THE EFFECTS OF ELIMINATION AND NON-ELIMINATION GAMES ON PHYSICAL ACTIVITY AND PSYCHOSOCIAL RESPONSES IN CHILDREN

by

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Abstract

Physically active games are one way to increase caloric expenditure in children. It is unknown if the structure of physically active games impacts physical activity levels. Furthermore, there has been no research examining psychosocial responses during a single game session. This study examined the effects of elimination games (EG) and non-elimination games (NEG) on physical activity (PA), self-efficacy (SE), peer victimization (PV), and enjoyment in children.

Children (n=29) in 4th-6th grade (65.5% male) participated in two sessions where they played either NEG or EG. Children were stratified according to gender and weight status into game sessions that were counter-balanced across two days. Each session consisted of playing two games 20 min. in duration. NEG were adopted from the evidence-based Coordinated Approach to Child Health (CATCH) games curriculum and modified for EG. Each child wore an Actigraph GT1M accelerometer and completed an 11-item questionnaire measuring self-efficacy, peer victimization, and enjoyment before and after each game session. Accelerometer data was analyzed using resting energy expenditure (METs).

A mixed effects regression model was conducted with child and day nested within child as random effects and observation, game session, weight status, and gender as fixed effects. Overall, girls spent more time in sedentary PA compared to boys ($p=0.0123$). Children engaged in significantly more moderate-vigorous PA during NEG compared to EG ($p=0.0013$), ostensibly because of more time in moderate PA during NEG ($p=0.0002$) and less time in sedentary PA ($p<0.0001$). Furthermore, children significantly increased SE after playing both game sessions ($p=0.0349$), but a significant interaction between game session and time of measurement in the prediction of enjoyment showed that enjoyment increased after EG and decreased after NEG ($p=0.0138$). There were no differences in PV or weight status.

These results provide preliminary evidence that NEG provide a greater amount of moderate-vigorous PA compared to EG and introduces differences in enjoyment

responses during EG and NEG. Therefore, it is important to promote NEG to increase physical activity, but also important to monitor enjoyment responses to promote a healthy, but fun environment for children.

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Dedication

For Julie, Staci, and Mallori.

CHAPTER 1 - Introduction

Childhood obesity is an important public health concern. Since the 1970's, the prevalence of obese children has increased nearly three-fold from approximately 4% to17% (52). Factors influencing childhood obesity are multifaceted, but a lack of physical activity is a likely contributing influence. Most recent recommendations are for children and adolescents to accumulate a minimum of 60 minutes of moderate-to-vigorous physical activity (MVPA) each day (47, 71). A majority of children and adolescents are not meeting this recommendation. NHANES gathered representative data of the U.S. population using accelerometers to objectively assess physical activity using accelerometers and found that 58% of children ages 6-11 years old did not meet these recommendations. Furthermore, only 8.0% and 7.6% of children ages 12-15 years and 16-19 years met these recommendations, respectively (75). The NHANES findings are consistent with self-reported data obtained by the CDC, which reported that of children 9-13 years old, 61.5% do not engage in any organized physical activity outside of school, as well as 22.6% do not engage in any free time physical activity (12). Lack of physical activity in children is a public health concern because an active lifestyle during childhood has been associated with an active lifestyle in adolescence (26) and adulthood (72). Thus, increasing the amount of physical activity during childhood is not only important for short-term health benefits (71), but also to foster a healthy, life-long behavior.

One effective way to increase physical activity in childhood may be through structured physically active games. One study provided evidence that elementary school aged children were significantly more active playing structured games when compared to free play during a recess period (44.4 vs. 37.9 minutes)(14). Other studies have found that physically active games provide a sufficient amount of MVPA (1, 29, 39, 41, 84). Additionally, there has been some evidence that children engage in more physical activity in any type of organized activity when compared to unorganized activity during recess (20, 66) and physical education classes (34, 39-42). Children who also participate in organized sport are more active than non-participants (30, 57, 84). However, other

investigations have found greater levels of physical activity during free play compared to structured games during after school (13, 77). These differences in physical may be attributed to types of games or activities played during these structured physical activity settings.

Although it has been shown that games may be successful in increasing physical activity levels, the influence of the structure or guidelines of the game on physical activity have not been considered. Of particular interest to this study was the structure of elimination, or the removal of participation from a game typically due to defeat. The two games evaluated in this study were elimination and non-elimination games. Non-elimination games were defined such that 1) winning is not the primary focus and the game may have no winners or several winners, 2) the game is often goal directed, and 3) amount of participation is fairly equal among all participants since there is no out of game waiting or elimination. Alternatively, elimination games were defined such that 1) focus is winning and the game usually has only one winner, 2) opponent directed where the purpose of the game is to do something to an opponent, and 3) amount of participation in elimination games is highly variable depending on the length of time that lapses before a child is eliminated.

In addition to the immediate impact on physical activity, structured games may influence psychosocial variables that mediate behavior change such as self-efficacy, enjoyment, and peer victimization. These psychosocial mediators may determine future participation in physical activity. Self-efficacy is defined as children's expectations that they can use their skills and abilities to successfully perform a specific behavior at a level necessary to reach a desired outcome (2). Past research has supported that increases in physical activity are associated with increases in self-efficacy. In a semi-quantitative review of determinants of physical activity in children ages 4-12 years four of nine studies showed a positive association between self-efficacy and physical activity (62). In another systematic review of adolescent girls, there was a small to moderate association between self-efficacy and physical activity in ten of ten studies (8).

Enjoyment is another psychosocial construct of interest, which is defined as a positive state of emotion and can be reflected through feelings of pleasure, liking, and fun (81). Similar to self-efficacy, enjoyment has been positively associated with physical

activity in a number of reviews (8, 62, 79). Recent research has also provided preliminary evidence that participation in informal physically active games and leisure time structured sport and games are correlated with enjoyment of physical activity and enjoyment of physical education in children (53).

Finally, another psychosocial variable of interest is peer victimization. Peer victimization was defined as being a target of negative physical and verbal action that have a hostile intent which causes distress, may be repeated over time, and involves a power difference between a victim and bully (16). There has been limited evidence showing that peer victimization is negatively associated with physical activity (70), but a few studies suggest that different social contexts of competitive and cooperative games elicits different behavior among children (7, 44). Likewise, peer victimization responses of children during non-elimination and elimination games may also differ.

Past research has supported that increases in self-efficacy and enjoyment and a decrease in peer victimization are associated with an increase in physical activity, but there is a lack of evidence whether these associations will occur during physically active games. Since the social contexts of non-elimination and elimination games differ, psychosocial mediators of physical activity may also differ.

Overall, very little research has examined physically active games in children. A few studies have objectively measured physical activity during physically active games but to our knowledge, there have been no reported measures of objective physical activity during a single session of elimination or non-elimination games. In addition, no study has examined psychosocial responses during physically active games, nonetheless during non-elimination and elimination games.

Statement of the Problem

The purposes of this study were twofold: a) to examine the impact of non-elimination and elimination games on physical activity and b) to examine the impact of non-elimination and elimination games on psychosocial responses.

Research Hypotheses

1) Children will have higher levels of moderate-to-vigorous physical activity (MVPA) during non-elimination games compared to elimination games.
2) Children will have lower self-efficacy, lower enjoyment, and higher peer victimization levels during elimination games compared to non-elimination games.

Operational Definitions

Self-efficacy (SE) is children's confidence in their skills and abilities to engage in a behavior at a level to reach a desired outcome (2) and measured with a self-report scale (46).

Enjoyment for physical activity is a positive emotion experienced with pleasure, liking, and fun due to physical activity and measured with a self-report scale (45).

Peer victimization is the amount of targeted aggressive behavior from peers measured with a self-report scale (9, 61, 69).

Weight status is measured by calculating body mass index (BMI) and adjusting for age and gender specific Centers for Disease Control (CDC) growth charts to determine level of obesity. BMI levels above the 95th percentile, between the 85th-95th percentile, and below the 85th percentile are classified according to new child BMI terminology of obese, overweight, and healthy weight, respectively (50).

Moderate-to-vigorous physical activity (MVPA) is minutes with accelerometer counts exceeding the moderate intensity threshold of 4 METS.

Assumption

1. Participants will follow instructions and play according to rules.
2. Participants will answer truthfully to items on the questionnaire.

Delimitations

1. This study is delimited to two elimination games and two non-elimination games. There are many other examples of elimination and non-elimination games that could be examined.

2. This study is delimited to participants in grades 4-6.

Limitation

1. This study only investigates a small sample of children in grades 4-6 in a Midwestern city, and it is unknown if these results will apply to other geographical areas.

Significance

This study will provide evidence of objectively measured physical activity during a single bout of non-elimination and elimination games and therefore will be able to distinguish which type of game is more likely to increase physical activity in children, ideally aiding in childhood obesity prevention. This study will also help identify some changes in psychosocial responses of physical activity after playing games. Together, by examining objective physical activity and psychosocial responses of physical activity in children, these results may help determine if one type of game would be more beneficial. In addition, these results may provide evidence-based recommendations for physical education leaders and other professionals leading physical activity sessions for children.

CHAPTER 2 - Review of Literature

This chapter will review the literature related to structured and unstructured physical activity, and more importantly the structure of games and their impact in youth populations. This review will further describe the structure of non-elimination and elimination games. Furthermore, many psychosocial variables have been associated with physical activity. The last part of this chapter will review the literature related to psychosocial variables of physical activity including self-efficacy, enjoyment, and peer victimization. This review of physical activity and physical activity psychosocial variables will hopefully provide direction of their possible impact on the structure of physically active games, particularly to non-elimination and elimination games in children.

Structured and Unstructured Physical Activity

There is some evidence that the delivery of physical activity programs in children may influence the amount of physical activity participation in children. Most previous research has examined the delivery of physical activity comprising of both structured activity (e.g. physical education class, organized sports, games) and unstructured activity (e.g. free play). A number of studies have examined these two subcategories of physical activity and have provided some evidence that structured physical activity settings may increase physical activity levels to a greater extent than unstructured physical activity settings. Typically, schools provide an opportunity for both structured and unstructured physical activity settings through physical education lessons and recess. Several studies have examined the amount and intensity of physical activity during physical education lessons and recess. There is also opportunity for children to engage in physical activity outside of school during after-school programs and organized sports. A few studies have examined physical activity after school and reported higher levels of physical activity in unstructured settings compared to structured settings. Another opportunity for children to engage in structured physical activity is through organized sports. Some studies have shown that children who participate in organized sports are more likely to have higher levels of MVPA compared to those who do not participate. The following paragraphs

review past literature of physical activity during the school day through physical education lessons and recess as well as physical activity outside of school through after-school programs and organized youth sport.

Physical Activity during School

Physical education lessons

A number of studies have examined the delivery of physical activity during physical education lessons. In 1995, one study observed 293 third-grade physical education classroom lessons from 95 different elementary schools participating in the Child and Adolescent Trial for Cardiovascular Health (CATCH) (40). Lessons were examined using the System for Observing Fitness Instruction Time (SOFIT) to collect simultaneous data of time and intensity of activity spent in various lesson contexts of management, knowledge, free play, game play, skill drills, and fitness every 20 seconds for the duration of the physical education lesson (38). Baseline results showed that delivery of physical education time was spent mostly in structured physical activity of game play (27.2%), fitness activity (21.8%), and skill drills (10.0%) compared to free play activity (6.0%). Additional time was spent in knowledge (14.0%) and classroom management (21.1%). Average time spent was not reported within each lesson context, but 36.2% of the time was spent in MVPA per lesson (40). In continuation of this baseline study, schools were randomly assigned to receive either the CATCH intervention or serve as a control. The CATCH intervention implemented changes to the physical education program to increase minutes of MVPA. At the conclusion of year three of the study, 96 third-grade physical education lessons were observed. Results showed that those schools who implemented the CATCH physical education curriculum increased both MVPA and vigorous physical activity levels significantly compared to control schools without significant changes in the length of the physical education lesson (34).

Another study evaluated the effect of a two-year middle school physical education intervention M-SPAN (Middle School Physical Activity and Nutrition) which assisted physical education specialists on instructional strategies to increase student MVPA (41). The SOFIT protocol was used to estimate levels of children's MVPA of the 24 middle

schools randomly assigned to receive the intervention or control. At baseline, 430 physical education lessons were observed. Results indicated that the majority of the time was spent in structured activity of game play (28.7%), fitness activity (24.9%), and skill drills (5.4%) compared to free play (8.1%). Other time was spent in knowledge (5.7%) and management (27.2%). Physical activity levels during each lesson context were also analyzed. Results showed similar MVPA levels during structured activity of fitness activity (59.2%), skill drills (47.6%), and game play (50.2%) when compared to free play situations (51.8%). MVPA was also observed in other lesson contexts of management (43.3%) and knowledge (5.9%). Although similar levels of MVPA were measured in both structured and unstructured activities, the time spent in different lesson contexts varied between the control and intervention schools after year one of the study. The control schools participated in less structured activities (game play, fitness activity, and skill drills) compared to the intervention schools (56.7% vs. 60.5%) and participated in more free play activity compared to the intervention schools (8.3% vs. 6.7%). Average percentage of MVPA per lesson also differed between the intervention schools (53.2%) and control schools (48.6%). At the conclusion of year two of the program, results showed that students who received the intervention significantly increased their levels of MVPA compared to intervention schools (52% vs. 48%) (42). In addition, SOFIT results showed that when compared to control schools the intervention schools spent more time in structured activities (56.5% vs. 52.2%) and less time in free play (9.6% vs. 11.1%). These studies may suggest that the increased levels of MVPA may be associated with increased time spent in structured activities.

In 2006, another study examined physical education classes of 36 public middle schools participating in the Trial of Activity for Adolescent Girls (TAAG) program (39). A total of 431 lessons were examined using the SOFIT observation tool. Results showed that the majority of the physical education lessons were delivered with structured activities in game play (26.1%), fitness activity (19.7%), and skill drills (12.1%). Students participated in free play (4.4%), classroom management (26.1%), and knowledge (10.6%). Physical activity levels during each lesson context was analyzed and showed that time spent in MVPA was higher in structured settings of fitness (58.7%), skill drills (48.6%), and game play (46.2%) when compared to free play (33.0%). MVPA

was also observed in other lesson contexts of classroom management (25.5%) and knowledge (5.6%). Though this study supports the idea that children have increased levels of MVPA during structured activities compared to free play situations, this study only evaluated girls thus possibly indicating that higher physical activity levels could be attributable to same-sex physical education programs.

The results from the previous four studies are summarized in table 2-1 and table 2-2. Overall, across all four studies of physical education lessons, students were more physically active during structured settings compared to unstructured settings within a physical education lesson using the SOFIT observation tool.

There are a few limitations to the previous studies using the SOFIT observation tool. One limitation to the SOFIT observation tool is that it is designed to measure classroom physical activity and consequently does not distinguish physical activity levels among individual children. Although not a limitation, it is important to consider that the children in these studies were examined during physical education lessons and increasing physical activity is just one of the many objectives for physical education specialists (10). Physical education lessons are not structured to strictly promote physical activity suggesting that physical education lessons that are not structured appropriately may provide less MVPA. Moreover, time spent in classroom management and knowledge often takes up a considerable amount of time, leaving limited time for physical activity. SOFIT data from the previous studies showed that at least 30% of the time was spent in knowledge and management during an average physical education lesson.

There are also several advantages to the SOFIT protocol such that it can distinguish activity levels between boys and girls if coded correctly. In the previous study of middle school physical education lessons, girls were significantly more active during fitness activities compared to free play (41) which was consistent with the findings from the sixth-grade adolescent girls of the TAAG study (39). In the same study of middle school physical education lessons, boys were significantly more active during game play and fitness activities compared to free play and were also significantly more active during game play compared to girls (41). Another advantage is the evaluation of time spent during different lesson contexts such as game play, fitness activities, and free

play. Time spent in these different lesson contexts allows us to distinguish time spent in structured activities from time spent in unstructured activity.

Table 2-1 Percentage of time spent in different lesson contexts using SOFIT

Study	Inter-vention	grade level	# lesson	game play	fitness activity	Skill drills	total structure	free play	knowledge	management
McKenzie et al., 1995	CATCH	3rd	293	27.2	21.8	10.0	59.0	6.0	14.0	21.1
McKenzie et al., 2000	M-SPAN	6-8th	430	28.7	24.9	5.4	59.0	8.1	5.7	27.2
McKenzie et al., 2004										
(Intervention, year 1)	M-SPAN	6-8th	~355	26.1	25.2	9.2	60.5	6.7	5.6	27.2
(Control,year 1)	M-SPAN	6-8th	~ 355	28.2	21.1	7.4	56.7	8.3	6.2	29.4
(Intervention, year 2)	M-SPAN	6-8th	~ 354	27.3	21.4	7.8	56.5	9.6	4.8	29.4
(Control, year 2)	M-SPAN	6-8th	~ 354	25.2	21.9	5.1	52.2	11.1	5.4	31.0
McKenzie et al., 2006	TAAG	6-8th	431	26.1	19.7	12.1	57.9	4.4	10.6	26.1

Note: total structure = game play + fitness activity + skill drills.

Table 2-2 MVPA during different lesson contexts using SOFIT

Study	game play	fitness activity	skill drills	Avg. structure	free play	knowledge	management	Avg. % MVPA per lesson	min. of MVPA	lesson length
McKenzie et al., 1995	N/A	N/A	N/A	N/A	N/A	N/A	N/A	36.2	10.6	29.5
McKenzie et al., 2000	50.2	59.2	47.6	52.3	51.8	5.9	43.3	48.5	16.5	34.3
McKenzie et al., 2004										
(Intervention, year 1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	53.2	19	35.7
(Control,year 1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	48.6	17	35
(Intervention, year 2)	N/A	N/A	N/A	N/A	N/A	N/A	29.4	52.1	19.5	37.4
(Control, year 2)	N/A	N/A	N/A	N/A	N/A	N/A	31.0	48.0	16.9	35.2
McKenzie et al., 2006	46.2	58.7	48.6	51.2	33.0	5.6	25.2	37.9	13.9	37.3

Note: avg. structure = game play + fitness activity + skill drills / 3

Another study found that structured physical activity provides a sufficient amount of physical activity during a physical education. This study examined the effect of a 22-lesson sport education program implemented during a physical education class (29). Nineteen seventh-grade boys classified as high skill and low skill, participated in 22

lessons of floor hockey which mimicked a sport season with skill practices, scrimmages, and formal competitions. Students wore an accelerometer and were assessed throughout the season. Results showed that children spent 61.3% of time in MVPA during the overall season and engaged in much more vigorous activity during formal competition of the sport. Children of low and high skill level did not significantly differ in amount of physical activity. While the success of this sport education program is limited to boys only, it provides evidence that structured physical activity can offer adequate amounts of MVPA.

Another study also found that structured physical of playing games can offer sufficient amount of MVPA. Arnett and Lutz (1) objectively measured physical activity via accelerometry in 60 girls in grade 8 during small-sided, game-based lessons of floor hockey and soccer. They found that regardless of ability level, girls spent an average of just over 56% of the time in MVPA. The results of this study are limited to girls only, but are consistent with previous studies of boys (29) such that games can provide sufficient amounts of MVPA.

Recess

Along with physical education classes, recess periods are another opportunity for students to engage in physical activity. There has been some evidence that children are less active in these unstructured recess settings and conversely more active when structured opportunities are implemented. A published abstract by Connolly and McKenzie (14) examined the effects of an easy-to-implement games intervention during recess periods. Over 13 days of observation using self-report, accelerometers, and direct observation, researchers found that children who participated in a games intervention during recess were more active than during a typical recess period.

Another study examined the effects of the Promoting Lifetime Activity for Youth (PLAY) intervention to promote physical activity for a fifteen minute break during the school day (20). A total of 28 classrooms across five elementary schools (4^{th}-6^{th} grades) were randomly assigned to receive either the 12-week PLAY intervention or serve as a placebo. The PLAY intervention included a wide variety of teacher led physical activities and promotion of lifelong physical activity. The placebo was allotted a 15 minute break without any teacher interaction to encourage students to be physically

active. Results showed that physical activity for both boys and girls who received the PLAY intervention significantly increased physical activity during both measurements taken at week five and week twelve. This study supports that structured activities significantly increase physical activity levels in a large sample of students in grades 4 to 6, yet the method of collecting physical activity levels was self-report. Objective measurements may be used in future research to limit possible bias in results.

In 2003, a similar study found that children are more physically active during recess if structured exercise is implemented using an objective physical activity measurement (66). In this study, a fitness break was implemented during the last hour of the school day on three consecutive days. The fitness break consisted of a continuous obstacle course where children engaged in multiple activities including dribbling, stair climbing, crawling, jumping, dancing, push-ups, etc. Physical activity levels were measured with a heart rate monitor during the regular scheduled morning recess, lunch recess, and fitness break. Results showed that children had a higher percentage of moderate-vigorous heart rate, a higher percentage of vigorous heart rate, and greater steps per minute during the fitness break compared to both morning and lunch recess periods. Although this study found significant increases of physical activity during the structured fitness break, it is important to recognize some of the weaknesses of the study. First, the sample size consisted of a small sample size of only 27 children in grade 5. Second, the fitness break took place at the same time on all three days of the study. It could be argued that children are more physically during the afternoon compared to times earlier in the school day. Advocates may also argue that children were aware of the afternoon fitness breaks, thus compensating for this planned afternoon physical activity during morning and lunch recesses.

Overall, there are many ways for children and adolescents to engage in physical activity both through structured and unstructured settings. The previously discussed studies provide strong evidence that structured activity delivered through physical education, organized sport, and recess settings is an effective way to increase physical activity levels in children and adolescents.

Physical Activity Outside of School

After-school Programs

A few studies have investigated physical activity during after-school programs. Coleman et al. (13) have examined physical activity in a sample of 144 children in grades 3 to 6 recruited from seven elementary after-school programs. Physical activity was evaluated using the SOFIT observation tool and each school was observed on six days throughout the school year. During after-school programs, children often had the opportunity to engage in structured physical activity through organized adult-led sessions or unstructured physical activity through free play sessions. The results showed that children engaged in more MVPA during free play sessions compared to organized sessions (69% vs. 51%). When examining moderate and vigorous physical activity individually, children also spent more time in vigorous physical activity (25.5% vs. 17%) and moderate physical activity (43% vs. 34%) during free play sessions compared to organized sessions. During game play children engaged in similar levels of MVPA during organized sessions (59%) and free play sessions (62%). Despite this, more time was spent in management during organized sessions compared to free play sessions (14.5% vs. 7%) and consequently less time was spent in MVPA during management of organized sessions compared to free play sessions (26% vs. 54%).

In the same sample of children, Trost et al. (77) objectively assessed physical activity using accelerometers. Physical activity was also evaluated on six days throughout the school year at each of the seven elementary schools. Results of objective physical activity measures were similar to that of the direct observation results from SOFIT. Children engaged in significantly more MVPA during free play sessions compared to organized sessions despite whether the session took place indoors or outdoors. Time spent in MVPA during organized physical activity was significantly higher when it took place indoors compared to outdoors, yet it was still significantly less time in MVPA compared to free play sessions. In addition, boys were significantly more active than girls during free play sessions and significantly more active during organized physical activity indoors.

These two studies suggest that the amount of MVPA spent during after-school programs differs from MVPA during in-school settings. Physical activity during school settings have reported consistent findings that children engage in more MVPA during structured physical activity sessions compared to unstructured physical activity sessions. However, studies during after-school programs report conflicting findings that children engage in more MVPA during unstructured physical activity sessions compared to structured physical activity sessions. The amount of MVPA may differ between school settings and outside of school settings because of lack of experience and training that after-school leaders have in conducting structured physical activities (31). Future research should further investigate these differences between physical activity during school and after school.

Organized Youth Sport

Another form of structured physical activity typically occurring outside of school is organized sports. There has been some evidence that physical activity may be increased through participation in organized sports. One study found that adolescents who had participated in organized sports had higher levels of MVPA compared to their peers who did not participate (30). In a study of 183 adolescents 12-14 years, MVPA was estimated using a three day activity record. Results showed that both males and females who engaged in some sort of organized sport across the three days of study had significantly greater amount of MVPA compared to peers who did not engage in any organized sport. The results also showed that participation in organized sport accounted for approximately 55-65% of daily physical activity expenditure.

One disadvantage to the previous study was the use of self-report assessment tool (63). Consequently, Wickel and Eisenmann (84) expanded from this study and assessed physical activity during organized sports using accelerometers. Boys 6-12 years wore an accelerometer for the duration of two school days. On one day, the children participated in organized sport and did not participate in sports on the second day. Results showed that youth sport contributed to 23% of total daily MVPA while recess and physical education class contributed 16 and 11%, respectively. In addition, on days that the children did not participate in organized sport, children engaged in significantly more sedentary behavior and significantly less moderate and vigorous physical activity.

During organized youth sport, children engaged in MVPA 49% of the time. Nearly half of the time spent in MVPA was during unstructured activities, but it is important to consider that the study population consisted of only boys and most studies of child physical activity have been reported that boys are more active than girls (62, 79).

These two studies support that physical activity can be increased through organized sport and more importantly, participation in organized sport has also been associated with future physical activity levels. Pfeiffer and colleagues (57) found that adolescent females who participated in organized sports in the eighth and ninth grades were more likely to be physically active in the twelfth grade. In conclusion, there is limited research in the area of physical activity and organized youth sport, however all studies have reported consistent findings that students participating in organized sport have higher levels of MVPA compared to non-participants.

Type of Structured Game and Impact on Physical Activity

Games are an example of structured physical activity and may be an effective approach to increase physical activity. A particular interest for this study is the effect of elimination or removal from participation by defeat during game play. There is unknown research examining the effects of elimination and non-elimination games in the literature. Thus, it is important to recognize the elements that classify elimination and non-elimination games. There are many elements that identify games including body contact, bodily activity, skill requirements, competition factors, interaction factors, time considerations, volume and distribution of participation, and much more (59). Non-elimination and elimination games commonly vary in three factors of competition, goal versus opponent directed, and amount of participation. For this study, non-elimination games were defined such that 1) winning is not the primary focus and the game may have no winners or several winners, 2) the game is often goal directed, and 3) amount of participation is fairly equal among all participants since there is no out of game waiting or elimination. Alternatively, elimination games were defined such that 1) focus is winning and the game usually has only one winner, 2) opponent directed where the purpose of the game is to do something to an opponent, and 3) amount of participation in

elimination games is highly variable depending on the length of time that lapses before a child is eliminated.

Most previous research of games focused upon the social context of cooperation or competition, which has very similar structures to non-elimination and elimination games, respectively. Cooperative games create interest in encouraging and assisting others (33) and attempt to foster children's motivation to cooperate with others to achieve a mutually desired goal (54). Competitive games are ones in which there are losers and winners (33) and attempt to foster children's motivation is to achieve a single mutually desired goal such as being faster or better than others, which may also encourage the devaluation of others (33).

Differences in non-elimination and elimination games may further be described in terms of motivational climates. Mastery and performance climates are also similarly structured to non-elimination and elimination games. A mastery climate is a social environment where a child is encouraged to learn and to accomplish a certain task (44). A performance climate is a social environment that focuses on an assessment of ability, which is demonstrated by exceeding the performance of others (49). Because elimination games focus upon exceeding the performance of others, it is likely that they foster a performance climate whereas non-elimination games focus upon improving self-skills may foster a mastery climate.

One study examined physical activity and motivational climate in a physical education curriculum (55). In this study, 452 middle school physical education students completed questionnaires both pre and post a three-day physical education lesson playing ultimate football. The questionnaire measured student's perceived motivational climate (whether ultimate football was more of a master or performance climate) and perceived ability (self-reflection of the ability to play ultimate football). Physical activity was objectively assessed using a pedometer. Results showed a positive association between mastery climate and physical activity even after accounting for perceived ability. The authors further explain that students who perceive a performance oriented climate will only be active if they believe a successful outcome is likely. This study reveals that children may be more physically active in mastery climates of physical education lessons independent of their perceived ability. Therefore, if non-elimination games create a

mastery oriented motivational climate, then children may be more physically active during these games compared to non-elimination games.

The previous paragraphs explain a few differences in characteristics of non-elimination and elimination games. Table 2-3 summarizes these characteristics.

Table 2-3 Characteristics of Non-Elimination and Elimination Games.

Non-Elimination Games	Elimination Games
▪ Winning is not the primary focus	▪ Winning is the primary focus
▪ May have no winners or several winners	▪ Usually has one winner
▪ Goal directed	▪ Opponent directed
▪ Fairly equal participation among participants	▪ Amount of participation is highly variable
▪ May be associated with cooperative games	▪ May be associated with competitive games
▪ May be associated with mastery oriented motivational climates	▪ May be associated with performance oriented motivational climates

Previously discussed studies have found that games provide sufficient physical activity in children and adolescents. Studies of physical education classes found that over 45% of the time was spent in MVPA during a game session for middle school students (42) and sixth grade females (39). Hastie and Trost (29) found that boys engaged in more MVPA during a formal competition floor hockey game compared to skills practice. Likewise, Arnett and Lutz (1) found that girls engaged in a sufficient amount of MVPA during small-sided, game-based lessons. Connolly and McKenzie (14) also found that children are more physically active playing games when compared to free play. Furthermore, another study found that simply providing game equipment significantly increased MVPA during morning and lunch recess (80).

One study by Sleap and Warburton (68) observed the physical activity levels of 5-11 year-old children in school and out of school also found similar results that children are consistently physically active playing games. In this study, 56 children were observed using continuous observation to estimate MVPA. Results showed that chasing games was the second leading activity for amount of MVPA right behind brisk walking.

Other games such as jumping games and playground games also were activities where children engaged in at least 10 minutes of MVPA. This study suggests that games may increase participation in physical activity.

Overall, these studies suggest that games promote physical activity in children and often provide a sufficient amount of activity. However, one major limitation of all the studies that observed physical activity during game play is that the types of games played often are not described. It is unknown if the games are characteristic of non-elimination games, elimination games, or a combination of both games. Yet despite this, typically elimination games result in some participants to sit and wait for a winner. Therefore, it is hypothesized that these elimination games will influence the amount of physical activity provided, such that children will engage in less MVPA during these games.

Impact of psychosocial correlates of physical activity in children

To develop strategies to influence physical activity, researchers recommend targeting variables that have been identified to influence physical activity for a specific population (5). Therefore, there is a need for researchers to identify these influences and whether these influences mediate the effects of intervention. Past research has shown that there are several psychosocial variables that are associated with physical activity in youth (8, 21, 62, 79). Of particular interest to this study, and because of consistent findings in past research, are the psychosocial correlates of self-efficacy, enjoyment, and peer victimization.

Self-efficacy

Bandura established self-efficacy as a central construct of behavior changes within social cognitive theory. Perceived self-efficacy is defined as children's expectations that they can use their skills and abilities to successfully perform a specific behavior at a level necessary to reach a desired outcome (2). Social cognitive theory included the hypothesis that the greater an individual's belief in his or her ability to achieve a specific outcome, the more likely that outcome will be achieved. Thus, it is predicted that the greater a person's self-efficacy, the more likely they are to complete a task (3). On the contrary, individuals with lower self-efficacy will more likely become

quickly discouraged when they encounter a challenging task and may even give up. Several studies have shown that physical activity self-efficacy is associated with physical activity in children and adolescents.

Reynold's et al. (60) was one the first to show this relationship in adolescents. Complete data was collected on 233 males and 141 female high school sophomores who participated in the Stanford Adolescent Heart Health Program (SAHHP). Results showed that students who reported a higher level of physical activity also reported higher levels of self-efficacy for both males and females. The positive relationship found between self-efficacy and physical activity led to further research in younger populations.

In 2000, a systematic review was completed of physical activity psychosocial mediators in children ages 4-12 years. The review included literature from 1970-1998, and showed four of nine studies having a positive association between self-efficacy and physical activity (62). Another recent systematic review of physical activity correlates examined papers published in 1999-mid 2003 that targeted adolescent girls. The review showed a small to moderate association between self-efficacy and physical activity in 10 of 10 studies (8). Another review paper examine studies published from 1999-2004. This review found that self-efficacy and physical activity were positively associated in 14 of 17 studies (79).

Since these reviews, several more studies have examined this relationship between self-efficacy and physical activity in children. Ward et al. (83) evaluated the influences on physical activity in a large sample of high school girls with a mean age of 14.6 years. Physical activity was measured using the Three Day Physical Activity Recall and a questionnaire assessed psychosocial correlates such as self-efficacy. The results indicated that there was a significant interaction between physical activity status and weight status. Girls who were classified as high active had significantly higher self-efficacy scores compared to girls who were classified as low active, regardless of weight status and ethnicity.

A recent study of sixth grade girls has shown that self-efficacy is significantly related to structured physical activity (6). Data was collected on a total of 2,791 sixth grade girls who participated in the TAAG study. The girls completed a questionnaire assessing involvement in structured physical activity and physical activity self-efficacy

among several other psychosocial correlates. Structured physical activity was defined as sports at school, sports outside of school, and lessons outside of school. Results showed that physical activity self-efficacy was 3.44 times greater for girls who participated in structured physical activity compared to girls who did not participate. It is unknown whether games were played during these structured physical activities, but this study does suggest that girls who participate in structured physical activities demonstrate greater self-efficacy compared to peers who did not participate in structured physical activities. Since games are one example of structured physical activity, the results of this study may advocate that participation in these activities may also lead to improved self-efficacy and enjoyment.

Overall, these studies provide substantial evidence that self-efficacy is associated with physical activity. It is important to recognize that self-efficacy may differ among different types of physical activity, especially during game play. No research has examined self-efficacy in structured physically active games. Elimination games create more barriers for children to overcome such as trying not to lose or become eliminated compared to non-elimination games. Children who have lower self-efficacy will have a much more difficulty overcoming these barriers than children who have higher self-efficacy. Consequently, it is hypothesized that non-elimination games will be associated with increased self-efficacy while elimination games will be associated with decreased self-efficacy in children.

Enjoyment

Enjoyment is another mediator of physical activity that will be assessed. Enjoyment is defined as a positive state of emotion and can be reflected through feelings of pleasure, liking, and fun and is an important predictor of adherence to physical activity (81). It is predicted that if an individual does not enjoy a physical activity, then he or she will not engage in that particular activity. Individuals will choose to participate in those activities that they find pleasing. Physical activity enjoyment has previously been measured using the Physical Activity Enjoyment Scale (PACES) in adults (32) and has been modified as a valid tool to measure enjoyment in youth (45). Many studies with children and adolescents have found a positive association between enjoyment and

physical activity. In a review of physical activity influences in children ages 4-12 years, three of five studies showed a positive association between enjoyment or physical activity preference and physical activity (62). In another review by Biddle and colleagues (8), enjoyment was shown to have a small to moderate association with physical activity in seven of eight studies in adolescent girls.

A study previously mentioned in the self-efficacy section above, also evaluated enjoyment in a sample of high school girls (83). Girls were classified as either active or not active based on physical activity questionnaire responses and completed a questionnaire that measured enjoyment of physical education and enjoyment of physical activity. The results showed a significant interaction between enjoyment and self-reported physical activity. Girls who were classified as active had higher levels of enjoyment for physical education and enjoyment for physical activity compared to girls who were classified as not active.

Another study previously mentioned in the self-efficacy section above also assessed enjoyment in a large sample of sixth grade girls who participated in the TAAG study (6). The girls completed a questionnaire assessing self-reported involvement in structured physical activity, physical activity enjoyment, and physical education enjoyment among others. The results showed a positive association between structured physical activity and physical education enjoyment. Physical education enjoyment was 1.97 times greater for girls who participated in structured physical activity compared to those who did not participate. Although there were no significant differences between structured physical activity and physical activity enjoyment, the authors speculated that physical education enjoyment reflects girls' comfort of participating in group-based activities while physical activity enjoyment reflects individual pleasure of movement. The TAAG study emphasized same-sex group based activities which could explain why physical education enjoyment increased more than physical activity enjoyment. Another interpretation is that girls who have higher levels of enjoyment are more likely to participate in structured physical activity. Overall this study supports that enjoyment is positively associated with a greater involvement in structured physical activity.

Organized sports are another form of structured physical activity. There have been numerous studies examining youth sport enjoyment that have reported consistent

findings. Early research has indicated that enjoyment is a principal reason for participation in youth sport (23, 64). These findings have also been confirmed by studies that identify lack of enjoyment as a primary motive for dropping out of youth organized sports (24, 25).

Another study examined several psychosocial correlates of physical activity among Norwegian boys and girls ages 9-15 years (53). These psychosocial correlates were evaluated in three location specific contexts of school commuting, informal games play at school, and organized sport or structured exercise and game play in leisure time. The results showed that significantly a higher level of self-reported active commuting to school was associated with high levels of physical activity enjoyment and physical education enjoyment. Children who reported engaging in higher amounts of informal games play during school had significantly higher levels of physical activity enjoyment and higher levels physical education enjoyment. Finally, there was also a positive association between the reported amount of leisure time physical activity and enjoyment of physical activity. The results of this study support that enjoyment is positively associated with physical activity regardless if it is the context of commuting to school, informal games play during school, and leisure time structured activities. More importantly, the results of this study support that there may be an association between games and physical activity.

These previous studies suggest that enjoyment is an influential mediator of physical activity and report consist findings that a positive relationship exists between physical activity and enjoyment in children. There also has been some evidence of a positive association between physical activity and enjoyment during structured physical activity, but there is a lack of evidence whether there is a positive association between games and enjoyment. Moreover, no studies have examined whether differences may exist in children's perception of enjoyment during non-elimination and elimination games.

Peer Victimization

Peer victimization may be an important variable influencing participation in physical activity settings. Victimization can be defined as being a target of negative

physical and verbal action that have a hostile intent which causes distress, may be repeated over time, and involves a power difference between a victim and bully (16). Examples of peer victimization may include teasing in an unpleasant way, being kicked or hit with intention, being called hurtful names, and being left out on purpose (16). A recent study by Storch and colleagues (70) found that peer victimization was negatively associated with physical activity in both overweight and non-overweight youth. In this study, 92 children and adolescents ages 8-18 years completed several questionnaires including a valid peer victimization scale and physical activity questionnaire. Peer victimization was found to be negatively associated with physical activity. The results of this study provide some support that children who are repeatedly victimized by peers may engage in less physical activity.

In the context of elimination and non-elimination games, peer victimization may differ because each type of game is associated with different social contexts. As discussed earlier, elimination games tend to be more competitive compared to non-elimination games. Some previous studies have examined behaviors of youth during games of high competition and low competition.

Bay-Hintz and colleagues (7) investigated the effects of cooperative and competitive games on behavior of young children. Behavior was described as either aggressive or cooperative. Aggressive behavior included destructive or hurtful action toward a person or object, both physically and verbally. Cooperative behavior included sharing, assisting, completing a task with another child, working together on a common goal, providing encouragement, etc. Seventy children were exposed to a number of cooperative and competitive games over 50 days. Competitive games included games that forced children against one another and only one winner was determined. Cooperative games included games that did not focus on winning and forced children to work collaboratively. Observers stood in the back of the classrooms and discreetly recorded the behavior of the children during the game sessions. Results showed that aggressive behavior increased during competitive games and decreased during cooperative games. Accordingly, cooperative behavior increased during cooperative games and decreased during competitive games. Though this study shows that aggressive behavior was associated with competitive game structures, individual

differences were not measured. Thus, one could argue that the children naturally express aggressive or cooperative behavior independent of competitive and cooperative environments.

Menesini and colleagues (44) examined interactional styles of children who exhibited aggressive behaviors compared to those who were victimized with these aggressive behaviors in competitive and cooperative settings. Children 8-11 years old completed a peer nomination questionnaire of bully-victim relationships. In this study, bullies were defined as receiving 40% of votes for bully and less than 25% as a victim. Likewise, victims were defined as receiving 40% of votes for victim and less than 25% for bully. Controls were defined as receiving less than 15% nominations for both victim and bully. All three groups of students participated in a competitive game and a cooperative game while direct observation protocol was used to assess children's behavior. Results showed that there were no significant differences between bullies, victims, and controls during the two types of games. Across all three groups higher levels of aggression, regulation, cohesion, collaboration, and fewer comments on the game were observed during the cooperative game compared to the competitive game, but overall aggression levels were low. Aggression was surprisingly higher during the cooperative game, but this behavior could be explained by the targeted direction of the aggression. This aggressive behavior was not directed toward another person, but instead it was the child's way of expressing his or her frustration in completing the task. This study suggests that cooperative games may incite aggressive behavior, but not towards peers. This study also provides some evidence that different social contexts of cooperative and competitive environments may influence behavior in children despite the child's perceived behavior (bully or victim) prior to exposure of cooperative and competitive environments. Therefore, in the context of elimination and non-elimination games, behavior will most likely differ since the environments differ between competitiveness.

These previously discussed studies suggest that aggressive behavior toward peers can be decreased in more cooperative, less competitive environments (7, 44). Thus, it is possible that children may experience less victimization during non-elimination games compared to elimination games. In addition, lower levels of peer victimization have been associated with an increased amount of physical activity in non-overweight and

overweight children (70). Overall, there is a lack of evidence concerning peer victimization and physical activity in children during different social contexts, especially during non-elimination and elimination games.

Summary and Conclusions

Research of the effects of non-elimination and elimination games on physical activity and physical activity influences of self-efficacy, enjoyment, and peer victimization is very limited. The findings from previous studies suggest that structured physical activity promotes more MVPA than unstructured activities. Therefore, appropriately structured games may be an effective way for children to increase physical activity. Games can be structured as elimination and non-elimination games. These games differ in several features that may influence physical activity and mediators of physical activity. Studies are consistent in that physical activity is positively associated with self-efficacy and enjoyment and negatively associated with peer victimization. Physical activity environments that increase self-efficacy and enjoyment as well as decrease peer victimization will most likely show increases in physical activity. No previous studies have examined physical activity and physical activity influences during any type of physically active game, nonetheless during non-elimination and elimination games. Determining more effective activities to promote physical activity is a rationale for examining physical activity, self-efficacy, enjoyment, and peer victimization during non-elimination and elimination games.

CHAPTER 3 - Methods

Setting and Participants

A one week day camp, organized through a community fitness facility operated by a Midwestern university was held from 8:00AM-11:00AM during the week of August 6-10, 2007. The camp exposed children in grades four to six to a variety of physically active and non-physically active games and activities. Children were recruited for the camp through community organizations and public announcements. All children enrolled in the one-week camp, were also eligible to participate in this study conducted during the last two days of the camp. Parents or guardians of interested participants provided informed consent and completed a brief questionnaire. Children also provided written assent. Thirty-seven children were recruited to attend the day camp and all children volunteered for the study. One child was excluded due to refusal to participate in games and seven children were excluded because of absence or tardiness. A total of twenty-nine children were included in the final sample. This study was approved by the Kansas State University Institutional Review Board.

Table 3-1 describes demographic and anthropometric characteristics of participants. Participants' weight status was similar to national prevalence rates of overweight and obese children (52). The percentage of meeting physical activity recommendations was slightly higher than recent national data from NHANES showing that 42% of 6-11 year old children engaged in 60 minutes of MVPA on at least five days of the week (75). These differences may be explained by differences in data collection methods. This study assessed meeting recommendations from parent self-reported days of child physical activity while NHANES data objectively measured physical activity (75).

Table 3-1 Characteristics of 29 children enrolled in the study.

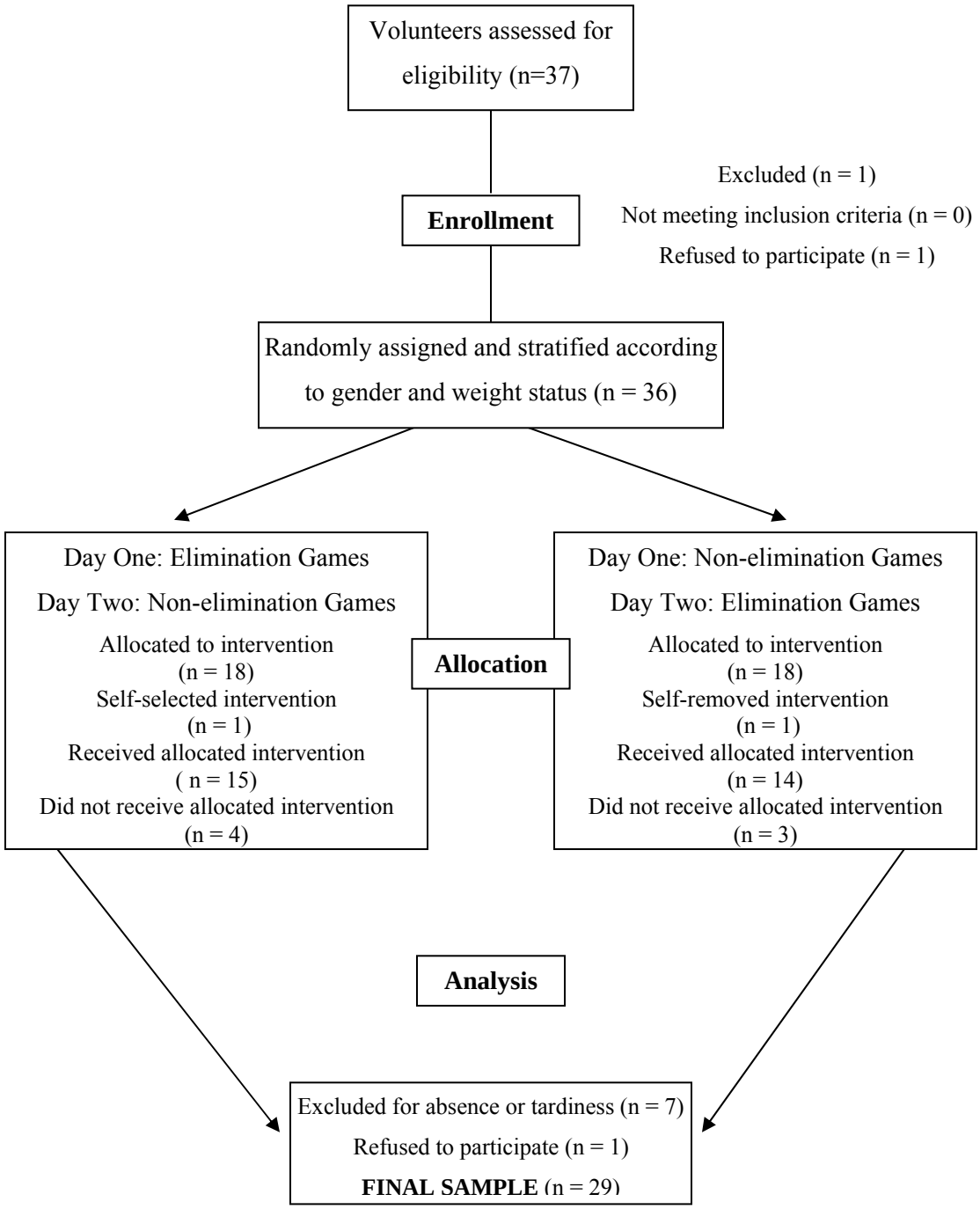
Characteristic	n	Percent or Mean (SD)
Gender		
Female	10	34.5%
Male	19	65.5%
Age	29	10.5 (1.0)
Grade Level		
4	11	37.9 %
5	10	34.5%
6	8	27.6%
Ethnicity		
White	26	89.7%
Non-White	3	10.3%
BMI (Body Mass Index)	29	18.72 (2.9)
Weight Status		
$\geq 85^{th}$ percentile	9	31%
$< 85^{th}$ percentile	20	69%
Meeting PA Guidelines		
Yes	19	65.5%
No	10	34.5%
Subsidized School Lunch		
Yes	3	10.3%
No	26	89.7%
Mother's Education		
High School	3	10.3%
Some College	8	27.6%
Graduated College	13	44.8%
Master's degree or above	5	17.2%
Father's Education		
Some College	3	10.3%
Graduated College	13	44.8%
Master's degree or above	11	37.9%
Not applicable	2	6.9%

Experimental Design

This true experimental design exposed children to conditions of non-elimination and elimination games. To control for order effects, children were stratified according to gender and weight status to one of two groups. The groups received the experimental conditions of non-elimination and elimination games on two different days with order

counter-balanced (see figure 3-1). Each experimental condition consisted of playing two game sessions each 20 minutes in duration.

Figure 3-1 Description of enrollment, allocation, and analysis in study design.



Experimental Conditions

Games

Games were adopted from the evidence-based CATCH study consisting of a modified physical education curriculum. The CATCH physical education objectives follow guidelines of emphasizing fun, encouraging cooperation by limiting competition, downplaying winning, and encouraging students to be active at all times (34). For this study, non-elimination games were adopted from the CATCH games curriculum (Flaghouse Inc., Hasbrouck Heights, NJ) and modified for elimination games. *See Ya Later Alligator* and *Foxes, Trees, and Squirrels* were the two non-elimination games used in this study.

All games had similar set-up of seven squares (approximately ½ x ½ yards) taped down in various places throughout the 20 x 20 yard playing area. These games were played on a large indoor turf field where each group played game sessions concurrently. One instructor was assigned to each group and led game sessions for that particular group on both days. Prior to leading these game sessions, each instructor was familiar with the game rules and had past experience leading physically active games in youth.

Non-Elimination Games

See Ya Later Alligator: Three to four children were designated to be "it" and wore a colored pinny to distinguish themselves from other players. On go, children moved throughout the playing area and avoided becoming tagged by the "it" players. If a child was tagged, he or she went to the outside perimeter and performed five repetitions of a specified fitness skill such as jumping jacks before he or she could re-enter the game. Children were able to stand inside the taped square to avoid a tag, yet only one child was allowed to stand in the square at one time. A child was allowed to enter the taped square even if it was already occupied and say to the child already standing in the square, "See ya later alligator." Upon this statement, the child in the taped square had to leave this taped area immediately. Different children were designated to be "it" after every five minutes of play. The game ended at the duration of twenty minutes and after four different sets of players were chosen to be "it."

Foxes, Trees, & Squirrels: Half of the children were given scarves and instructed to tuck one end into their waistband to represent a tail. These children were known as squirrels while children without scarves were known as foxes. On go, the foxes moved around the playing area trying to grab the tails of the squirrels. If a fox pulled a squirrel's tail, then the fox tucked the tail into his or her waistband and became a squirrel, and the squirrel became a fox. Squirrels were allowed to hide for five seconds in the taped squares which symbolized trees. Squirrels hiding in the trees had to count five seconds as acorns (one acorn, two acorn, etc.) and upon counting the fifth acorn, the child had to re-enter the playing field. The game ended after 20 minutes of play with a signal from the instructor.

Elimination Games

See Ya Later Alligator: This game is very similar to the non-elimination form, starting the game with designated "it" players. However, in this situation, once a player is tagged, he or she was unable to re-enter the playing area. (Recall that in the non-elimination version of *See Ya Later Alligator*, a tagged player was allowed to re-enter the game after performing a fitness activity). Once a player was tagged, he or she had to sit out on the perimeter until only one player remained. Then new players were designated to be "it" and the game started again.

Foxes, Trees, & Squirrels: In this game situation, every child was a squirrel, meaning every child had a tail tucked in the posterior side of his or her pants. Each child then moved around and attempted to steal one another's tails. Once a squirrel's tail was taken, he or she had to sit out until only one squirrel remained. After a winner was declared, the game started again until twenty minutes of game play had expired.

During both versions of *See Ya Later Alligator*, instructors allowed all children to be "it" at least once before they were allowed a second time within the same game and averted all boys or all girls from being "it" simultaneously. During elimination games, as more children became eliminated from the game, the instructors reduced the playing area boundaries to advance the end of the game.

Measures

Weight Status

Height and weight measurements of each child were taken in a private location on the first day of camp. Height was measured to the nearest 0.1 cm using a stadiometer (Invicta Plastics Ltd., Leicester, UK) and weight was measured to the nearest 0.1 kg using an electronic scale (Seca Corp, Model 770, Hamburg, Germany). Body mass index (BMI) was calculated from these height and weight measurements (kg/m^2) and plotted on age and gender specific CDC growth charts to determine percentile rank. BMI levels above the 95th percentile, between the 85th-95th percentile, and below the 85th percentile were classified according to new child BMI terminology of obese, overweight, and healthy weight, respectively (50).

Physical Activity

Physical activity levels and sedentary behavior were objectively measured using the Actigraph GT1M accelerometer. This accelerometer was attached to an adjustable elastic belt, secured around the child's waist, and positioned just above the right hip bone. Children wore the accelerometer for the duration of the camp activities on all five days which decreased the likelihood of the Hawthorne effect. Accelerometers were initialized each day prior to data collection. Activity counts were collected using a 30 second epoch and downloaded to a computer for subsequent analysis. Activity counts were converted to units of relative energy expenditure (METs) using a regression equation taken from Freedson and colleagues (22) to determine time spent in sedentary behavior (< 50 counts), light physical activity (50 counts - 3.9 METs), moderate physical activity (4 - 6.9 METs), vigorous physical activity (≥ 7 METs) and MVPA (≥ 4 METs). These higher moderate and vigorous physical activity intensity levels more accurately estimate energy expenditure in youth (27) and are comparable to several other studies using accelerometry (56, 75, 77, 84). The cutpoint used to determine sedentary behavior was defined as less than 50 counts per 30 seconds and reflected those cut points used in other studies (35, 56, 74). Therefore, time spent in light physical activity was determined as the difference between MVPA and sedentary behavior. This Actigraph accelerometer has been found as a valid and reliable measure of physical activity in youth (76).

Lesson Contexts

Research assistants recorded time spent in different lesson contexts of game play and management during each 20 minute game session. Time spent in management consisted of time used to instruct and guide the game session such as choosing a set of player's to be "it" and organizing children to begin a new game. All portable stopwatches used to record time spent in lesson contexts were calibrated to the exact time of accelerometers to ascertain accurate measurements of physical activity and lesson contexts.

Child Questionnaire

Children completed a brief 11 item questionnaire before and after each game session. Research assistants distributed questionnaires and pencils to the children. One research assistant read the questionnaire to the children, while the other research assistants circulated the area and answered questions. The questionnaire assessed self-efficacy, peer victimization, and enjoyment related to physically active games. A physically active game was defined as "any game that gets your body moving, heart beating faster, and breathing harder." Prior to the study, professionals with prior experience surveying children of this age reviewed the questionnaire and offered suggestions. These suggestions were discussed and appropriate changes were made.

Self-efficacy for physical activity assessed a child's perceived beliefs to successfully engage in physical activity for a specified duration. Measures were developed following Bandura's recommendations of self-efficacy (2) as well as others (36). A series of statements adapted from previously developed scales (15, 46) addressed the duration of the elimination and non-elimination games and was rated by the child using a five-point Likert-type scale of 1 as "not sure" to 5 "very sure." The internal consistency of this scale in the present study was 0.853.

Physical activity enjoyment was measured with questions adapted from the Physical Activity Enjoyment Scale (PACES) (32) which has been shown to be a reliable and valid measurement of physical activity enjoyment in adolescents (45). Children were asked a series of questions about physically active games on a five-point Likert-type scale with various endpoints such as I enjoy it/ I feel bored and I am having fun/ I would

rather be doing something else. The internal consistency of this scale in the present study was 0.807.

Peer victimization was measured based on literature and validated measures of perceived bullying and victimization from peers. The questionnaire consisted of modifications of the Gatehouse Bullying Scale (GBS) (9) and Peer Relations Questionnaire (PRQ) (61, 69) so that they were applicable to physically active games. These questions were presented using a five-point Likert-type scale of 1 as never and 5 as often. Questions pertained to feelings of teasing from peers, feelings of threat by kicking and hitting from peers, and feelings of not belonging. The internal consistency of this scale in the present study was 0.678.

Parent Questionnaire

The parent survey provided demographics such as age, gender, socioeconomic status, and ethnicity. Child physical activity was also assessed using the PACE + physical activity measure (58). This measure has been found valid and reliable for adolescent self-report of physical activity. To our knowledge, there are no valid and reliable measures of parent-reported child physical activity measures, thus the PACE+ was used to determine if a child was meeting the recommended physical activity guidelines. Socioeconomic status was assessed by whether or not child was eligible to receive free or reduced priced school meals.

Data Analyses

All data was analyzed using SAS (Statistical Analysis System, version 9.1). Differences in physical activity and questionnaire responses were evaluated for significance using a mixed effects regression model. For physical activity levels, the model included child and day nested within child as random effects and game session, weight status, and gender as fixed effects. Two separate analyses were conducted for physical activity measurements. Two separate analyses were conducted for physical activity measurements. Data was collected from the start of the first game until the end of the second game. The first analysis included data collected on physical activity, sedentary behavior and management across the two games for a total of 40 minutes. The

second analysis excluded data where time was spent managing the children from the forty minute time period , such that data only included active game play.

The same mixed model was used to evaluate psychosocial responses from the child questionnaire. For psychosocial responses, the model included child and day nested within child as random effects and observation, game session, weight status, and gender as fixed effects. Analysis of psychosocial responses consisted of four observations while analysis of physical activity consisted of two observations. Alpha level for significance was set at 0.05.

CHAPTER 4 - Results

Physical Activity

Means and standard errors of physical activity and sedentary behavior during the elimination and non-elimination games with management time are presented in Table 4-1. Children engaged in five minutes more MVPA and spent nearly 13% more time in MVPA during non-elimination games compared to elimination games. However, when examining moderate and vigorous physical activity independently, children engaged in significantly more moderate physical activity during non-elimination games, but there were no significant differences in vigorous physical activity. Children also engaged in significantly more sedentary behavior during elimination games compared to non-elimination games. There were no differences in light physical activity. Overall, when examining total activity counts, non-elimination games provided a greater volume of activity compared to elimination games ($F_{1,25} = 10.69$; $P = 0.0031$). The only gender difference that existed was that girls spent more time in sedentary behavior compared to boys ($F_{1,25} = 7.28$; $P = 0.0123$).

Means and standard errors of physical activity and sedentary behavior during the elimination and non-elimination games without management time are presented in table 4-2. More time was spent in management during elimination games (6 min 49 s) compared to non-elimination games (4 min 8 s). Notably, the only significant difference from the analysis including management time was differences in light physical activity. Children spent significantly more time in light activity during non-elimination games compared to elimination games.

Children engaged in significantly more light ($F_{1,25} = 10.35$; $P < 0.0036$) physical activity on the first day and significantly more vigorous ($F_{1,25} = 12.46$; $P < 0.0016$) physical activity on the second day, regardless of condition. Furthermore, a significant interaction between day and game condition showed that vigorous physical activity was greater during non-elimination games on the first day compared to playing non-elimination games on the second day ($F_{1,25} = 5.95$; $P < 0.0221$).

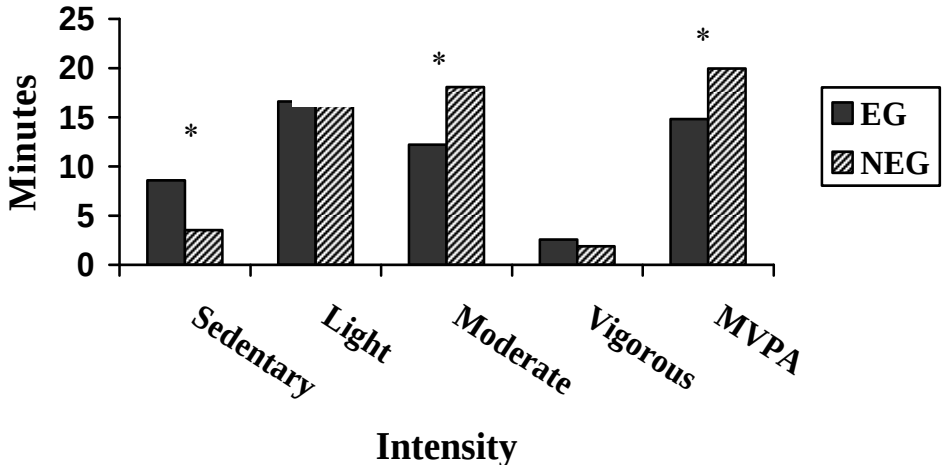
Table 4-1 Means (SE) of sedentary behaviors and physical activity with management time expressed in minutes.

Measure	Elimination	% time	Non-Elimination	% time	F-value	P-value
Sedentary	8.59 (0.84)	21.5	3.53 (0.84)	8.8	23.53	<0.0001
Light PA	16.60 (1.15)	41.5	16.52 (1.15)	41.3	0.01	0.9392
Moderate PA	12.24 (1.21)	30.6	18.08 (1.21)	45.2	18.97	0.0002
Vigorous PA	2.58 (0.51)	6.5	1.87 (0.51)	4.7	1.97	0.1725
MVPA	14.82 (1.42)	37.1	19.96 (1.42)	49.9	13.16	0.0013

Table 4-2 Means (SE) of sedentary behaviors and physical activity without management time expressed in minutes.

Measure	Elimination	% time	Non-Elimination	% time	F-value	P-value
Sedentary	8.86 (0.87)	27.0	3.66 (0.87)	10.2	19.83	0.0002
Light PA	11.07 (1.12)	33.3	13.39 (1.12)	37.2	4.38	0.0467
Moderate PA	10.82 (1.18)	32.6	17.02 (1.18)	47.4	21.17	0.0001
Vigorous PA	2.44 (0.48)	7.4	1.80 (0.48)	5.0	1.81	0.1905
MVPA	13.26 (1.39)	40.0	18.83 (1.39)	52.5	14.94	0.0007

Figure 4-1 Minutes spent in different intensity levels of physical activity during elimination and non-elimination games



Note: EG = Elimination games, NEG = Non-elimination games

* denotes significant difference between EG and NEG, $P < 0.05$

Child Questionnaire

Means and standard errors of self-efficacy, peer victimization, and enjoyment by game structure and time of measurement are presented in Table 4-3. A significant interaction between game session and time of measurement in the prediction of enjoyment showed that enjoyment increased after elimination games and decreased after non-elimination games. Simple effect comparisons of observation and condition showed a significant change in enjoyment ($P = 0.0368$) and self-efficacy ($P = 0.0310$) at pre-test but not at post-test. Simple effect comparisons also showed a significant change in enjoyment during elimination games ($P = 0.0226$) but not during non-elimination games. There were no differences in self-efficacy or peer victimization by game structure and time of measurement. After participating in both game sessions, children significantly increased self-efficacy ($F_{1,56} = 4.93$; $P < 0.0349$). Overall, there were no differences in peer victimization or gender.

Table 4-3 Means (SE) of psychosocial responses by game structure and time of measurement.

Variable	Elimination		Non-Elimination		F value	P value
	Pre	Post	Pre	Post		
Self-efficacy	3.97 (0.23)	4.21 (0.23)	4.18 (0.23)	4.24 (0.23)	1.31	0.2569
Peer-Victimization	1.60 (0.19)	1.63 (0.19)	1.69 (0.19)	1.56 (0.19)	1.42	0.2386
Enjoyment	4.41 (0.11)	4.54 (0.11)	4.57 (0.11)	4.50 (0.11)	6.46	0.0138

Note: F and P values are representative of game structure by time of measurement interaction.

CHAPTER 5 - Discussion

The results support our primary hypothesis that children engaged in more MVPA during non-elimination games compared to elimination games. Children engaged in over five minutes more MVPA and consequently engaged in five minutes less sedentary behavior during non-elimination games compared to elimination games. Also, children spent nearly 50% of the time in MVPA during non-elimination games and only 36.5% of the time in MVPA during elimination games. These results are comparable to other studies that have objectively measured physical activity during a single game session. Arnett and Lutz (1) measured physical activity via accelerometry in 60 girls in grade 8 during small-sided, game-based lessons of floor hockey and soccer. They found that regardless of ability level, girls spent an average of just over 56% of the time in MVPA. These results may be comparable to non-elimination games since all the girls participated in the game sessions at all times. Another study objectively measured student physical activity levels in 19 seventh-grade boys during a single session of floor hockey (29). They found that boys regardless of skill level, spent 60.8% of the time in MVPA during formal competition of ice hockey. This higher percentage may be attributable to a number of differences in study population such as gender and age. Also, these results may not be comparable to non-elimination or elimination games since students not playing in the formal competition engaged in other roles as scorekeepers, referees, and peer coaches. A more recent study objectively assessed physical activity during three types of youth sport of basketball, soccer, and football in 119 boys 6-12 years old (84). They found that approximately 49% of the time was spent in MVPA. However, it is unknown if participation in the sports varied among players and therefore may not be able to compare these results to non-elimination or elimination games.

In addition to studies that have objectively measured physical activity, a few other studies have used direct observation to measure physical activity during physically active games. McKenzie et al. (41) measured physical activity using the SOFIT (System for Observing Fitness Instruction Time) observation tool during 430 middle school physical education lessons. They found that during game play, children spent 50.2% of the time in MVPA. Expanding from this study, McKenzie and colleagues (39) observed 431

physical education lessons targeting girls in grades 6-8. The results were similar to the previous studies with 46.2 % of time spent in MVPA during game play. Clearly, the results of these direct observation studies during game play parallel the results of our study and other studies using accelerometry. Although these results are similar, it is unknown if the games observed in these SOFIT studies were characteristic of non-elimination games, elimination games, or both.

One advantage of the SOFIT observation tool is measurement of time spent in different lesson contexts such as game play, fitness activities, free play, skill drills, knowledge, and management. In this study, we also recorded time spent in the lesson contexts of game play and management. More time was spent in management during elimination games compared to non-elimination games most likely because of the need to repeatedly begin new games within a 20 minute game session. Previous SOFIT studies have found that time spent in management ranged from 21.1% to 31.0% of the time during physical education lessons (39-42). In this study, the percentage of time spent in management was 17% and 10.3% for elimination and non-elimination games, respectively. These lower levels of management time may be explained by the methodology used to record management time. Research assistants only recorded time spent in management during game play and did not include time needed to explain instructions prior to the beginning of a game session since the primary purpose of this second analysis of physical activity was to determine if time spent solely in game play differed from time spent in both game play and management lesson contexts.

One interesting finding in the analysis of game play including management showed children engaged in more vigorous physical activity during elimination games although this was not significant. Therefore, physical activity was analyzed solely during game play to determine if this difference in vigorous physical or other levels of physical activity would strengthen. The second physical activity analysis did not find differences in vigorous physical activity, but did find differences in light physical activity. During sole game play, non-elimination games provided more light physical activity whereas during game play including management no differences were found. In addition, during sole game play the amount of moderate physical activity and MVPA provided during non-elimination games was strengthened. These results further support our primary

hypothesis that non-elimination games provide more MVPA compared to elimination games, regardless of time spent in management.

The secondary purpose of this study was to examine psychosocial responses prior to and after game sessions. Contrary to our hypothesis, the only difference found between the structured physically active games and psychosocial assessments was a time of measurement by game condition effect showing that children increased enjoyment after playing elimination games and decreased enjoyment after playing non-elimination games. However, there was no difference in the main effect of game condition on enjoyment. Enjoyment scores were high for both game conditions but there was a difference in the direction of the change in enjoyment. These results suggest a possible difference in enjoyment responses during elimination and non-elimination games, yet this study should be replicated in a larger sample to make such conclusions that children enjoy elimination games more than non-elimination games. Although this preliminary study suggests that children may enjoy elimination games more than non-elimination games, no data was collected to examine why children feel this way.

Previous qualitative studies have investigated why children enjoy particular sports. Wankel and Kreisel (82) have identified three broad sources of enjoyment of intrinsic, social, and extrinsic factors. In this study of a sample of children 7-14 years, all sources of enjoyment were found important in the prediction of youth sport enjoyment with intrinsic factors as most important and extrinsic factors least important.

A recent qualitative study of children ages 11-12 years found that social recognition of competence, encouragement, excitement, and challenge as the most reported sources of enjoyment (37). One reason why children enjoy elimination games more than non-elimination games could be explained by sources of enjoyment. During elimination games, the recognition of winning and recognition of competence may be viewed as an external reward and a valuable source of enjoyment for some children. In addition, excitement and challenge are also more characteristic of elimination games compared to non-elimination games, suggesting that excitement and challenge may account for some of the differences in enjoyment.

Moreover, there are several theories of youth physical activity enjoyment that may further explain these differences in enjoyment. These theories include achievement

goals and the theory of task-ego orientations (48), Intrinsic Motivation and Self Determination Theory (17), Sport Commitment Model (65), and Competence Motivation Theory (28). However, the sources of enjoyment or constructs of enjoyment theories were not examined in this study. Future research may investigate these theoretical approaches to gain a more thorough understanding to why children enjoy physically active games.

An alternative interpretation why children may favor elimination games more than non-elimination games is familiarity of competitive games or games that imitate characteristics of elimination games. One study has provided evidence that children may enjoy competitive games because of familiarity (43). This study examined cooperative sport structures in two different samples of children in grades 7 and 8. One sample of children was from a unique, isolated community in northern Canada comprising mostly of Native Americans who traditionally engaged in cooperative sports. The other sample of children was from a larger city in southern Canada who traditionally engaged in competitive sport structures. Both samples of children played a similar cooperative game of broomball and completed a questionnaire assessing after playing the game. Nearly 85% of girls and 45% of boys from northern Canada responded positively toward the game, while only 57% of girls and 9% of boys from southern Canada responded positively toward the game. When the children from northern Canada were asked if they would ever want to play this game again 33% responded yes, 67.6% responded maybe, and no children responded no. When the same question was asked to the children from northern Canada, only 5% responded yes, 55% responded maybe, and 38% responded no. Furthermore, this study was also replicated in a younger sample of elementary children from southern Canada and demonstrated that younger children are more willing to accept cooperative games and cooperative games become more acceptable with repeated exposure. The results of this study may suggest that children are familiar with characteristics of elimination games and therefore may be attributable to the increased enjoyment reported after playing elimination games compared to non-elimination games.

Although there were no differences in self-efficacy between the two different structured games, children did significantly increase self-efficacy after playing both game sessions. These results support Bandura's theory of self-efficacy (3) and confirm

findings of others studies that have found an increase of physical activity is associated with increases in self-efficacy (36). Specific to youth populations, a recent study by Dwzewaltowki and colleagues (19) found that changes in MVPA were associated with changes in self-efficacy over time in middle school students.

A notable and confounding finding existed between day and the amount of physical activity. Children engaged in more light physical activity on the first day of the study and more vigorous physical activity on the second day, regardless of which game condition they played. Although it is unclear why this occurred, we speculate that these differences may be explained by excitement of playing a new game, excitement of the approaching weekend, differences in instructor behavior, or differences within the individual. Moreover, there was a significant interaction between day and game condition. Children engaged in more vigorous physical activity during non-elimination games on the first day compared to playing non-elimination games on the second day. This suggests that children react differently to the order that games are played. Other environmental factors such as peers and group instructors may influence physical activity.

A major strength of this study was the objective assessment of physical activity along with measurement of time spent in management and game play lesson contexts. Several studies have measured physical activity during a variety of settings including physical education, recess, and organized sports but failed to objectively measure physical activity or determine the time spent solely in game play. In this study, we were able to objectively quantify the amount of physical activity provided during the two structured games as well as analyzing this amount of physical during the lesson contexts of game play and management. Evaluating physical activity during both lesson contexts provided stronger evidence of any differences that occurred between elimination and non-elimination games. To our knowledge, this was also the first study to assess self-efficacy, peer-victimization, and enjoyment prior to and after a single game session. Assessments both prior to and after game sessions provided information of the immediate impact that the game sessions may have had on psychosocial responses. Another important strength of this was study includes the methodology of conducting a randomized controlled trial that was counterbalanced across two days and the use of

evidence-based games. Finally, this study fills a gap in the literature regarding children's in grades 4 to 6. Most previous literature of youth physical activity has examined early elementary school age children or middle school age children.

Along with the strengths of this study, there were also several limitations. Given the small sample size of children participating in this study, the results may not accurately represent other children of this age. The small sample size also limited other analyses of other possible moderating factors such as weight status and gender that have been found significant in recently published studies examining objective physical activity (11, 67, 77). A second limitation was the use of the broad term of physically active games to assess psychosocial responses on the child questionnaire. This term may be too vague and an inaccurate measure to truly explain differences in psychosocial responses during non-elimination and elimination games. Furthermore, the results of this study describes whether children perceive games as enjoyable or not, but does not explain why. Gaining a more thorough understanding of why the game is fun such as because it is highly competitive or a winner is chosen could be more valuable. A third limitation was a low internal consistency for the peer victimization scale used in this study. However, this value is just slightly lower than the acceptable consistency of 0.70. A fourth limitation was the evaluation of only two non-elimination games and two elimination games because of time, easy set-up, and game popularity. It is unknown if other games will provide similar results. A fifth limitation was the use of a 30 second epoch to determine physical activity levels. This frequent sampling method of 30 seconds has been reported as a more accurate time interval to assess child physical activity compared to one minute sampling (51). Yet, a higher frequency sampling method of 15 second epochs may more accurately distinguish concise bouts of vigorous physical activity (4). Consequently, the quantity of vigorous physical activity performed by children playing physically active games in this study may be underestimated since a 30 second epoch was used. A sixth limitation was the differences that existed between physical activity and days that games were played. It is unclear why children engaged in significantly more light physical activity on the first day and significantly more vigorous physical activity on the second day. These differences could be attributed to a number of factors previously discussed. However, it is also important to note that differences in day only occurred for light and

vigorous physical activity and differences in day by condition only occurred for vigorous physical activity.

Although data from this study provided substantial information about psychosocial responses and the amount of physical activity during non-elimination and elimination games, there are several unanswered questions that present implications for future research. First of all, results of enjoyment responses showed that children enjoyed elimination games more than non-elimination games, yet failed to determine why children responded this way. Qualitative research has been acknowledged as increasingly important to public health evidence (18) and may offer more extensive insight into child experiences and perceptions of motives and barriers during these physically active games (73). It is also important to note that the elimination games used in this study may reinforce physical activity behavior because a child has a chance to win the game, whereas there was no reinforcement of physical activity behavior during non-elimination games. Future studies should investigate reinforcement of physical activity behavior during structured games and determine if reinforcement may account for differences in enjoyment. Future studies should also investigate other potential factors that may influence physical activity behavior during game play such as weight status, instructor behavior, and physical fitness.

In summary, this study was the first to provide scientific evidence of differences between non-elimination and elimination games. The results provide preliminary evidence that non-elimination games offer more opportunity for MVPA compared to elimination games. This evidence may be beneficial to physical education leaders and other professionals directing child physical activity; such that non-elimination games meet the 2010 Healthy People goal of approximately 50% of the class time spent in MVPA (78) and highlights the importance of quality over quantity in structured physical activity of children. This study also introduces differences in enjoyment responses between non-elimination and elimination games. Although children increased in enjoyment from elimination games compared to non-elimination games, children reported high enjoyment scores for both structured games. Thus, it is important to promote non-elimination games to achieve greater physical activity participation but also

important to monitor enjoyment responses to promote a healthy, but fun environment for children.

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Appendix A - Recruitment Flyer

Want to have fun the last few days of summer?

L.I.F.E. 4 KIDS DAY CAMP

FOR CHILDREN ENTERING GRADES 4-6

You're guaranteed to have lots of fun before you go back to school!

Days: Aug. 6-10th

Time: 8-11AM

Location: Ahearn gymnasium on KSU campus

Cost: $10.00

Activities: Lots of games, contests, theme days, fun, and much more!

What to wear: Please wear athletic shoes and comfortable clothes

Themes:

Monday crazy socks day
Tuesday funky t-shirt day
Wednesday wild hair day
Thursday inside out day
Friday dress like someone famous

Snack will be provided daily and kids will receive a t-shirt

To sign up or for more information please contact:

Karla Bruggeman
Community Health Institute
Kansas State University
Phone: 419.733.0415
Email: karlab@ksu.edu

Appendix B - Informed Consent

July 18, 2007

Dear Parent/Guardian:

Thank you for your interest in the L.I.F.E. 4 KIDS Day Camp! As a part of this five day camp, some data will be collected and used in a master's thesis project. Data will be collected to evaluate differences between physically active games. This project is directed by K-State Community Health Institute at Kansas State University under the team of Dr. David Dzewaltowski, Dr. Melissa Bopp, and Dr. Beth Fallon.

I believe that this project will expose your child to new and different games as well as providing valuable information on more favorable physical education games for health care professionals working with youth populations. **Please help make this project a success by completing the attached permission slip.** Feel free to contact me if you have any questions or concerns.

Thank you for your consideration!

Sincerely,

Karla Bruggeman
Community Health Institute
Natatorium 7
Kansas State University
Phone: 419-733-0415
Email: karlab@ksu.edu

Sincerely,

David Dzewaltowski, Ph.D.
Professor and Head Department of Kinesiology
Director of Community Health Institute
Kansas State University
Phone: 785-532-6765

L.I.F.E.4 kids day camp!: Elimination versus non-elimination games project

Project Information. This project is designed to evaluate differences in physically active games of children in 4th-6th grades. The project is directed by Community Health Institute at Kansas State University under the team of Dr. David Dzewaltowski , Dr. Melissa Bopp, and Dr. Beth Fallon. Results from this project will be used to improve physical activity in youth and provide direction to physical education leaders and other health professionals on the type of game environments that provide more favorable outcomes. This study was approved on 7/16/07 by the K-State Institutional Review Board.

What is involved? This is a five day camp. On one day of the camp, children will have their height and weight measurements taken. Research assistants will distribute a short survey consisting of 11 questions about confidence to be physically active, enjoyment of physical activity, and peer influence while being physically active. The survey should take about 5-10 minutes. Children will then play physically active games. These games will be played on two separate days. Two games will played each day and each game will last 20 minutes with a 10 minute break between the end of game one and the beginning of game two. Children will be asked to

wear an accelerometer while playing the elimination and non-elimination games. An accelerometer is a small device that measures physical activity and is worn on the hip like a beeper or pedometer. Following the games, children will complete the 11 question survey, return the accelerometers, and will move on to the next activity of the camp. Parents will also be asked to complete a concise 7- item questionnaire.

Information is confidential. Student names and parent names will be replaced with ID numbers on surveys. No one will be allowed to connect student names with their height and weight or answers on the surveys.

Potential benefits and concerns. As stated above, your son or daughter's answers to the survey will be kept completely confidential. Benefits of being a part of this project is an opportunity for exposure to different types of physical activity, making new friends, and enjoying the final days of summer.

Participation is voluntary. Your son or daughter's participation in this study is completely voluntary. There will be no penalty if you do not wish for your son or daughter to participate. They may withdraw at any time during the study and refuse to answer any of the questions.

Institutional Review Board Chair Contact/ Phone Information. Any further questions concerning research may be discussed with an official of the university listed below:

- Rick Scheidt, Chair, Committee on Research Involving Human Subjects, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224.

_ _

→ Please check one box, sign, and return to the contact listed below as soon as possible:

- ❑ I will allow my child to participate in this project.
- ❑ I do not want my child or myself to participate in this project.

Parent Name: _____ _____
(Please print) (Date)

Parent Signature: _____

Child's Name: _____

Child's Signature: _____

Please return completed form to:

In Person:

The front desk of the L.I.F.E. program
Located in Ahearn Field house
Use front entrance off Denison Ave
Pass through 2 sets of doors and the
L.I.F.E. room will be located on the right.
Room 4

By Mail:

Karla Bruggeman
Community Health Institute
Natatorium 7
Kansas State Univer0sity
Manhattan, KS 66506

Appendix C - Enrollment and Medical Release Form

L.I.F.E. 4 Kids Day Camp 2007

Enrollment and Medical Release Form

Child:

Last name_____**First name**_____**MI** ___ **Birth date** _____

Address _____ **City** _____**State** __ **Zip** _____

Phone: _____ **Gender:** M F (please circle)

T-shirt size: XS S M L XL (please circle)

Parents/Guardians:

Father's name _____ **Address**_____**Phone**:_____

Mother's name _____ **Address**_____**Phone**:_____

Email _____ (optional)

List any medical problems that may limit or may interfere with play at this camp

_____

_____

List any food allergies

_____

Emergency Contacts:

Person to notify _____ **Relationship** _____**Phone** _____

Doctor to notify_____**Phone** _____

Publicity Release

I authorize Kansas State University to photograph my child's image for use in research, educational, and promotional programs. I also recognize that these images are the property of Kansas State University.

[ ] Yes, I authorize the use of my child's images

[ ] No, I do not authorize the use of my child's images

Release

The undersigned, being a parent or legal guardian of the child requesting admittance to the L.I.F.E. 4 Kids Day Camp 2007, does hereby affirm that the applicant is in good health and suffers from no illness, disability or condition that requires the taking of medication on a regular basis unless that condition is disclosed above and approved. Furthermore, the undersigned has no knowledge of any reason the applicant cannot participate in vigorous physical activity.

The undersigned hereby expressly agrees to be responsible for any medical bills incurred in the treatment of any illness or accident of the applicant. In the event of any such accident or injury, I hereby consent to allowing any of the camp supervisors to procure any medical treatment deemed advisable and necessary on behalf of my child or ward without prior consent. I understand and acknowledge that no primary medical insurance is provided by the L.I.F.E. Program or by Kansas State University.

The undersigned, in consideration of the applicant's participation in the L.I.F.E. 4 Kids Day Camp, on behalf of the applicant hereby releases Kansas State University, the State of Kansas, and their officers, agents, and employees from any and all liability for personal injury or property damage arising out of or connected with said participation, including liability for negligence.

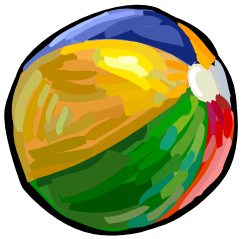
Printed Name of Parent/ Legal Guardian _____ Date _____

Signature of Parent/ Legal Guardian _____

Appendix D - Child Survey

Name _____

How sure are you that you can	Not sure at all		Somewhat sure		Very sure
1. play physically active games for 10 minutes straight	O	O	O	O	O
2. play physically active games for 20 minutes straight	O	O	O	O	O
3. play physically active games for 30 minutes straight	O	O	O	O	O
4. play physically active games for 40 minutes straight	O	O	O	O	O



When I play physically active games, I feel…….	Never		Sometimes		Often
1. I have been teased in a bad way	O	O	O	O	O
2. I have been left out or I do not belong	O	O	O	O	O
3. I have been threatened by being hit or kicked	O	O	O	O	O

When I play physically active games ……..

1. I enjoy it	1	2	3	4	5	I feel bored
2. It's a lot of fun	1	2	3	4	5	It's no fun at all
3. I like it	1	2	3	4	5	I don't like it
4. I want to keep playing	1	2	3	4	5	I would rather be doing something else

Appendix E - Parent Survey

Your name _____ Your child's name _____

1. Your child's gender? (mark one)
   - O male
   - O female

2. What is your child's date of birth? (for example: 1/24/1997)

month	day	year

3. How would you describe your child? (select one or more)
   - O American Indian or Alaska Native
   - O Asian
   - O Black or African American
   - O Hispanic or Latino
   - O Native Hawaiian or Other Pacific Islander
   - O White
   - O Don't know/ Not sure
   - O Prefer not to answer

4. Is your child eligible to receive school breakfast or lunch for free or at reduced cost? (mark one)
   - O Yes
   - O No
   - O Prefer not to answer

5. For yourself and the other adults in the household, indicate the highest level of education completed (mark one in each column)

Mother/ Female Adult	Father/ Male Adult
O Less than high school	O Less than high school
O High school	O High school
O Some college or associates degree	O Some college or associates degree
O Graduated college	O Graduated college
O Master's degree or above	O Master's degree or above
O Not applicable	O Not applicable

6. During a *typical* week, how many days is your child physically active for 60 minutes per day?

O	O	O	O	O	O	O
1	2	3	4	5	6	7

7. *Over the past 7 days*, on how many days was your child physically active for a total of at least 60 minutes a day?

O	O	O	O	O	O	O
1	2	3	4	5	6	7

Thank you!

Appendix F - Camp Evaluation

Camp Evaluation Form

Dear Parents:

Thanks for making L.I.F.E. 4 Kids Day Camp 2007 a success. We had a very fun-filled week with your kids! We hope to make this an annual camp. Please take a few minutes to answer the following questions to help improve the camp in the future.

The L.I.F.E. 4 Kids Day Camp Staff ☺

Please circle your answer for questions 1-7:

1) How did you find out about the camp?

KSU advertisement Mercury Boys and Girls Club
1350 KMAN radio Public Building flier Other_____

2) Which location did you prefer? Ahearn Brandeberry No preference

3) Were you satisfied with the camp? strongly agree agree neutral disagree stongly disagree

4) Did your child like the camp overall? strongly agree agree neutral disagree stongly disagree

5) Did your child like the games? strongly agree agree neutral disagree stongly disagree

6) Did your child like the snack? strongly agree agree neutral disagree stongly disagree

7) Would you enroll your child again? strongly agree agree neutral disagree stongly disagree

8) Do have any other suggestions for improvement?

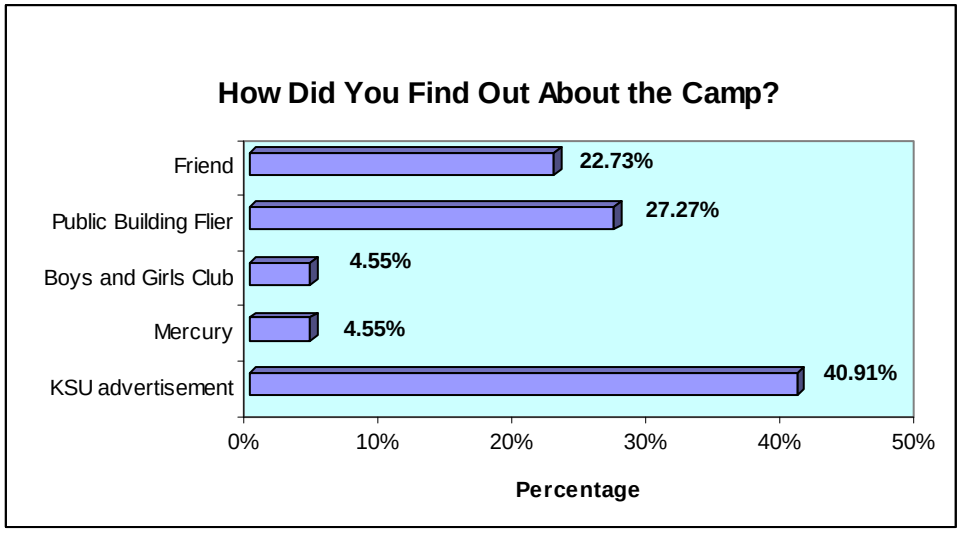
_____
_____
_____
_____
_____

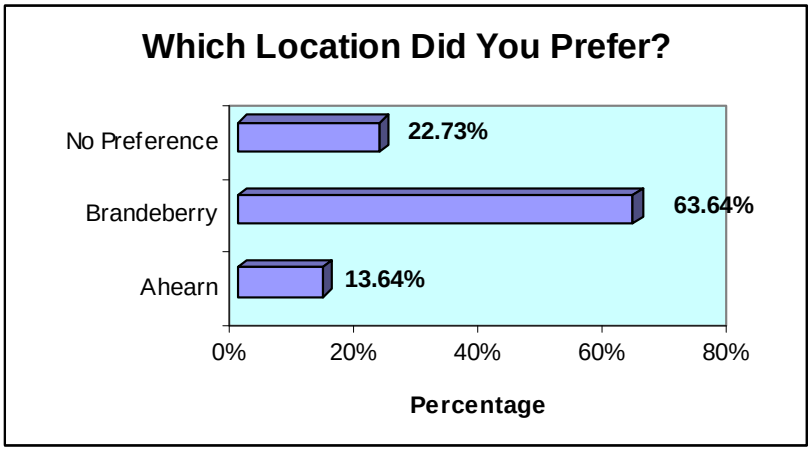
Please return this in the stamped envelope provided. Thank you!

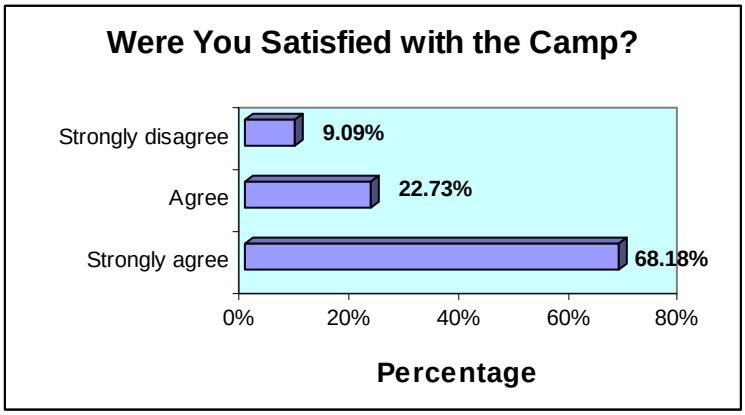
Camp Evaluation Results

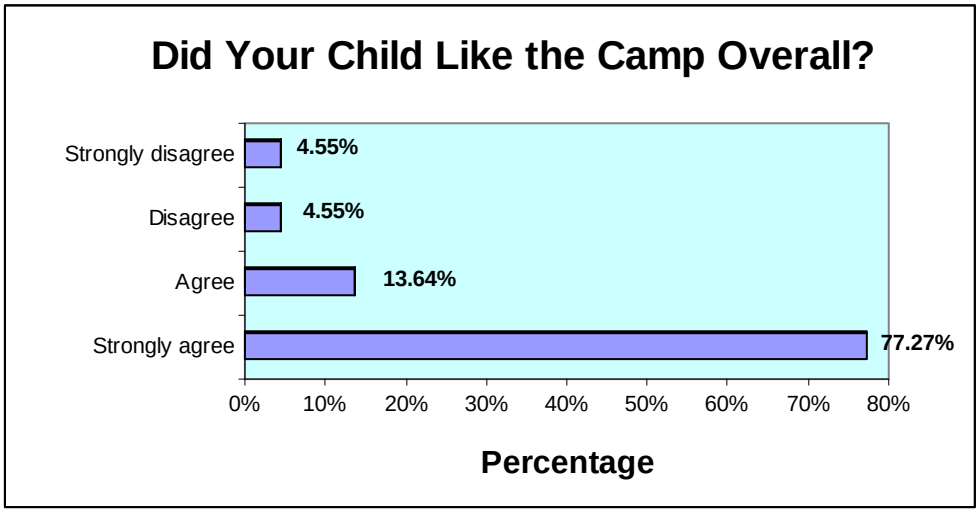
Results of Parent Evaluation of L.I.F.E. 4 Kids Day Camp 2007

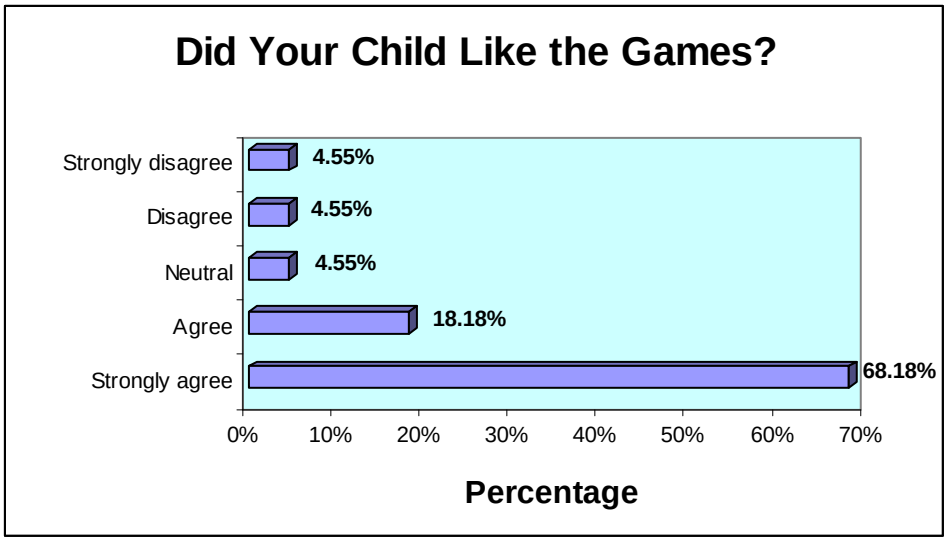
A total of 22 of a possible 30 parents (73.3%) completed the brief evaluation form. The answers and feedback are shown below.

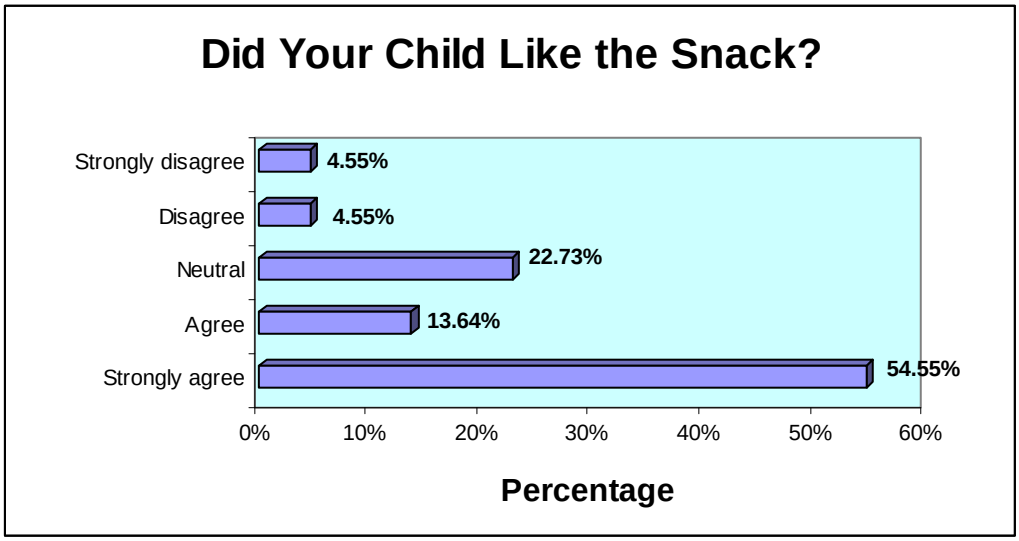


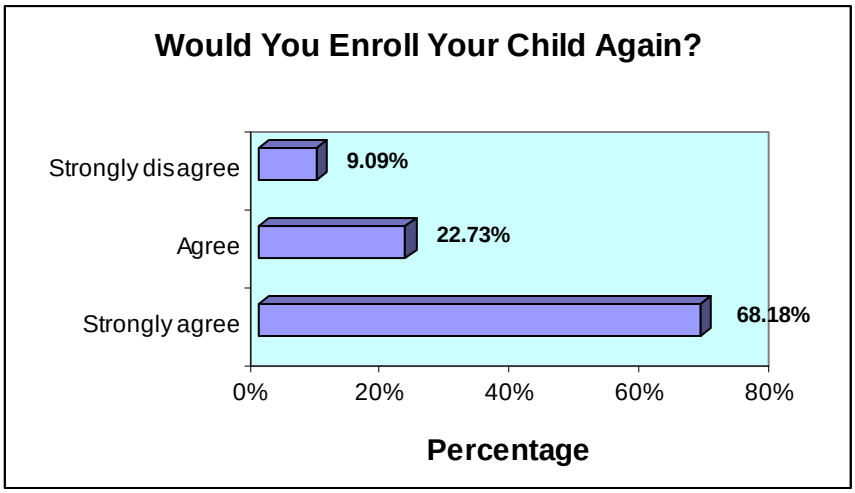



Were You Satisfied with the Camp?
Strongly disagree
Agree
Strongly agree
9.09%
22.73%
68.18%
0%
20%
40%
60%
80%
Percentage


Did Your Child Like the Camp Overall?
Strongly disagree
Disagree
Agree
Strongly agree
4.55%
4.55%
13.64%
77.27%
0%
10%
20%
30%
40%
50%
60%
70%
80%
Percentage


Did Your Child Like the Games?
Strongly disagree
Disagree
Neutral
Agree
Strongly agree
4.55%
4.55%
4.55%
18.18%
68.18%
0%
10%
20%
30%
40%
50%
60%
70%
Percentage





Additional Comments:

My son really enjoyed the camp, I think he would have preferred it to be both longer each day as well as more than 1 week in length. The Brandeberry facility was very nice, but the reason that we had signed up was because Ahearn was just across the street from my office...

She had a great time, thanks!

On the last day my son was , unfortunately (and accidentally) injured. He received 4 stitches on his 'ring' finger of his left hand. Other than that my son always gave me good feed back about the camp.

My son doesn't normally participate in camps but he had so much fun and enjoyed everything about it! He would definitely like to participate again. Thanks!

If you continue to use the K State facilities, parking is an issue for drop off and pick up. Perhaps have a designated area and someone out there shuffling the kids into and out of cars.

My daughter was very interested to learn about the nutritional facts in regards to eating out - she even made the comment she will start watching more about what she eats.

My son would love to attend this camp again next year, but he will be 13 yrs old. So maybe you can put on a camp like this one for older children as well. Thanks again for everything

Please continue to have this camp.. my son enjoyed it and my daughter is looking forward to going!!!!!

My son had a good time. Fruits and/or veggies for snacks was suggested by him.

There was so much energy from the staff. My son came back everyday and said that he really enjoyed himself and looked forward to going back. You all were creative with the theme days and I hope you can do this camp again. I definitely spread the word about you.

Different games. Better "cooler" themes

We really enjoyed the program and hope next year younger age groups will be able to attend.

Parking passes. Include younger age program. Closer supervision with young boys, they all seem to want to prove themselves bigger and stronger.