questionnaires regarding social support from parents-in terms of emotional and instrumental support-as well as wearing an accelerometer for a week to track physical activity levels. In regards to parents for the baseline analyses, excluding additional results that encompassed peer social support, there was a negative correlation between BMI and emotional support from family. For baseline physical activity, family instrumental support and peer emotional support were positively associated with higher levels of physical activity. For every standard deviation increase for family instrumental support, there was an increase in physical activity of 4.5 minutes (95% CI: .61 to 4.00). There was no significant association between family emotional support and physical activity. The longitudinal analyses for this study showed that an increase in physical activity near the end of the intervention was associated with an increase in baseline family instrumental support (95% CI: .31 to 4.25) and instrumental support change (95% CI: .79 to 4.80); these led to 5-minute and 6-minute increases in daily physical activity, respectively. This study is important in understanding parents' intentions and willingness to promote physical activity because it showed that instrumental support

significantly contributed to increase physical activity levels, while emotional support did not. In having this information, there may be an association between provided instrumental support and parental self-efficacy for promoting child physical activity behaviors that has yet to be observed.

Several studies have generalized 'support' broadly, failing to actively report specific actions parents take in actively supporting their child's physical activity. To elaborate on potential methods to support childrens' actions, Pyper, Harrington, and Manson (2016) determined the impact of different types of parental support on the following health related behaviors: physical activity, screen time, and healthy eating. To do so, Computer Assisted Telephone Interview surveys were conducted for 3,206 parents with youth ages 2 to 18 years. Respondents were told to answer two of the four health behavior surveys (physical activity, healthy eating, screen time, and sleep); 2,237 respondents answered the physical activity survey. For physical activity, the responses were divided based on the child's age. The age group that showed the most statistically significant differences when reporting physical activity levels in relations to the guidelines was 13-17 years old; consistent with other data, more males were said to have met the guidelines than females. The results showed that 80.5% of parents reported that they took part in physical activity with their child and that 97.2% of parents encouraged their child to be active outdoors. When observing which types of support led to the most physical activity among children, parents who transported their child to places where they could participate in physical activity were twice as likely to have their child meet guidelines (OR: 2.06; 95% CI: 1.32-3.21). Encouraging their child to be physically active led to children being 1.94 times more likely to meet guidelines (95% CI: 1.04-3.61). The final behavior of taking part in physical activity with their child led their child to be 1.35 more likely to meet guidelines (95% CI: 1.03-1.76). All three forms of support significantly increase the chances of children meeting

physical activity guidelines. However, it is important to recognize that instrumental support such as providing transportation is the form of support that has the most impact on a child's physical activity level. In knowing this information, active efforts can be made to promote all three forms of support described in this study, as all have an impact on children's physical activity levels. As we continue to delve into parents' abilities to promote physical activity and aid their children in meeting physical activity guidelines, we must consider that certain forms of support may provide more assistance in doing so, as children can only participate in so much physical activity if they don't have the proper equipment or environment to do so. This study also encourages the need to examine these relationships among parents and younger children.

As several studies have shown, girls are less likely to participate in physical activity than boys. With that being said, interventions regarding support may be crucial towards increasing the amount of physical activity that young girls participate in. To observe the influence of family support on young girls, Dowda, Dishman, Pfeiffer, and Pate (2007) had 421 girls with ages ranging from 8^{th} to 12^{th} grade participate in a study. The study consisted of the collection of physical activity levels through accelerometer wear as well as a questionnaire consisting of content related to perceived family support. Items regarding family support consisted of the following: the encouragement of physical activity, co-participation in physical activity, providing transportation for physical activity, watching the girl participate in physical activity, and informing the girl that physical activity was good for her. A growth curve analysis was created using an average score for support and the amount of physical activity the young girl participated in. The results indicated that family support, self-efficacy, and perceived behavioral control had a positive correlation with higher activity levels. One noteworthy finding of this study is that family support led to higher physical activity levels for all ages. This is crucial because it shows

that higher family support may counterbalance the age-related decline of physical activity among girls. This information is important to the current study because, depending on which age ranges result in the dramatic decline in physical activity levels, parental support early on may prevent the decrease in physical activity that may cause inactivity to become habitual among adolescents.

Parental Self-Efficacy for Promoting Child Physical Activity

The concept of self-efficacy is derived from one's confidence to perform a specific activity. For parents to effectively promote or encourage to their child's health behaviors, they must be confident in their own abilities to do so. Exploring the development in one's self-efficacy for promoting healthy behaviors related to their children, Gunnarsdottir and colleagues (2011) observed the impact of parental motivation in family-based interventions to treat childhood obesity among 84 parent-child dyads. In this study, behavioral treatments were followed by several weigh ins for both parent and child and number of group treatment sessions attended was noted and diet and activity records were completed. Parents were asked to fill out questionnaires to assess their motivation, which in this case consisted of importance, confidence, and readiness; a Likert scale was used. The results showed that out of all three motivation variables, parent reports of confidence in their ability to complete the treatment was the strongest predictor for the completion of treatment ($p=.003$) and response to the treatment early on in the intervention ($p=.003$). In regards to the child's results, parent confidence for doing well throughout treatment was also the most significant predictor of child weight loss after the treatment occurred ($p=.014$). This study shows the importance of addressing parental confidence when it comes to child physical activity and solidifies the idea that having some form of competence when it comes to promoting healthy behaviors among children can impact the child

positively. In knowing this, the importance of parental self-efficacy will continue to be emphasized throughout the current study.

Parenting practices for promoting activity among young children can only be so effective if parents have the ability to properly do so. A certain degree of self-efficacy for promoting health-related behaviors such as physical activity must be present for parents to even attempt doing so. To explore this concept of parental self-efficacy, Bohman, Rasmussen, and Ghaderi (2016) developed a study examining this concept in regards to dietary and physical activity behaviors in preschool-aged children. Mothers (N=698) of children age 5 years old filled out the Parental Self-Efficacy for Healthy Dietary and Physical Activity Behaviors in Preschoolers Scale, which focused on parental self-efficacy for diet and physical activity in children. This scale assessed parents' confidence in regards to taking part in the previously mentioned health-promoting behaviors with their children in mind. Participants also took part in semi-structured interviews and other behaviors were assessed using questionnaires revolving around food frequency, physical activity, and sedentary behavior. The items for the self-efficacy scale were broken down into four factors, with factors three and four focusing on facilitating parental self-efficacy for promoting physical activity behaviors in children and factor four inhibiting parental self-efficacy for promoting physical activity. Internal consistency for factors three and four were α=.88 and α=.87, respectively. Although the correlations were considered to be low (all $r \leq .32$), there were positive correlations between parental self-efficacy and child physical activity behaviors and negative correlations between parental self-efficacy and sedentary behaviors among children. Limitations discussed in this study were the low response rate and the fact that overlap among certain behaviors-due to the fact that healthy eating and physical activity are in very similar domains, often being combined into one, could have affected the results. Although

this study encompasses all forms of health-related behaviors among children rather than just focusing on physical activity, it provides some way of measuring parental self-efficacy and initial evidence supporting the relationship between self-efficacy of child health behaviors among young children.

Continuing to focus on the idea of parental self-efficacy, Wright et al. (2014) sampled 304 parents with children ages 4-10 years to see how they fared in their confidence to promote health-related behaviors. To do so, the following four behaviors were selected: helping their child get at least 60 minutes of activity per day, helping their child consume five servings of fruits and vegetables per day, limiting sugary drinks to one per week, and limiting daily fruit juice consumption to 6 ounces. In total, 21 different situations were used to identify each target behavior, except for fruits and vegetables; a five-point Likert scale was used for each situation. In specific regards to physical activity, parents responded to a questionnaire that focused on their child's participation in certain activities, as well as open-ended questions focusing on time their child may spend being active. This time spent performing certain activities was also converted to MET values. The results for physical activity showed a positive correlation between parental self-efficacy and total time spent being physically active throughout the course of a week ($r=.22$, $p<.001$). A positive correlation also existed among parental self-efficacy and MET hours ($r=.21$, $p<.002$). A positive association between parental self-efficacy and time spent playing outside also occurred ($r=.15$, $p<.03$). This study is crucial to the current study as it not only focuses on parental self-efficacy and child physical activity levels, it also contributes to possible methods for measuring parental self-efficacy in regards to promoting health behaviors among children. Further research can be conducted focusing specifically on parental efficacy related to physical activity behaviors among children.

The confidence and self-efficacy that parents have related to their actions must be derived from an internal source. Self-efficacy often arises with success in oneself. Arsenault and colleagues (2014) explored the effect of parents' obesity-related behaviors and the effects they have on their confidence to promote behavioral change among their children. Parent-child dyads (N=787) were observed; self-reports for both parents and their children occurred for the following five behaviors: physical activity, screen time, sugar sweetened beverage consumption, sleep duration, and fast food consumption. Looking at the specifics for physical activity, questions focused on how much physical activity occurred at various intensities. The goals for parents and children were meeting 30 minutes per day and on hour per day, respectively. Chi square tests were also used to examine associations between parental confidence in their abilities to help their children and the parents' achievement in the behaviors they reported confidence for. These topics were answered using a 4 point scale for parental confidence assessment and a simple yes or no for whether or not the parents achieved their own behavioral target. The results showed that 46% of both parents and children met physical activity guidelines. However, only 19% of parents were extremely confident in both completing the physical activity behavioral goals and supporting the same goals among their children. There was a significant positive association between parental confidence and parental achievement of physical activity goals. Parents who achieved the physical activity goals were less obese than parents who did not achieve the goals (34% vs. 43.8%, p=.006), weight status did not have an influence on one's confidence. In showing the different factors that may influence a parents' self-efficacy in promoting activity, proper intervention tactics can be considered. This study also shows that a parents' own habits can significantly contribute to their confidence in their abilities. This is relevant to the current study as it shows that child physical activity success and parent's physical

activity habits can increase a parents' confidence in their ability to reinforce and encourage child physical activity.

DiLorenzo and colleagues (1998) re-emphasized the importance of parental self-efficacy in a study that examined determinants of physical activity among children. Families (N=111) with children in fifth and sixth grade participated in this 'two-phase' study; phase one was the initial phase and phase two occurred three years after phase one. Both phases consisted of a structured in-home interview, where parents completed a questionnaire and children were interviewed using the Physical Activity Interview, which consisted of questions focusing on duration and intensity of the child's activity. The children's physical activity questionnaire focused on variables related to participation in exercise and the parents' physical activity questionnaire focused on the parents' physical activity habits and opinions. The results focused on trends from phase one to phase two. The exercise knowledge from children was greater at phase two ($t=9.68$, $p=.003$). Perceived family and peer support experienced an increase in the second phase, while mothers' activity related self-efficacy decreased. Looking at parental influence, phase one showed that friend and family modeling support and mother's negative family support were inversely related. Relating to mothers, the longitudinal regression model for girls showed that mother's self-efficacy for physical activity, mother's barriers to exercise, mother's enjoyment of exercise, and child self-efficacy significantly contributed to the variance in girls' physical activity. Father's physical activity levels and self-efficacy for activity contributed to variance among boys' physical activity. These results are important to the current study because they show the impact that both parents can have on a child's physical activity levels, as well as the magnitude of the impact. In noting that mother's self-efficacy for activity could be considered a challenge when approaching child physical activity habits, this study

implies that focusing on parental self-efficacy could produce beneficial effects in regards to children's physical activity levels.

Looking specifically at mothers, Hosseinzadeh, Niknami, and Hidarnia (2014) observed the effects of maternal self-efficacy on children's physical activity habits. Mother-child dyads (N=300), which children ages ranging from 5^{th} to 6^{th} grade, were selected. Physical activity recalls (PDPAR) were collected for the children regarding the day prior-the PDPAR had children list their forms of activity and the amount of time spent in them, as well as the intensity of the activity. Mothers completed the international physical activity questionnaire (IPAQ). To measure mothers' self-efficacy levels, an eight-item physical activity self-efficacy questionnaire was completed; questions featured responses that determined a mother's ability to carry out certain activity related tasks on her own. Correlation tests were used to examine at the relationships between maternal and child physical activity levels and maternal efficacy and child physical activity levels. The tests showed both a positive relationship between maternal and child physical activity ($r=.748$, $p\leq.05$) and maternal self-efficacy and child physical activity ($r=.433$, $p\leq.05$). This study is significant because it supports the idea that self-efficacy among parents is crucial to promoting and increasing child physical activity. With that in mind, proper techniques can be developed to target parental self-efficacy in physical activity interventions. In relation to the current study, this study shows that parental efficacy is associated with child activity, but this study was limited by self-reported physical activity.

De Lepeleere, De Bourdeaudhuij, Cardon, and Verloigne2015) chose a different approach to parental efficacy by also analyzing specific parenting practices; however, the premise and goal of the research was similar to previous studies. Parents (N=207) completed questionnaires related to their parenting practices and parental efficacy for promoting health-

related behaviors. Children's physical activity and screen time was reported using the Flemish Physical Activity Questionnaire. Parental self-efficacy questions focused on promoting healthy lifestyles for their children and used a five-point scale. According to the results for physical activity, children were more likely to be active when they had access to sports-related equipment at home (p=.06) and when parents did not consider it to be difficult to convince their child to participate in activity (p=.04). There was consistency among the results for several subsections of the population as well, which included socioeconomic status, age, and gender of children-an overall conclusion of more sports equipment and ease to motivate led to more physical activity among children. In this study, the main representation of parental self-efficacy was the ease with which they were able to motivate their children to be active. The more confidence the parents had in their ability to motivate their children, the more likely they were willing to do so, which contributes to an increase probability of their children participating in physical activity. This is important to the current study because it not only emphasizes the importance of parental self-efficacy and the possible priorities when developing interventions, it also shows that simple things can be used to help increase a person's self-efficacy, such as having certain equipment accessible to children.

Roles of Fathers in Research

Several studies often rely on one parent to provide enough information regarding familial trends. This can either be the result of one parent being more 'hands on' with their child or availability to participate in said research. Harris et al. (2018) made an active effort to determine whether or not discord among parents had an influence on their child's eating habits or if a collaborative effort contributed to healthier eating behavior. In this study, 504 triads completed the Feeding Practices and Structure Questionnaire-28, which observes parents attitudes and

utilization of the following behaviors in regards to their children: “persuasive feeding”, “reward for eating”, and “reward for behavior”. Parents also filled out the Children’s Eating Behavior Questionnaire to provide information regarding their child’s fussy eating habits. Out of the 504 triads, 208 were used to collect data. The results showed demographic differences between mothers and fathers, identifying that fathers were older, worked longer hours, and were considered more obese. Fathers were more likely to use “rewards for behavior” than mothers, whereas there were no significant differences between mothers and fathers eating behaviors-both persuasive eating and reward for eating. A notable finding of this study is that parents in discordance with one another reported fussier eating habits from their child than concordant parents. Although eating habits were observed in this study, further investigations should be performed to look at the effects of parent discordance and concordance with other health behaviors, such as physical activity.

Lloyd, Lubans, Plotnikoff, Collins, and Morgan (2014) took the idea of parenting practices one step further in observing their relationship with other health-related behaviors amongst children. The focus of this study was to observe parental factors on child adiposity, as well as observe differences in parental parenting styles and the effects they have on their child’s behaviors. Families (N=70) participated in the study. Parenting practices were measured with the Parenting Strategies for Eating and Activity Scale. Children’s physical activity was monitored with a pedometer and their leisure activity was recorded by their mothers. The results of this study showed a significant positive correlation between child’s weight status, father’s BMI, and mother’s control. There was a significant association between father’s reinforcement and child’ physical activity ($p<.01$). This study reported maternal/paternal parenting differences among monitoring, finding that mothers monitored their children more when it came to health

behaviors. This study is relevant to the current study as it demonstrates the differences among mothers and fathers in parenting practices and how they influence their children's health-related behaviors. This study also acknowledges a lack of studies featuring the tested items and their influence on objectively measured physical activity, which is what the current study is trying to observe.

Maternal and Paternal Influences and Beliefs Regarding Child Physical Activity

As mentioned earlier, there tends to be an absence of input from fathers when it comes to research, mothers typically fulfill the necessary roles when it comes to certain studies in need of parents. Walsh and colleagues (2017) made the decision to obtain fathers' perspectives on their roles in their children's physical activity and dietary behaviors and how they can promote healthier lifestyles for their children. Fathers (N=20) with children ages 5 years and under participated in semi-structured interviews with questions exploring the following topics: beliefs about their role in the home, role modeling and rules for dietary behaviors, role modeling and contribution towards physical activity, and the support they need to promote healthy behaviors for their children. A portion of the fathers (N=16) acknowledged a shared responsibility with their children's mother when it came to dietary and physical activity behaviors of their children. A portion of interviewed fathers (N=18) considered parental role-modeling to be an integral part in the promotion of a healthy diet and physical activity; in regards to physical activity, there was an emphasis placed on participating in physical activity in different contexts and the importance of enjoyment in physical activity. Fathers also believed that their children were more likely to participate in activity when they got involved themselves. Out of all the fathers, 95% believed that they lacked the knowledge to deal with their children's health behaviors, such as healthy eating and physical activity. With this information known, fathers also stated that it would be

beneficial for them to have resources that could provide them with the proper information regarding such topics. These responses are significant towards the current study because it assists in developing a perspective on fathers' roles in the promotion of physical activity for their children. It also demonstrates the active desire to have resources that could be purposeful in interventions rather than just basing information on experience.

As parenting roles evolve, the impact that both mothers and fathers have on their child's behavior has changed. To explore the role that fathers currently have and observe their own perspective of their involvement as opposed to their wives' perspective, Zahra, Sebire, and Jago (2015) composed a study to do so for fathers with children ages 5-6 years. Parent child triads (N=410), father-child dyads (N=212), and mother-child dyads (N=645) provided 5-day accelerometer data; questionnaires were also distributed to these participants. Mother (N=47) and father (N=3) interviews with questions consisting of perceptions of parents on child's activity, influences of others on child's activity, and children's screen time habits. Key words and phrases were derived from these interviews and categorized based on encouragement, role-modeling, co-participation, and overall presence and involvement. From the results, mothers implied that fathers were key sources of encouragement for promoting child physical activity, often providing an environment for the activity to occur in and the instigation for beginning the activity, whereas mothers saw themselves more involved in the academic aspect of their children's lives. Interviews also indicated that mothers viewed fathers as an important role model for child physical activity behaviors, suggesting that children are aware when their parents participate in physical activity. Other important aspects highlighted in the interviews surrounded co-participation; mothers believed they were more involved in the organization of the physical activity itself whereas fathers had more of an active participation in the activity. A significant

majority of the direct quotes from the interviews were from mothers whose children displayed medium to high moderate-to-vigorous physical activity-this information was provided by the accelerometers but no further activity patterns were discussed. The interviews from the fathers followed the same trends as they believed they had a greater role in carrying out the activity; however, due to a limited number of father interviews, this information cannot be fully assumed. This article is relevant to the current study because it observes the father's roles in physical activity, which could show some semblance of self-efficacy in the promotion of activity and can also provide targeting strategies for physical activity interventions among children. It also shows that mothers and fathers might have different beliefs regarding the promotion of child physical activity that should be explained.

Children's physical activity levels may be perceived differently, depending on how aware parents are of their children's habits. Pesch et al. (2015) explored this idea by observing mother's perceptions of their young children's physical activity patterns. Mother-child dyads (N=278) participated. Two study visits were conducted; the first consisted of questionnaires and interviews and the second revolved around anthropometric measurements. The interview portion of this study was derived from a larger study and focused on four questions regarding child's activity levels, mother's concern about child activity, similarities in activity among the dyads, and how mothers may change activity of children. Family chaos was also measured using the Confusion, Hubbub, and Order Scale. Anthropometric measurements consisted of BMI, socioeconomic status, and parenting style. Based on the results, two key themes were identified: mothers believe that their children were active and several mothers believed that their child's high activity level was problematic. About 88% of mothers believed their children were naturally active; 27.0% of mothers believed their child's activity level was so high that it created

problems-these problems were along the lines of interference with focus. Other problems the mothers considered when discussing their child's high activity levels is that they themselves were tired. As a result, mothers either tried to reduce their child's activity or increase it in order to wear their children out. This information is important to consider because it shows that in some cases, intentions for increasing physical activity among children may not be for the children's sake. In knowing this, there may be other targets for intervention. This study also shows that mothers may have false perceptions of their child's current activity levels-this study failed to capture the children's activity levels via accelerometer, but that could be another factor to consider when designing future studies targeting the same topics.

To observe the differences between mothers and fathers in supporting child physical activity, Solomon-Moore and colleagues (2018) focused on 944 parent-child dyads to look at the effects of both the sex of the parent and the child on physical activity promotion. Children wore accelerometers to provide physical activity data and their parent completed a questionnaire on gender roles associated with their effort to support child activity. Parents (N=51) also completed a semi-structured phone interview to make this study one of mixed methods. For the results, 72% of them were derived from a mother/female caregiver, the remaining 28% from fathers/male caregivers. For the phone interview, 31 interviews were completed by mothers and 20 were completed by fathers. During the week, most mothers believed that they led supporting their child's activity, while most fathers reported that the role was shared. The questionnaire showed a trend among same gender dyads-mothers supported their daughters and fathers supported their sons; however, the interviews showed that there was a mix in gender and support. Overall, physical activity endeavors for boys were supported more than girls. Some fathers claimed to support their daughters for the sake of enjoyment while watching and mothers reported a lack of

confidence due to their own physical abilities. Comparing mothers supporting physical activity and a shared role in supporting physical activity, reporting a shared role averaged an extra 3.5 minutes of child physical activity per week; there was no strong statistical data difference for boys and girls (p=.34). Fathers who primarily supported physical activity during the week had an inverse relationship with girls, but there was no strong evidence for gender. However, fathers supporting activity on the weekends had a similar effect as parents having a shared role-the more support from fathers, the higher the overall physical activity from children. This study is important to the current study because it demonstrates the importance of having fathers involved in the promotion of child physical activity; having fathers heavily involved or sharing the role was deemed more effective than having mothers serve as a main source of influence for their child's activity. This study also shows the differences between weekday and weekend activity, which can assist in making assumptions for when support for activity may peak.

Rodrigues and colleagues (2018) explore the associations between children's participation in sport and parental engagement in physical activity, differentiating between mothers and fathers in an effort to prove possible effects of same-gender influences. Parents (N=834) of children 6-10 years old participated in the study, which consisted of a questionnaire focusing on parents' activity behaviors and child's participation in sports. Similar to other studies, gender correlations were found. Girls were 2.48 (95% CI: 1.066-5.753) times more likely to participate in a sport if their mother was active (p=.034). Boys were more likely to participate in a sport if they had an active father (OR=2.789, 95% CI: 1.203-5.392; p= .005) or if both of their parents were active (OR=3.027, 95% CI: 1.995-10.574; p=.005). Participation in more than one sport was positively correlated with having a same gender parent active or both parents active. The frequency of weekly participation in sport also experienced a positive

correlation with parents' activity level-boys practicing 1-2 times per week (OR=2.546, 2.620, p=.015, .018) and ≥3 times per week was associated more with having a father who was active or having both parents active. Girls were more likely to participate in sports 1-2 times per week if their mothers were active, with participation increasing to ≥ 3 times per week if both parents were active (OR=2.646, 95% CI: 1.153-6.076; p=.022). This study is important because it not only demonstrates the influences of same gender on activity habits of children, but it also serves a purpose in the development of intervention as well. In addition to providing results for same gender associations, this study shows that having both parents involved can have a greater impact on a child's activity level.

Inactivity throughout childhood can lead to several adverse health outcomes as an adult, which can lower one's quality of life. However, research has shown that increased parental support can increase a child's physical activity levels; this support from parents can present itself in numerous different forms as well. Parental efficacy for promoting physical activity has shown to have a positive relationship with child activity levels as well. The more efficacious the parent, the more likely the child will participate in physical activity. A lack of fathers in research and known differences in the influences of both mothers and fathers on child activity demonstrates the need to observe both maternal and paternal influences on their child. There has yet to be a study composed of all these variables and their influence on objectively measured child activity, which is what this study aims to observe. Once these factors have been considered, interventions can be altered to maximize the influences on child activity.

Methods

Participants

Participants were recruited through local and online sources that included flyers in daycares and preschools, emails sent throughout the region, and Facebook advertisements. All participants met the following inclusion criteria: a) between 18 and 64 years of age; b) their spouse/partner being between 18 and 64 years of age; c) having at least one child aged 2-5 years; d) living in the same household as their child and spouse/partner; e) not pregnant; f) not limited in their ability to perform physical activity; and g) willingness to complete all study procedures.

Initially, recruitment efforts yielded contact in the form of email and phone with 32 individuals. Upon initial contact, participants were provided with a general explanation of the purpose of the study and what it would entail. If contact was made through the phone, the screening process was done over the phone. If participants failed to give any additional contact information aside from email, the screening process was sent through email. A lack of response constituted a follow-up email being sent approximately one week after initial contact was made.

There was a lack of response from 12 individuals after follow-up contact. Eight potential participants were unable to participate due to one of the following reasons: did not live with spouse, not in the area, time commitment, child did not meet the age requirements, physical activity affected by unexpected circumstances, and pregnancy. Two individuals made contact after the enrollment period was over. In total, 12 triads were enrolled; however, three dropped out unexpectedly due to transportation and scheduling problems.

Procedures

A university institutional review board approved all study procedures. Interested participants were screened over the phone or via email for inclusion criteria. After meeting inclusion criteria, participants (mother, father, and one child) scheduled their first in-person visit. The initial visit consisted of the following: obtaining written informed consent from the adult participants, obtaining anthropometric measurements for each member of the triad, parental participants completing the same Qualtrics survey-independently of one another without any interaction, with selected questionnaires, and participants receiving their accelerometers and daily logs. Participants wore their accelerometers continuously for 7 days except while sleeping and engaging in water activities. After the completion of one week, participants were asked to return for a second in-person visit in which they returned all study materials and received $25 and a small toy for their child for participation.

Demographic Measures

Anthropometric measurements were taken for all members of the triad during the initial visit. These values consisted of each participant's height and weight-all measurements were taken twice and an average value was calculated for each participant. In addition to these values, the sex of the child and their exact date of birth was also recorded.

Demographic information regarding each triad was completed in the survey that both parents took in the initial visit. Only one parent was responsible for completing demographic information for their child and generalized questions regarding their living situation. These items consisted of the following: age of child, sex of child, race/ethnicity of child, preschool attendance, elementary school attended if applicable, after-school care attendance, home

environment, household income, and sex and age of any additional children in the household. Both parents completed demographic information about themselves which was compiled of age, sex, race/ethnicity, educational status, occupation if applicable, and marital status.

Physical activity

The ActiGraph GT3x+ accelerometer was used to objectively measure both the parents' and child's physical activity over a 7-day period. Parents were provided with instructions to place the accelerometer around waist, over the right hip, and to wear during all waking hours of the day with the exception of showering/bathing and participation in water activities. Parents were also requested to fill out a log regarding the time of day the accelerometer was both put on and removed from the child, as well as any additional moments where the accelerometer was not worn throughout the day. For adults, cut points used were Freedson Adult (Freedson, Melanson, & Sirard, 1998). For children age 2 years, cut points used were Trost Toddler (Trost, Fees, Haar, Murray, & Crowe, 2012). For children ages 3-5 years, Butte Preschooler cut points were used (Butte et al., 2014). Data from the accelerometer were processed to yield average minutes per day spent in moderate-to-vigorous physical activity (MVPA) for both parents, MVPA for children, and total physical activity (including light) for children. In order for the participants' data to be included in the analysis, they had to wear the accelerometer for a minimum of two days and eight (children) or 10 (parents) hours each day.

Support for Physical Activity

Parental support for child physical activity was measured with Support for Physical Activity Questionnaire (Trost et al., 2003). Participants were asked to report how often they provide support, both direct and indirect, for their enrolled child's physical activity on a weekly

basis. A 5-point scale was used to record responses ranging from never to daily. All five items in the original scale were average to yield one total score for parental support for child physical activity. Items on this survey were developed to observe the frequency at which parents provide numerous forms of support for their child's physical activity. Internal consistency for this scale was .78 for children ages 7 to 12 years. The one-week test-retest reliability for this scaled was R=.81 (Trost et al., 2003).

Parental Self-Efficacy

Parental self-efficacy for promoting healthy behaviors among children was measured with the Parental Self-Efficacy for Healthy Dietary and Physical Activity Behaviors in Preschoolers Scale (Bohman et al., 2016). Participants were asked to report how confident they were in their abilities to do the following: prioritize healthy eating and serve as a role model, promote healthy dietary behaviors when circumstances may cause it to be more difficult, prioritize physical activity behaviors and serve as a role model, and promote physical activity when circumstances may cause it to be more difficult to do so. An 11-point Likert scale was used to record responses, ranging from 0 (not at all confident) to 10 (completely confident). Twelve of the 21 items from the questionnaire were summed to yield separate scores for parental self-efficacy for promoting child physical activity, with higher scores indicating a greater amount of parental self-efficacy. Items on this survey were developed to observe parental self-efficacy in relation to psychological states and situation demands. Internal consistency for both the total scale and individual factors is present (α=.94 and .84-.88, respectively) and all expected correlations between parental self-efficacy and healthy behaviors occurred ($r \leq 3.2$) (Bohman, Rasmussen, & Ghaderi, 2016).

Statistical Analysis

Means and standard deviations were calculated for the following factors for all participants: age, height, weight, BMI, BMI z-score in children, daycare/kindergarten status of children, and total number of children present in household. Percentages were calculated for demographic factors including sex of children, race of all participants, education level of parents, and household income. Two-tailed t-tests were used to compare maternal and paternal self-efficacy for promoting child physical activity and maternal and paternal support for child physical activity. Pearson's correlations were used to examine the relationships among (a) parental MVPA and parental self-efficacy for promoting child physical activity,(b) parental MVPA and parental support for child physical activity, (c) child physical activity (total and MVPA) and parental self-efficacy for promoting child physical activity, and (d) child physical activity (total and MVPA) and parental support for child physical activity. The alpha level was set at $p<.05$ and Microsoft Excel (2016 version) was used to complete the statistical analysis.

Results

In this study, demographic information from nine triads was collected; Table 1 displays the demographic results, where one-third of the children were male. Of the total child participants, over half were Caucasian and the reported household income of all triads varied from $35,000-$75,000+. In regards to parent-specific demographics, two-thirds of mothers were Caucasian, the remaining third African American. Race of fathers varied, with 55% Caucasian, 22% African-American, and 22% classified as 'other'. Mothers reported obtaining either their Bachelors or Masters degree (44% and 55%, respectively). Fathers' educational levels ranged from high school/GED to Masters, with 44% of fathers having obtained a Masters degree.

Number of children in the household varied from one to three children, with a majority of households having two children present.

Table 1

Participant Demographic Information

Variable	Percent (%) N=9
Child Sex	
Male	66
Female	33
Child Race	
African-American	33
Caucasian	55
Other	11
Child Education	
Attends Daycare	77
Attends Kindergarten	11
Does Not Attend Anything	11
Household Income	
$35,000-49,999	44
$50,000-74,999	22
$75,000+	33

Mother Race	
African-American	33
Caucasian	66
Father Race	
African-American	22
Caucasian	55
Other	22
Mother Education	
Bachelor's	44
Master's	55
Father Education	
High School/GED	11
Vocational School	11
Bachelor's	33
Master's	44
Total Children in Household	
1	33
2	55
3	11

Table 2 displays the collected anthropometric data collected from triads. The mean age of child participants was 3.93 years (SD=1.01). The mean BMI of the children was 7.13 kg/m^2

(SD=1.00) and the children were considered a healthy weight based off BMI percentile. The mean age of mothers was 34.25 years (SD=5.02) and the mean age of fathers was 35.89 years (SD=6.30). The mean BMIs for mothers and fathers were 26.82 kg/m^2 and 29.19 kg/m^2, respectively; these values classified both sets of parents as overweight.

Table 2

Participant Anthropometric Measurements

	Child	Mother	Father
Variable	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Age (years)	3.93 ± 1.01	34.25 ± 5.02	35.89 ± 6.30
Height (cm)	104 ± 11.63	162.79 ± 5.24	176.13 ± 8.52
Weight (kg)	18.86 ± 4.69	71.71 ± 15.996	90.63 ± 16.06
BMI (kg/m^2)	7.13 ± 1.00	26.82 ± 4.43	29.19 ± 4.73
BMI z-score	$.97 \pm .65$	N/A	N/A
BMI Percentile	78.89 ± 18.55	N/A	N/A

Table 3 displays the measured physical activity levels for the triads. All triads had complete data except one; the mother's physical activity was not obtained. Children spent more time participating in MVPA (52.0 ± 17.0 minutes/day) than both mothers and fathers (22.6 ± 15.2 minutes/day, 40.2 ± 16.6 minutes/day; respectively). Over half of the average wear time for both mothers and fathers was spent doing sedentary activities. On average, children and fathers both met recommended physical activity guidelines for their respective populations.

Table 3

Accelerometer Results

	Mothers	Fathers	Child
	N=8	N=9	N=9
PA Level	$\bar{x} \pm SD$	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Sedentary (min/day)	475.8 ± 163.3	443.9 ± 130.9	352.8 ± 30.8
Light (min/day)	333.3 ± 91.0	355.3 ± 89.9	585.1 ± 852.3
Moderate (min/day)	20.9 ± 13.7	37.2 ± 12.8	44.3 ± 15.3
Vigorous (min/day)	1.7 ± 2.9	3.0 ± 5.0	17.4 ± 5.8
MVPA (min/day)	22.6 ± 15.2	40.2 ± 16.6	52.0 ± 17.0
Wear Time (min/day)	832.6 ± 111.2	839.3 ± 127.5	687.2 ± 57.6

Comparisons between mothers and fathers for their reported physical activity self-efficacy and physical activity support in regards to their children are reported in Table 4. Mothers and fathers were similar in their confidence to encourage child physical activity in situations that may inhibit it, as well as providing physical activity support for their children. The similarities between mothers and fathers in self-efficacy for promoting physical activity in situations facilitating it were present.

Table 4

Maternal and Paternal Self-Efficacy for Promoting Physical Activity and Providing Support for Physical Activity in their Child

	Mother	Father
Variable	$\bar{x} \pm SD$	$\bar{x} \pm SD$
Self-Efficacy Facilitating	$8.51 \pm .64$	7.98 ± 1.18
Self-Efficacy; Inhibiting	$6.97 \pm .91$	6.56 ± 1.89
Support	$3.09 \pm .75$	$2.96 \pm .97$

Correlations between parental self-efficacy and support for child physical activity and parental MVPA are presented in Table 5. No statistically significant relationships were detected; however, the correlations were in expected directions. Positive correlations were present for self-efficacy under both circumstances (i.e. facilitating and inhibiting) and mother MVPA. Father's also displayed weak positive correlations between their self-efficacy in both facilitating and inhibiting situations and their own measured MVPA. Positive correlations were observed for both maternal and paternal physical activity support and maternal and paternal MVPA.

Table 5

Correlations Between Maternal and Paternal Efficacy and Support and Maternal and Paternal MVPA

	Parental MVPA
Mother	
Self-Efficacy; Facilitating	.49
Self-Efficacy; Inhibiting	.18
Support	.06
Father	
Self-Efficacy; Facilitating	.28
Self-Efficacy; Inhibiting	.23
Support	-.04

Correlations between self-efficacy, support, child total physical activity, and child MVPA are presented in Table 6. The only relationship that was statistically significant was the correlation between father's self-efficacy in facilitating situations and child MVPA, signifying that the more perceived self-efficacy for promoting physical activity by fathers, the less active the child was. Negative correlations occurred between child MVPA and the following: mother's self-efficacy for promoting physical activity in facilitating and inhibiting situations and father's self-efficacy for promoting physical activity in facilitating and inhibiting situations. Similar to child MVPA, negative correlations also occurred for both parental self-efficacy in both circumstances and total child physical activity. Positive correlations occurred for both mother and father physical activity support and child MVPA levels. Positive correlations also occurred

among parental support and total child physical activity. There were no significant values in regards to the variables and their relationship to child total physical activity, however similar trends appeared: negative relationships between child total physical activity and all parental self-efficacy and positive relationships between child total physical activity and parental support.

Table 6

Correlations Between Child Total PA, MVPA, Parental Efficacy, and Support for PA

	Child MVPA	Child Total PA
Mother		
Self-Efficacy Facilitating	-.18	-.34
Self-Efficacy Inhibiting	-.11	-.24
Support	.21	.20
Father		
Self-Efficacy Facilitating	-.81*	-.53
Self-Efficacy Inhibiting	-.50	-.48
Support	.30	.58

Note: *p<0.05; MVPA = moderate-to-vigorous physical activity; PA = physical activity

Discussion

The study was developed for the following purposes: (a) to compare the levels of parental physical activity support and physical activity promotion self-efficacy between mothers and fathers; (b) to examine the relationships among parental physical activity, parental self-efficacy for promoting child physical activity, and parental support for mothers and fathers; and (c) to

examine the relationships among child physical activity with parental self-efficacy for promoting physical activity and physical activity support for mothers and fathers. Mothers and fathers reported similarities in their parental PA support and parental self-efficacy for promoting child physical activity. Higher paternal self-efficacy for promoting physical activity in facilitating situations was associated with decreased levels of child MVPA. No other statistically significant relationships were found between parental (mothers or fathers) self-efficacy for promoting physical activity, physical activity support, and child physical activity.

The present study found that the values for self-efficacy in promoting physical activity in children and support for child physical activity between mothers and fathers were similar. This is a novel finding as past literature for the concepts of self-efficacy and support for promoting child physical activity has yet to differentiate between mothers and fathers, choosing to use the term 'parent' rather than creating subscales to separate maternal and paternal results. Research has implied that fathers provide more support for child physical activity in the forms of encouragement and creating an atmosphere for physical activity participation while mothers are more directly involved in the organizational aspect of said physical activity (Zahra et al., 2015). The present study did not determine the type of support mothers and fathers gave. Additional research is needed to understand if there are differences between parents related to PA support and if so, how are they different.

In regards to parental MVPA and its relationship with parental self-efficacy for promoting child physical activity, no statistically significant relationships were present. These findings are in contrast with those of Arsenault et al. (2014), who observed strong positive relationships between parental physical activity levels and reported parental self-efficacy. Hosseinzadeh, Niknami, and Hidarnia (2014) also found positive relationships between parental

physical activity and parental self-efficacy; however, the study population was only mothers, which contributes to the present study's desire to observe fathers in additions to mothers. Possible differences could be due to the questionnaires used, as previous studies did not use the same questionnaire utilized in the current study.

Parental MVPA and its relationship with parental support for providing child physical activity was also considered in the present study. No relationships were found between parental MVPA and support for child physical activity among either mothers or fathers. These results imply that the amount of MVPA the parents do does not impact their level of support for their child's physical activity. There has been little research focusing strictly on the relationship between parental physical activity and parental support for child physical activity, making the findings of the current study unique.

A negative correlation was found between paternal self-efficacy in facilitating situations and child MVPA. These findings are the opposite of what has been reported by past literature. DiLorenzo et al. (1998) reported that paternal self-efficacy is associated with increased child physical activity levels. Furthermore, other studies have reported results similar to DiLorenzo's, but did not differentiate between mothers and fathers (Bohman, Rasmussen, and Ghaderi, 2016; Wright et al., 2014). Possible differentiation between the past studies and the present one could be the result of the age of the children. DiLorenzo et al. and Wright et al. sampled populations of older children (fifth and sixth graders) than that of the present study. In contrast, Bohman, Rasumussen, and Ghaderi (2016) sampled a population of children five years old and found different results than the present study, so further investigation needs to occur in order to explain the differences. The age of the child may have an influence on the relationship in the form of parents having more self-efficacy with their older children because they've had more time to

figure out tactics that may work for promoting child physical activity in regards to that specific child.

No relationships were found between parental support for child physical activity and child physical activity levels (both MVPA and total). These findings are contradictory to what has been reported by past literature. In 2003, Trost et al. found that parental support was related to higher levels of child physical activity. This finding was also consistent among several other studies (Rachele, Cuddiny, Washington, and McPhail, 2017; Vander Ploeg et al., 2013). Rhodes et al. (2013) found contrasting results for mothers; their study concluded that the more parental support mothers displayed, the more physically active their children were. Studies conducted by Trost et al. (2003) and Loprinzi and Trost (2010) did not differentiate between mothers and fathers, but found results similar to those of Rhodes and colleagues, further contradicting the results present in the current study. Possible explanations for the contrasting findings could be age of population (past studies used children ages 10-15) or the sample size, where past studies had larger samples of parents and children. While this finding has been examined numerous times in older children with very little contradicting evidence, further investigation should be conducted to have a better understanding of this relationship in younger children.

One strength of the present study is that triads were recruited. Because there has been very little research including both mothers and fathers, the current study observed populations that past literature has not. Another possible strength of this study is the age group of the children. Limited research has been conducted about parental self-efficacy and its effects on preschool-aged children's physical activity, so the current study explores bounds that other studies have not. With that being said, these variables can contribute to future interventions specifically designed for preschool-aged children, which can encourage them to start a healthy

lifestyle early on in life. Another positive aspect of this study was the observation of the relationship between parental physical activity and parental support for child physical activity; little research has been conducted in this specific area, allowing the current study to contribute to the current knowledge on the subject. Another strength is the completion of the questionnaires independently; parents did not interact with each other while filling out the questionnaires, eliminating the possibility of one influencing the other's answers. The use of accelerometers was also considered a strength as past research has not used objectively measured physical activity with this population-objectively measured physical activity has been used for adolescents, but subjectively-measured physical activity reported by parents has been common in the preschool-aged population.

In additions to strengths, this study has had some limitations. One of the main limitations of this study was the sample size. With only nine participating triads, the strength of the results can be questionable as the results can be easily skewed by a minimal number of outliers (i.e. extremely physically active children or extremely sedentary children). While the age range of the children can serve as a strength, it can also be a weakness. A younger population means they may be more dependent on their parents when it comes to physical activity under specific circumstances; for example, a child may not have access to a proper environment to perform physical activity in (i.e. grassy field) without transportation provided by their parents. Another concern regarding measuring physical activity in such a young age group is their willingness to comply to study procedures; however, procedures were put into place (e.g., sticker placed on activity monitor) to increase compliance with wearing the activity monitors.

To our knowledge, this is one of the first studies conducted using these particular variables (i.e., parental PA support, parental self-efficacy, and child physical activity) for both

mothers and fathers. This study focused on ‘traditional’ triads composed of mother, father, and child; however, future research could be conducted in families with single parents or same-sex parents and could include multiple children instead of one child per household. Future research could observe a larger sample size than present in the current study. Another factor that could be considered in future research is adjustments to be made that may cater to the younger population used, such as the use of different activity trackers (e.g., FitBit) which may be more comfortable than a banded accelerometer around the waist. Future research could also be conducted longitudinally and utilize intervention programs to increase parental support and self-efficacy, then observe the effects on child physical activity after intervention.

In conclusion, aside from the negative relationship between father’s self-efficacy in facilitating situations and child MVPA, parental self-efficacy for promoting child physical activity and parental support for child physical activity are not related to child physical activity levels (both total and MVPA). In addition, parental MVPA are not associated parental self-efficacy and support for child physical activity. Further, mothers and fathers share similar levels of self-efficacy and support for child physical activity, implying that similar beliefs may be shared among households. Although a majority of the data does not show relationships between parental attributes and child physical activity levels for this population, the present study contributes to the research gaps for both the preschool-aged population and the influence of fathers in physical activity research.

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