

PHYSICAL ACTIVITY DURING RECREATIONAL YOUTH SPORT: DOES COACH
TRAINING HAVE AN INFLUENCE?

by

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Abstract

Background: This study examined youth moderate-to-vigorous physical activity (MVPA) levels during flag football practice and compared youth MVPA in practices led by trained or untrained, and by experienced or inexperienced coaches.

Methods: Boys ($n = 111$, mean age = 7.9 ± 1.2 years) from 14 recreation flag football teams wore an accelerometer during two practices. Each team's volunteer head coach reported prior training and coaching experience.

Results: Mixed-model team-adjusted means showed the proportion of practice time spent in sedentary ($13 \pm 1\%$), MVPA ($34 \pm 2\%$), and vigorous ($12 \pm 1\%$) activity. Practice contributed ~20 minutes of MVPA towards public health guidelines. There was no significant difference in percentage time spent in MVPA between teams with trained (mean = 33.3%, 95% CI = 29.4%, 37.2%) and untrained coaches (mean = 35.9%, 95% CI = 25.5%, 42.4%) or between experienced (mean = 34.1%, 95% CI = 30.2%, 38.0%) and inexperienced coaches (mean = 33.8, 95% CI = 27.9%, 39.7%).

Conclusion: Although sport provides a setting for youth to be physically active at a moderate to vigorous level, two-thirds of practice was spent sedentary or in light activity. Having participated in a coach training program was not associated with higher MVPA. Further research is needed to inform volunteer coach training programs that provide coaches with skills necessary to increase the percentage of practice time spent in MVPA.

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Preface

In accordance with requirements of the degree of Master of Public Health at Kansas State University, this report serves the dual purpose of presenting a master's thesis and a field experience report. The report is presented in three chapters: a review of the literature, an original research report, and a field experience report.

Chapter 1 presents an original research report examining physical activity levels during youth recreational flag football. The study examines to what extent coach training and coach experience influences a child's physical activity levels.

Chapter 2 reviews the literature on leader behavior strategies that are optimal for children's physical activity within behavior settings. This chapter will provide an overview on the classroom ecology of physical education as well as an overview of intervention strategies of other youth settings targeting leader behavior.

The final chapter describes a field experience project focused on measuring food waste in two elementary school lunchroom. The chapter presents an overview of the field experience, as well as results of two food waste assessments.

Chapter 1 - Physical Activity During Recreation Youth Sport: Does Coach Training Have an Influence?

Background

Participation in physical activity (PA) has been associated with numerous health benefits in children and adolescents, including decreasing the risk of type 2 diabetes, hypertension, heart disease, and osteoporosis (Janssen & Leblanc, 2010). Current physical activity [PA] guidelines recommend children to accrue 60 minutes of moderate-to-vigorous physical activity (MVPA) per day, a portion of which should be vigorous activity (VPA) at least 3 days per week (U.S Department of Health and Human Services, 2008). Despite the evidence for the benefits of PA, less than half of 6-11 year olds and only 8% of 12-15 year olds in the United States meet PA guidelines (Troiano et al., 2008).

One suggested strategy to increase MVPA among youth is participation in developmentally age-appropriate sports (School Health Council on Sports Medicine and Fitness and Council on School Health, 2006). Children who participate in youth sport have higher MVPA than their non-participating counterparts, and accumulate more MVPA during sport days compared to non-sport days (Nelson et al., 2011; Wickel & Eisenmann, 2007). Compared to other physical activity settings, youth sport has been shown to contribute more minutes of MVPA to daily totals than either physical education (PE) or recess (Wickel & Eisenmann, 2007).

In the United States an estimated 44 million children and adolescents participate in youth sport (National Council of Youth Sports, 2008). A survey by the Women's Sports Foundation Research Project (Sabo & Veliz, 2008) reported that 84% of 3rd-12th graders had participated in youth sport and 72% were current participants (i.e., participated on a youth sport team one or

more times in the past year). Of these, 55% of 3-8th graders participated in a community-based sport program, such as parks and recreation. Therefore, youth sport is a setting with the potential to reach a large number of children to have a public health impact (Kokko, Green, & Kannas, 2013).

Although youth sport contributes to daily MVPA, approximately half of youth sport time is spent in either sedentary or light activity (Guagliano, Rosenkranz, & Kolt, 2013; Leek et al., 2011; Sacheck et al., 2011; Van Den Berg & Kolen, 2015; Wickel & Eisenmann, 2007). Studies conducted in youth sport have shown that a range of 30–53% of available practice or game time is spent in MVPA for soccer, baseball, softball, basketball, netball, and ice hockey (Cohen, McDonald, McIver, Pate, & Trost, 2011; Guagliano et al., 2013; Leek et al., 2011; Sacheck et al., 2011; Van Den Berg & Kolen, 2015; Wickel & Eisenmann, 2007).

One way to increase daily amounts of physical activity is to increase the percentage of time during youth sport practices that children are active. Coaches are key leaders of the youth sport setting, leaders who likely provide the structure that contributes to the variability in percentage of active time. As youth sport programs primarily utilize volunteer coaches, often with little coaching experience or training, (Conroy & Coatsworth, 2006; Seefeldt & Ewing, 1997) providing coach training may provide the skills necessary to conduct an active practice. Therefore, this study has two objectives: 1) to report PA levels during practice time for parks and recreation youth flag football participants; and 2) to compare youth PA levels between teams with trained coaches versus untrained coaches, and between teams with experienced coaches versus inexperienced coaches. We choose flag football because over one million high school boys compete annually in school football programs, more than double the amount who participate in basketball or baseball (The National Federation of State High School Associations,

2014). As such, a large number of boys are likely to also partake in a youth football experience, such as recreational flag football. Our first hypothesis was that children would spend less than 50% of flag football practice time in MVPA. Our second hypothesis was that coaches who had received prior coach training or had prior experience coaching football would conduct practices that resulted in higher MVPA than their untrained or inexperienced counterparts.

Methods

Setting

Youth flag football teams participating in a parks and recreation league in a Midwestern city of >50,000 residents were targeted for recruitment for the study (Figure 2-1). The league ran from the last week of August until the last week of October, with teams practicing once or twice weekly, and playing one game per week, for a total of 8 games per season. Teams were grouped by school grade level into the following 3 leagues: 1st/2nd, 3rd/4th, and 5th/6th. All 24 teams in the 1st/2nd or 3rd/4th grade league were eligible for the study, of which 15 volunteered for participation. One team was excluded due to scheduling conflicts. The Institutional Review Board of the study authors' university approved this project.

Participants

Of 126 youth enrolled on participating teams, 112 (91%) provided parental informed consent to participate in the study. Fourteen children did not return parental consent forms. One female was excluded, resulting in 111 male participants, ranging in age from 5–11 years (7.9 years, SD = 1.2) (See Table 2-2).

Measures

Physical Activity

Physical activity was assessed using ActiGraph GT1M accelerometers (ActiGraph; Pensacola, FL). ActiGraph accelerometers are the most widely used accelerometer in PA research, and have been validated against criterion measures to quantify PA in youth (Cain, Sallis, Conway, Van Dyck, & Calhoun, 2013; Trost, Mciver, & Pate, 2005). In order to capture sporadic movement of children, especially in the flag football setting, 15-second epochs were used (Cain et al., 2013; Trost et al., 2005). PA was assessed from scheduled practice start time until practice completion.

To be included in analysis, boys had to arrive at practice within 30 minutes after the start of practice. After data collection, stored epochs were downloaded into ActiLife v6.6.3 where all data outside of each participant's accelerometer wear times were excluded. An age-specific cutpoint, validated for the participants' age group, was applied to determine time spent in sedentary (≤ 100 counts per minute, CPM), light (101–2295 CPM), moderate (2296–4011 CPM), and vigorous activity (≥ 4012 CPM) (Evenson, Catellier, Gill, Ondrak, & McMurray, 2008).

Classification of coach training and experience

Coaches completed a short questionnaire regarding demographic information, in addition to past coach training and past coaching experience. Coach training was defined as any of the following: a degree related to coaching; coach certification; coach training workshop; or National Youth Sport Coaching Association Training (NYSCA, provided free of charge to all coaches through city Parks and Recreation program). Prior coach experience was defined as having coached football at least once prior to the current season, regardless of competition level (e.g., school competitive, non-school affiliated competitive, or recreation). Coaches were categorized for three comparisons: trained or untrained; received NYSCA training or did not receive NYSCA training; and prior experience coaching football or no prior experience coaching football.

Child Demographics

Child demographic characteristics including child and caregiver date of birth, gender, race, socioeconomic status (via free or reduced lunch status, and caregiver education level) were obtained through a parent questionnaire.

Procedures

Data Collection

For each of the participating teams (n = 14) a research assistant attended a practice or parent meeting to introduce the project to parents, familiarize children with the accelerometers, and collect parent and coach consent and survey information. Coaches were asked to handle distribution and collection of consent forms for parents absent from the initial meeting. Only children with parental consent were included in the study.

During September and October, one or more research assistants attended two practices per team, allowing at least 14 days between the first and second practice for each team. Research assistants placed accelerometers on each consenting child as he arrived to practice, and removed it upon practice completion. Accelerometers were placed on the right hip of the child, underneath the shirt, so as to avoid interference with flags the children wore. Practice beginning and end times, as well as each child's accelerometer on-and-off times were recorded using a universally synchronized clock.

Statistical Analysis

A three-level model (team, time, child) examined the impact of coach experience (previous coaching, no previous coaching), coach training (trained, untrained), or NYSCA training (NYSCA training, no NYSCA training) and time during season (Early, Late) on physical activity responses (sedentary, moderate-to-vigorous, vigorous) using SAS Proc Mixed (SAS

version 9.4). Team, Team*Day, and Child were random effects. Percentage of time and absolute minutes spent in each PA intensity were presented.

Results

Team Characteristics

All 14 team coaches were male (mean age = 40.1 years, SD = 12.5, See Table 1-1). The majority of team coaches were Non-Hispanic Caucasian (78.6%, n = 11) and had at least a college degree (64%, n = 9). Survey responses indicated that 10 (71%) coaches had received coach training prior to practice observation, in the form of workshops (n = 3), certifications (n = 3) or city-provided NYSCA training (n = 7), while 4 (29%) coaches had received no prior training. Ten (71%) had coached football before (any competition level) and 4 (29%) had no prior experience coaching football.

Practice duration ranged from 27 to 90 minutes with a mean of 61.5 (SD = 8.6) minutes.

Participant Characteristics

Participant characteristics are displayed in Table 1-2. The majority of children were Non-Hispanic Caucasian (78%), had parents who were Non-Hispanic Caucasian (82%), and did not qualify for free or reduced lunch (71%). Most mothers and fathers reported achieving at least a college degree (66% and 69%, respectively).

Physical Activity

Minutes and percentage of time spent in each physical activity intensity level during practice are presented in Table 1-3. Teams averaged 13% (95% CI = 10.8%, 15.2%) of practice time in sedentary activity, 34% (95% CI = 31.1%, 36.9%) of practice time in MVPA, and 12% (95% CI = 10.4%, 13.6%) of practice time in VPA. Practice contributed approximately 20

minutes of MVPA towards recommended public health guidelines of 60 minutes of MVPA per day. There were no significant differences in percentage of time spent in PA intensities between practices during the first half of the season (Day 1) or the second half of the season (Day 2).

Mean minutes and percentage of time spent in sedentary, moderate to vigorous, and vigorous activity are presented separately for trained and untrained coaches, coaches trained with and without NYSCA training, and experienced and inexperienced coaches (Table 2-3). There were no significant differences in percentage of time spent sedentary ($F [1,24] = 2.01, p = 0.17$), in MVPA ($F [1,24] = 0.47, p = 0.50$), or in VPA ($F [1,24] = 0.17, p = 0.68$), between trained and untrained coaches. No significant differences were found between coaches with and without NYSCA training in percentage of time spent sedentary ($F [1,25] = 0.00, p = 0.95$), in MVPA ($F [1,25] = 0.36, p = 0.56$, or in VPA ($F [1,25] = 0.66, p = 0.43$). No significant differences were found between experienced and inexperienced coaches for percentage of time spent sedentary ($F [1,24] = 0.11, p = 0.73$), MVPA ($F [1,24] = 0.01, p = 0.92$), or VPA ($F [1,24] = 0.07, p = 0.79$). No significant differences were found for minutes spent in each physical activity intensity between trained and untrained coaches, NYSCA trained coaches and non-NYSCA trained coaches, or coaches with experience and coaches without experience.

Discussion

The objective of this study was to determine the amount of physical activity accrued during youth flag football practice, and to compare children's physical activity levels between coaches with or without training and experience. Our first hypothesis, that children would spend less than 50% of practice time engaged in MVPA, was supported. Our second hypothesis, that coaches with prior training or prior experience coaching flag football would conduct practices resulting in higher levels of physical activity, was not supported.

Although there are no current recommendations for amount of time that should be spent in MVPA for youth sport, there are guidelines for similar youth settings (e.g., PE), where it is recommended that youth spend at least 50% of time in MVPA during the session (U.S Department of Health and Human Services, 2008). Results from our study indicate that across all teams, 33% of practice time was spent in MVPA, far lower than recommendations.

Current physical activity guidelines recommend children accumulate at least 60 minutes of MVPA per day, half of which is recommended to come from regular school hours, with the remaining half recommended to come from out-of school time (Koplan, Liverman, & Kraak, 2005; U.S Department of Health and Human Services, 2008). Youth sport presently contributes significantly to daily MVPA totals, but there is substantial room for improvement. Across all flag football teams, approximately 20 minutes of MVPA were accrued during youth sport practice. By achieving 50% of time in MVPA, youth sport would have the potential to contribute an additional 10 minutes of MVPA per practice, totaling 30 minutes of MVPA per practice, or the recommended amount of MVPA to be accrued outside of the school setting.

Youth sport offers an opportunity to accumulate VPA, which guidelines suggest should be performed at least 3 days per week (U.S Department of Health and Human Services, 2008). In children, participation in VPA has shown inverse relationships with waist circumference, fat mass, systolic blood pressure, and BMI, (Carson et al., 2014; Steele, Van Sluijs, Cassidy, Griffin, & Ekelund, 2009) as well as a positive relationship with cardiorespiratory fitness (Carson et al., 2014). In the present study, 11% of practice time (approximately 7 minutes) was spent in VPA. Recent studies suggest that a minimum of 7 minutes of VPA is necessary to gain health benefits, (Hay et al., 2012) though 15 minutes a day has been recommended to increase likelihood of meeting health benefits (Martinez-Gomez et al., 2010).

Other studies characterizing PA during youth sport have shown considerable variation in MVPA depending on sport, context (game or practice), and age (Cohen et al., 2011; Guagliano et al., 2013; Katzmarzyk, Walker, & Malina, 2001; Leek et al., 2011; Sacheck et al., 2011; Wickel & Eisenmann, 2007). Cohen and colleagues (2011) characterized PA during youth soccer in a similar age group to the present study (5–10y), and found children spent a larger percentage of practice time in sedentary activity (24%), and in MVPA (36.8%) compared to the present study. Contrary to the present study, Cohen included both boys and girls, and examined soccer, which is likely to have higher amounts of MVPA than flag football (Wickel & Eisenmann, 2007).

To our knowledge only one other study has examined youth sport flag football physical activity levels. Wickel and Eisenmann (2007) found similar amounts of time (11min) spent in VPA but substantially more time (28min) spent in MPVA in a similar age group (6–12y), although comparison between outcomes is difficult due to differences in reporting units. Wickel and Eisenmann (2007) reported minutes spent in each PA intensity after controlling for practice time, but no percentage of time was presented, nor were the raw minutes. The differences in MVPA outcomes that are observed could be attributed to difference in accelerometer methods. In the present study, practice start and stop times, as well as accelerometer wear time, were observed by a research assistant. Wickel and Eisenmann (2007) relied on self-report practice times and a standardized non-wear time analysis, which may inaccurately estimate practice time and accelerometer wear time, respectively. Two accelerometer data reduction methods were also different between the two studies: epoch length and accelerometer count cutpoint selection. Wickel and Eisenman (2007) reintegrated 30-second epochs to 60-second epochs for analysis, which may overestimate MVPA levels, (Kim, Beets, Pate, & Blair, 2013) and used Freedson's age-specific metabolic equivalent (MET) cutpoint to classify physical activity intensity,

(Freedson, Pober, & Janz, 2005) which has been shown to misclassify light activity as moderate activity in youth ≤ 10 years (Trost, Loprinzi, Moore, & Pfeiffer, 2011). The present study used 15-second epochs and applied Evenson (2008) cut points to activity counts to analyze intensity, currently considered the most accurate estimation of physical activity for this age group (Trost et al., 2011).

Our second hypothesis concerned potential differences in physical activity levels of teams with trained versus untrained and experienced versus inexperienced coaches. As coaches are the leaders of the youth sport setting, we hypothesized that coaches who had received training prior to practice observation, or who had prior coaching experience, would conduct practices that resulted in higher physical activity levels than their untrained or inexperienced counterparts. No significant differences were found, however, between trained and untrained coaches, or experienced and inexperienced coaches.

These results indicate that further research is needed on how to train coaches to conduct practices that provide opportunities for MVPA. Guagliano and colleagues (Guagliano, Lonsdale, Kolt, & Rosenkranz, 2015) demonstrated the efficacy of a short-term coach training program that focused on strategies that coaches could implement in their practices to increase MVPA and decrease inactivity. The authors demonstrated that brief coach education sessions could significantly increase MVPA and decrease inactivity without detrimental effects on players' motivation in a youth sport context (Guagliano et al., 2015; Guagliano, Lonsdale, Kolt, & Rosenkranz, 2014).

In the PE setting, providing training to teachers on basic management strategies has been shown to increase in-class MVPA (Lonsdale et al., 2013). The SPARK PE program trained and provided a curriculum to PE specialists as well as teachers who had no formal physical education

training. Post training, specialists led PE sessions that resulted in greater activity than teacher PE sessions, although both accumulated greater MVPA than the control condition (Sallis et al., 1997). Although PE specialists conducted sessions with the greatest PA, teachers with no formal degree in PE were also responsive to the intervention, thus suggesting training may be effective in populations with and without formal PE backgrounds.

Out-of-school settings, such as after-school or Girl Scout programs, have also been targeted to increase MVPA (Dzewaltowski et al., 2010; Rosenkranz, Behrens, & Dzewaltowski, 2010). Similar to recreation youth sport, out-of-school programs often employ leaders who have not had training in PE. As such, success in training after school providers to increase physical activity shows promise that the same can be done in the youth sports setting, where volunteer coaches often have little or no training in regards to promoting PA.

The HOP'N After-School program found that training after-school leaders with teaching strategies to increase MVPA during active recreation resulted in a greater percentage of time spent in MVPA compared to control (Dzewaltowski et al., 2010). Also in the after-school setting, Weaver and colleagues (Weaver, Beets, Saunders, Beighle, & Webster, 2014) showed success at increasing staff behaviors that were conducive to physical activity, such as staff leading a physically active session, staff utilizing small games, staff verbally promoting physical activity, staff engaged in physical activity with children, and offering more than one physical activity opportunity. The program also decreased occurrences of staff verbally discouraging physical activity or withholding physical activity as a consequence of misbehavior, occurrences of children standing in line and waiting for a turn, frequency of elimination games, and idle time (Weaver et al., 2014). Although physical activity was not measured, these staff behaviors have been associated with an increase in MVPA during session (Foster, Behrens, Jager, &

Dzewaltowski, 2010; Weaver, Webster, & Beets, 2013). In Girl Scout Troops, the Scouting Nutrition and Activity Program (SNAP) (Rosenkranz et al., 2010) used troop leader training to decrease girls' time spent sedentary and increase MVPA, as well as increase troop leader PA promotion.

Current coach training programs may not emphasize achieving MVPA as an important outcome of youth sport. One reason for this may be that coaches believe that their players are receiving adequate amounts of physical activity during youth sport sessions (Guagliano, Lonsdale, Rosenkranz, Kolt, & George, 2014). Through qualitative interviews with volunteer youth sport coaches Guagliano and colleagues (Guagliano, Lonsdale, Rosenkranz, et al., 2014) found that although coaches perceived themselves as role models for girls' physical activity, they also believed that their players were accumulating sufficient amounts of PA during practice.

Though youth sport largely has not been considered as an avenue to impact public health, the setting has the potential to reach a large number of children. In the future, researchers and practitioners should focus on physical activity as a primary outcome of youth sport. Moreover, researchers should attempt to determine which coaching strategies and coach behaviors are related to high amounts of physical activity, without compromising the myriad positive outcomes associated with sports participation, such as enjoyment or skill development.

Potential limitations to the current study should be considered when interpreting the results. First, due to time and budget constraints, the sample was limited to 14 teams. Further, the ability to generalize the results of the current study across other flag football programs is limited. The present study was conducted in a Midwestern city with a Parks and Recreation program that utilized volunteer coaches. Coaches of other programs, such as teams who provide financial compensation for their coaches, may differ. However, numerous youth programs use

primarily volunteer coaches. Despite these limitations, this study was able to provide a detailed description of PA during youth sport practice, due to a high participation rate across teams (91%), use of objective measures of PA, and a rigorous definition of practice time. All practices were observed by a research assistant, therefore start and stop time were observed rather than gathered from an athlete or coach self-report. In addition, the start of practice was defined as the time the coach scheduled for practice, thus, coaches were held accountable for the entire duration of scheduled practice time, regardless of whether practice began on time or not. To our knowledge, this is the first study to compare children's PA levels between recreational teams with coaches that were trained versus untrained, and those that were experienced compared to inexperienced.

Conclusion

Although the observed flag football programs are contributing to public health physical activity guidelines (20 of the 60 minutes needed daily), two-thirds of practice was spent in sedentary or light activity, leaving an opportunity for coaches to increase time spent in MVPA. Current coach training showed no difference in youth sport physical activity levels. Further research is needed to identify strategies to train volunteer coaches with the skills necessary to increase the percentage of time spent in MVPA at practice, thus helping children to increase their daily MVPA levels towards meeting public health guidelines.

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Figure 1-1 Recruitment and Consent Flow Diagram

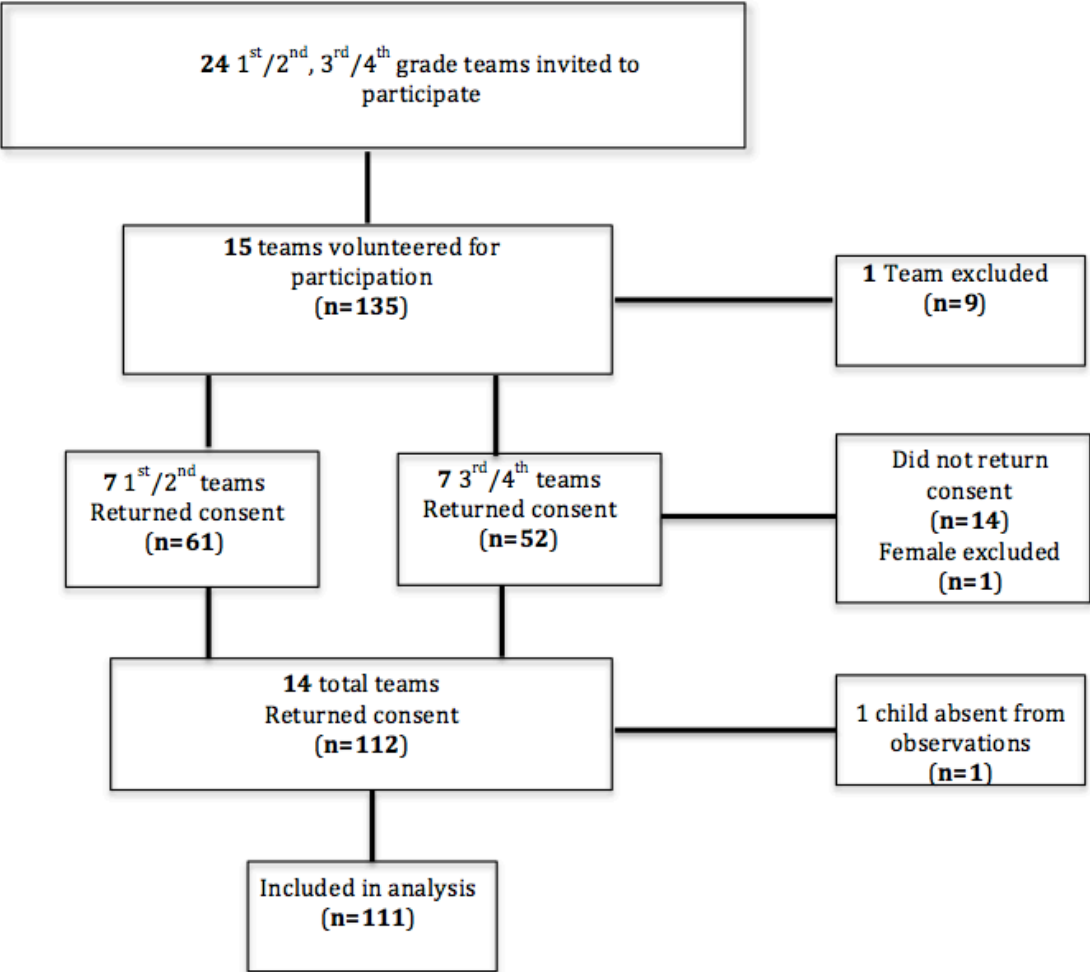


Table 1-1 Team Characteristics

Coach Participants, n	14
Coach Age, Years (SD)	40.1 (12.5)
Coach Education level, % (n)	
High School	7.1 (1)
Some college or associates degree	28.6 (4)
Graduated college	35.7 (5)
Master's Degree or above	28.6 (4)
Coach Race, % (n)	
White (Non-Hispanic)	85.6 (11)
Ethnic Minority	21.4 (3)
Team Grade level, % (n)	
First/Second	50.0 (7)
Third/Fourth	50.0 (7)
Day 1 Attendance, Number of kids (SD)	6.6 (1.6)
Day 2 Attendance, Number of kids (SD)	7.0 (1.3)
Average consent per team, Number of kids (SD)	8.0 (1.2)
Prior Coaching Experience, % (n)	
Prior coaching Football	71.4 (10)
Prior coaching non school competitive	21.4 (3)
Prior Coaching school competitive	21.4 (3)
Prior Coaching recreation/non-competitive	42.9 (6)
No prior coaching	14.3 (2)
Prior Coach Training, % (n)	
Coaching Certification	21.4 (3)
Coaching Workshop	21.4 (3)
NYSCA	50.0 (7)
No Training	28.6 (4)

Abbreviations: SD = standard deviation; NYSCA = National Youth Sport Coaching Association

Table 1-2 Child Characteristics

Participants, n	111
Age, Years (SD)	7.9 (1.2)
Free or reduced lunch status, % (n)	
Not eligible	71.2 (74)
Free/Reduced	25.0 (26)
Do Not Know	3.6 (4)
Race/Ethnicity, % (n)	
Non-Hispanic Caucasian	77.7 (80)
Racial/Ethnic minority	22.3 (23)
Parent Race/Ethnicity, % (n)	
Non-Hispanic Caucasian	81.6 (84)
Racial/ethnic minority	18.4 (19)
Parent Gender, % (n)	
Female	43.9 (47)
Male	56.1 (60)
Mother Education, %(n)	
Less than high school	1.0 (1)
High School	6.0 (6)
Some college or associate's degree	27.0 (27)
Graduated college	38.0 (38)
Master's degree or above	28.0 (28)
Father Education, % (n)	
Less than high school	0 (0)
High School	9.8 (9)
Some college or associate's degree	20.8 (20)
Graduated college	42.7 (41)
Master's degree or above	26.0 (25)
Does not apply	1.0 (1)

SD = standard deviation

Table 1-3 Least Squares mean estimate of sedentary, MVPA, and VPA percentage and minutes of practice time by coach characteristic

Coach Characteristic (n)	Sedentary		MVPA		VPA	
	Mean (SE)		Mean (SE)		Mean (SE)	
	%	Min	%	Min	%	Min
All Teams (14)	13.0 (1.1)	7.7 (0.5)	34.0 (1.5)	19.9 (1.2)	12.0 (0.8)	6.8 (0.5)
Overall Trained (10)	14.4 (1.4)	8.7 (0.6)	33.3 (2.0)	19.4 (1.5)	11.3 (1.0)	6.5 (0.6)
No Training (4)	11.1 (1.9)	6.6 (0.7)	35.9 (3.3)	21.5 (2.5)	12.1 (1.7)	7.3 (1.1)
NYSCA Training (7)	14.0 (1.8)	8.0 (.8)	34.7 (2.4)	19.6 (1.9)	12.1 (0.6)	6.9 (.5)
No NYSCA Training (7)	14.2 (2.1)	8.5 (.9)	32.7 (2.4)	19.7 (1.9)	10.7 (1.6)	6.5 (1.1)
Coach Experience (10)	13.8 (1.5)	8.4 (0.7)	34.1 (2.0)	19.8 (1.6)	11.6 (1.0)	6.7 (0.7)
No Prior Coach Experience (4)	12.9 (2.1)	7.5 (1.0)	33.8 (3.0)	20.5 (2.5)	11.1 (1.5)	6.8 (1.1)

MVPA = moderate to vigorous physical activity; SE = standard error, NYSCA = National Youth Sport Coaching Association

Chapter 2 - Review of the Literature

What leader strategies lead to optimum physical activity within a behavior setting?

In the United States today an alarmingly high number of children are overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014). Moreover, a large proportion of children are not meeting recommended physical activity (PA) guidelines of 60 minutes of moderate to vigorous physical activity (MVPA) per day (Troiano et al., 2008); (U.S Department of Health and Human Services, 2008) despite the benefits of PA (Janssen & Leblanc, 2010).

The World Health Organization (WHO) and the Midcourse Report of the 2008 Physical Activity Guidelines (2012) have made a number of recommendations to attempt to increase daily MVPA in children, of which include implementing opportunities for PA where children live, work and play, such as before, during, and after school, through settings such as physical education (PE), afterschool programs, and youth sport programs (Physical Activity Guidelines for Americans Midcourse Report Subcommittee of the President's Council on Fitness Sports & Nutrition, 2012; Piercy et al., 2015; World Health Organization, 2015). Although participation in these programs provides opportunities for PA, in many of these settings children spend a low proportion of time in MVPA (Dzewaltowski et al., 2010; Leek et al., 2011; McKenzie et al., 1996; Simons-Morton, Parcel, Baranowski, Forthofer, & O'Hara, 1991; Wickel & Eisenmann, 2007).

One reason for low MVPA during the setting may be inadequate leader training on principles that can decrease time spent sedentary and increase time spent in MVPA. As demonstrated in the above chapter, youth sport coaches who had received training did not conduct practices that were higher in MVPA than those without training.

Interventions targeting these settings have shown that providing leader training on simple management and instructional strategies can increase percentage of time spent in MVPA during a session. The purpose of this review is to summarize these strategies and provide a ‘best practice’ list of strategies. First, Siedentop’s ecology of the physical education classroom and recommended teaching practices for physical education (Siedentop & Tannehill, 2000) will be reviewed. Then a review of some current research literature and summarize various teaching strategies to increase MVPA used within interventions in a variety of children’s settings will be presented.

The Ecology of Youth Settings

Ecology refers to the human-environment interaction resulting from many systems at work to maintain homeostasis. These systems are intertwined with each other, and a change in one system causes a change in another. Though traditional ecology studied interactions between organisms and their environment, these systems are also at work in behavior settings, such as a physical education class, after school programs, or youth sport. Within classes, there is a dual directional influence exerted between students and the setting leader, which dictates the characteristics of the setting. Maintaining homeostasis between these forces within a setting is one way to increase enjoyment, reduce problem behaviors, and ultimately increase PA (Siedentop & Tannehill, 2000).

Physical Education Setting Recommendations

The ecology of the classroom can largely determine characteristics and outcomes of a PE class, such as how time is spent or the amount of MVPA accrued during the class. Siedentop, Metzler, and colleagues (2000) described time spent during PE using three categories; allocated time (time that a teacher plans for students to be engaged in motor activities during a lesson),

engaged time (time that a student is actually physically engaged in activities), and Academic Learning Time in Physical Education (ALT-PE; the amount of time a student spends engaged successfully in activities related to lesson objectives). In many classrooms, the amounts of allocated time differ greatly from time spent actually in engaged or in ALT-PE time. One way to decrease the difference in allocated time to engaged activities or ALT-PE is to use preventive class management techniques (Siedentop & Tannehill, 2000). The following techniques have been suggested by Siedentop to ensure the classroom climate is task-oriented, and to decrease the amount of time spent in management.

Rules and Routines.

Siedentop terms routines and rules as ‘the foundation for a managerial system.’ Routines are the procedures for performing tasks that are reoccurring. Within these routines, rules are used to identify appropriate and inappropriate behavior. Successful teachers institute routines and rules at the beginning of the school year in order to establish their managerial system (Siedentop & Tannehill, 2000).

A PE class offers multiple opportune areas to implement routines: at class entry, when calling for attention, by creating a ‘home base’, when gathering or dispersing, when retrieving equipment, when establishing partners, when finishing or leaving the class, during housekeeping activities. Seidentop presented the following as keys to teaching routines: explain and show, rehearse, expect perfection, reward direction, use positive models, provide frequent feedback, use activities to practice routines, check for student understanding (Siedentop & Tannehill, 2000,).

Class rules should be short and direct, communicated effectively, stated positively, and consistent with school rules. When establishing rules, teachers should provide examples of

acceptable and unacceptable behavior, as well as a hierarchy of consequences for not meeting rule standards (Siedentop & Tannehill, 2000) .

Reduce Managerial Time

Managerial time refers to the time spent in class where there are no opportunities for students to accomplish tasks within the instructional system. Teachers who spend the most time accomplishing managerial tasks have less time to spend engaged and ALT-PE time. Teachers can reduce managerial time by creating an active lesson start; by managing transitions, equipment transitions, formations for practice and momentum and pace; and engaging in optimal teacher behaviors (Siedentop & Tannehill, 2000).

Lesson Start. Managerial start time can be reduced by starting class on time and using a time saving or active method for roll taking. A good rule is to have the initial activity be routine, this way kids are less likely to engage in problem behaviors during the initial activity.

Managing Transitions. Transitions, if not managed correctly, can quickly detract large amounts from engaged or ALT-PE time. To decrease wasted time, have a designated ‘stop’ and ‘go’ signal for gaining attention, and create gathering and dispersal routines. Set a time goal for the transition ‘we will start the next drill in 20 seconds,’ and make sure the kids have an activity to do once the transition is completed.

Managing Equipment Transitions. Time spent gathering and dispersing equipment can be reduced by designating an equipment manager, establishing a system for distributing equipment (e.g. receive equipment by birth months) and having an organized equipment space.

Managing formations for practice. Changing formations during class can be time consuming. Make sure children are familiar with commonly used formations, and allow time for

them to practice. Structure the space for formations of the day by using cones, hot spots, or floor lines, or split the floor space into grids.

Manage momentum and pace. Momentum is how smoothly a class transitions from segment to segment throughout a day, while pace is the speed at which the lesson moves ahead. To ensure adequate class momentum and pace, clearly define expectations of the pace and momentum to students. Start class on time, and begin with an active, well-paced activity. Eliminate dead times by decreasing transition time through strategies mentioned earlier. Prepare for interruptions by creating a procedure for how the class should act in case of disruptions.

Teacher skills. Teacher behaviors can help control management time and ensure an on-task climate. Teachers should have clearly communicated expectations for their students, and give explicit instructions, frequent prompts, and regular feedback. These habits help to maintain accountability and reduce risk for students. As a teacher, self-monitoring and observation systems can help quantify frequency of behaviors, and detect problem areas.

By establishing rules and routines and decreasing management time, greater proportions of a PE class can be spent in ALT-PE, ultimately leading to greater time spent developing positive outcomes.

Although Seidentop used a PE class as his model to describe the ecology of a physical activity behavior setting, many of his concepts can be translated into other settings that children encounter throughout the day or week, such as preschools, after school programs, and youth sport settings. Each of these settings is comprised of complex systems of interactions between leader, child, and the environment of the setting. As such, strategies used to maintain homeostasis within a PE class are likely to be successful when translated into other, similar settings.

Common Themes for Best Practices in Interventions

To date, a number of interventions have attempted to increase PA within a session by training the existing setting leaders on skills and behaviors conducive to PA. This has occurred the most in physical education, but has also been done preschool, afterschool, youth sport, and recess. Although each setting is unique, the strategies used to efficiently lead the setting are similar across the setting. Thus strategies employed in a PE classroom to increase MVPA can also be translated to a youth sport setting.

Staff training interventions in PE have showed success in increasing percentage of time spent in MVPA during a PE class (S. J. Fairclough & Stratton, 2006; S. Fairclough & Stratton, 2005; McKenzie et al., 1996; Mckenzie et al., 2010; Miller et al., 2015; Sallis et al., 1997; Simons-Morton et al., 1991; van Beurden et al., 2003; Verstraete, S., Cardon, G., De Clercq, D., & De Bourdeaudhuij, 2007; Webber et al., 2008). The CATCH program (McKenzie et al., 1996) has been widely disseminated across the US and was able to significantly increase percentage of time spent MVPA between intervention compared to control schools. Schools participating in the CATCH program were provided with staff training, as well as the CATCH activity box and a CATCH PE Guidebook. The activity box provided example activities that were organized by units, to be used in conjunction with the guidebook, which provided recommendations for class structure, example unit and lesson plans, and techniques for class management. Similar to CATCH, the SPARK PE program (Sallis et al., 1997) aimed to increase percentage of time spent in MVPA during PE while increasing children's motor skills. The intervention provided training and curriculum to leaders of the PE setting, which consisted of recommended lesson plans and teacher strategies to increase MVPA during the class. Compared to control, teachers and PE specialists trained in SPARK curriculum led classrooms with significantly higher percentage of time spent in MVPA. Simons-Morton and colleagues (1991) used the CAPE to train teachers

and significantly increase percentage of time spent in MVPA across multiple grade levels. Fairclough and Stratton (2005, 2006) significantly increased percentage of time girls spent in MVPA during PE class by training teachers on strategies to increase MVPA. Miller (2015) utilized a 'game centered approach' to train PE teachers and showed a significant treatment effect on adjusted mean step counts for in-class PA. A myriad of other PE interventions have also shown success by implementing strategies adapted from CATCH and SPARK (Mckenzie et al., 2010; van Beurden et al., 2003; Verstraete, S., Cardon, G., De Clercq, D., & De Bourdeaudhuij, 2007; Webber et al., 2008).

Although less frequent, interventions have also targeted after school providers to increase the percentage of time spent in MVPA (Dzewaltowski et al., 2010; Kelder et al., 2005). Both the HOP'N Afterschool Program (Dzewaltowski et al., 2010) and the CATCH Kids Club (Kelder et al., 2005) trained after school leaders on CATCH principles to increase MVPA during active recreation time. Compared to control, the HOP'N Afterschool program showed a significant increase in percentage of active recreation spent in MVPA, although the increase was not maintained past year one of the project (Dzewaltowski et al., 2010). CATCH Kids Club showed a significant increase in percentage of time spent in MVPA during the PA sessions from pre-post in intervention compared to control (Kelder et al., 2005). Similar to CATCH principles, Beets and colleagues increased MVPA in a multisite after school program that trained staff leaders on principles similar to CATCH, LETUSPLAY (Weaver et al., 2014, 2013). The strategy focused on removing lines, elimination of elimination games, a reduction in team size, trying to get uninvolved staff and children involved in the games, and creatively using space, equipment, and rules.

In the preschool setting, O'Dwyer and colleagues conducted active play training for existing preschool teachers (O'Dwyer et al., 2013). Compared to control classrooms that engaged in the normal physical activity segment of the day, active play classrooms significantly increased percentage of time spent in MVPA and total PA for the session.

Huberty and colleagues (2011) implemented a recess intervention focused on increasing MVPA by providing staff training and supplementing the recess physical environment. MVPA was significantly increased in healthy weight boys with equipment and staff training, overweight or obese boys with staff training, and overweight or obese girls with equipment and staff training. Healthy weight girls decreased MVPA in all conditions (Huberty et al., 2011).

To our knowledge, only one intervention has focused on increasing time spent in MVPA during youth sport practice by training coaches. Guagliano and colleagues (2014) conducted a short education program to coaches on simple strategies to decrease management and increase MVPA, and found an increase in percentage of time spent in MVPA from pre-post testing in intervention compared to control (Guagliano, Lonsdale, Kolt, et al., 2014). Although these interventions took place in a variety of settings, many of the key principles for training staff to increase child MVPA overlap. As success has been shown in the aforementioned settings, it is likely that the strategies for increasing MVPA are translatable across multiple physical activity settings.

Teacher skills. Multiple teacher behaviors were suggested by previous research as being conducive for physical activity. Teachers were suggested to make students aware of goals and expectations, (Miller et al., 2015; Webber et al., 2008) and remain in close proximity to where students are to offer feedback and demonstrations (Fairclough & Stratton, 2006; Fairclough & Stratton, 2005; Sallis et al., 1997). Teachers should stay alert through class to supervise (Huberty

et al., 2011) and regularly scan the area for problem situations (Webber et al., 2008). In order to create a fun environment, teachers are encouraged to be enthusiastic, as well as occasionally participate in activities (Huberty et al., 2011; Sallis et al., 1997). Teachers should also be aware of ‘teacher-talking time’ and minimize the amount of time spent explaining drills, disciplining, or doing managerial tasks (Fairclough & Stratton, 2006; Fairclough & Stratton, 2005; Huberty et al., 2011; Sallis et al., 1997).

Provided Recommended Lesson Schedule. A number of studies provided a recommended lesson schedule, or example schedule, as part of staff training during the intervention (Dzewaltowski et al., 2010; Guagliano, Lonsdale, Kolt, et al., 2014; Kelder et al., 2005; McKenzie et al., 1996; O’Dwyer et al., 2013; Sallis et al., 1997; Simons-Morton et al., 1991). Most commonly this consisted of a warm-up, a fitness activity and/or a game activity, followed by a cool-down. Multiple interventions provided handouts that detailed curriculum, including a schedule, examples of each activity in the schedule, and necessary equipment (Huberty et al., 2011; McKenzie et al., 1996; O’Dwyer et al., 2013; Sallis et al., 1997).

Use of Space. Efficient use of space was a common theme across studies. This was achieved in a number of ways, most commonly by using ‘grids’ (Guagliano et al., 2015; Sallis et al., 1997; Springer et al., 2013), small-sided games or practice groups, (Fairclough & Stratton, 2006; Fairclough & Stratton, 2005; Guagliano et al., 2015) and creating activity zones (Huberty et al., 2011). These areas could be marked off with cones, chalk, tape, or verbal boundaries.

Prepare to lead youth. Multiple interventions emphasized the necessity of preparing the lesson before the actual session, as well as following the schedule throughout the sessions (Guagliano et al., 2015; McKenzie et al., 1996; Sallis et al., 1997; Webber et al., 2008). The SPARK intervention suggested teachers have sessions planned for the day, month, and year, are

told review them before class, and bring a clipboard with the schedule to class (Sallis et al., 1997).

Pace. Three studies specifically addressed pace as a strategy for interventions (Fairclough & Stratton, 2006; Fairclough & Stratton, 2005; Webber et al., 2008). Pace is suggested to be maintained by keeping students interested in activities, being aware of whether or not students are becoming uninterested, and if so, changing activities. Pace can also be maintained by selecting activities that can easily be instructed, with limited instructions, rotating through activities frequently, and having quick, effective transitions.

Format. Format refers to how students in the class are arranged. Teachers should try to maximize the number of students involved in an activity. This can be accomplished by using formats that eliminate lines, such as small groups, activity stations, circuits, grids, and grid circuits (Guagliano et al., 2015; Kelder et al., 2005; McKenzie et al., 1996; Miller et al., 2015; Sallis et al., 1997). Most games can be modified to use a format conducive to PA (McKenzie et al., 1996; Sallis et al., 1997; Webber et al., 2008). The number of formats used in a given session should be limited in order to eliminate the need for students to transition (McKenzie et al., 1996; Sallis et al., 1997; Webber et al., 2008).

Management strategies. Reducing management time has been related to increasing MVPA during a session. Strategies for reducing management time include creating boundaries and routines, (McKenzie et al., 1996; Sallis et al., 1997) having an active roll call (McKenzie et al., 1996; Sallis et al., 1997; Webber et al., 2008), using start and stop signals to begin and end session components, having concise explanations for drills and games, (Miller et al., 2015; Sallis et al., 1997; Webber et al., 2008) and having an active class closure (McKenzie et al., 1996; Sallis et al., 1997; Webber et al., 2008). In addition, equipment should be prepared before class

begins, otherwise there should be an efficient system for distributing equipment in place (Miller et al., 2015; Sallis et al., 1997; Webber et al., 2008). Manage transitions by providing a time goal for forming groups and transitioning (e.g., count back from 10 as children form groups) (McKenzie et al., 1996; Sallis et al., 1997; Webber et al., 2008), or try to have kids active during the transition by practicing a skill (e.g., hop to the next station) (Webber et al., 2008).

Conclusions

The strategies suggested to be used in PE settings to use to optimize time spent in ALT-PE coincide with the strategies used to train leaders of physical activity settings to conduct sessions conducive to PA. Many of these strategies addressed managerial issues, and ways to decrease management time to increase time spent in PA.

In many physical activity settings, leaders may not have extensive training on how to organize or manage a group or classroom, as physical educators do. Simple managerial and organizational teaching strategies can decrease time spent sedentary and increase opportunities to accumulate MVPA. In addition, they can help to decrease problem behaviors, increase enjoyment, and increase time spent on task.

Although the interventions reviewed above were conducted in an array of physical activity settings, the strategies to increase PA during the session largely overlapped. Six categories were identified as leader strategies to increase in session MVPA; teacher skills, use of a lesson schedule, use of space, preparation, pace, and management strategies. In future interventions, leaders of various physical activity settings, such as youth sport, can be trained on these strategies to increase MVPA accrued during a physical activity session.

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Chapter 3 - Food Waste In Manhattan, Kansas Elementary School Lunch

Introduction

In partial fulfillment of the Master of Public Health (MPH) degree, I completed 180 field experience hours with the Riley County K-State Research and Extension Agency. Established in 1914, the Cooperative Extension system, operated through the Land Grant University system, partners with federal, state, and local governments to bring education to surrounding communities. In Riley County, the Cooperative Extension office is operated through Kansas State University. The office provides educational and problem solving help in many areas, with four major emphasis areas that each house an extension agent; Family & Consumer Sciences, Horticulture, Agriculture, and 4-H.

For my experience, I worked with Virginia (Ginny) Barnard, the Family & Consumer Sciences agent, as my mentor. Ginny holds a MPH from Kansas State University, has a number of responsibilities in the areas of food health, safety, nutrition, cooking, and has administrative roles in the Flint Hills Wellness Coalition and the Walk Kansas program. At the time of my field experience, Ginny was beginning to undertake a new project, assessing food waste in Manhattan, Kansas elementary schools. I saw this project as an opportunity to work on developing my measurement skills, as well as use my background in ecological systems and behavioral science to assess food waste and help determine possible evidence-based solutions for the problem.

The School Food Waste Problem

In the United States (US) 133 billion pounds of food was wasted at the consumer and retail level in 2010, resulting in a total loss of 161.6 billion dollars (Buzby, Wells, & Hyman, 2014). This translates into 387 billion calories per day being wasted, of which 96% ends up in

landfills (Buzby et al., 2014). Moreover, decomposing food waste in landfills emits methane, a potent greenhouse gas, that accounts for 20% of all methane emissions (EPA, 2014).

Food waste can come from a variety of sources, including at the farm level (e.g., food lost to a unfavorable environment conditions), the farm to retail level (e.g., foods that do not meet food safety regulations; are misshapen or blemished), the retail level (e.g., dented cans; damaged packaging), and the consumer level (e.g., plate waste; food that spoils before consumption) (Buzby et al., 2014). In 2013 the United States Department of Agriculture (USDA) and Environmental Protection Agency (EPA) launched the U.S Food Waste Challenge in an attempt to reduce, recover, and recycle food waste in the United States (USDA OCE, n.d.). One of the major commitments of the project was to minimize waste in school meal programs, where studies have shown plate waste to be 29-43% of food taken (Cohen, Richardson, Parker, Catalano, & Rimm, 2014).

Scope of Work

The majority of my duties at Research and Extension involved measuring food waste in two elementary schools in Manhattan, Kansas. I was responsible for determining the observation system to assess food waste, for performing the measurement assessment, and to meet with food service personnel in the school lunch rooms to discuss results and possible solutions to the food waste problem. In addition, I helped with multiple child education projects throughout my field experience.

Learning Objectives

Before starting my field experience, I worked with Mrs. Barnard to develop four main learning objectives. The first objective was to understand the global public health challenge of feeding a growing population, as well as the need to decrease food waste. This was done

primarily by a review of the literature, as well as consulting with a current administrative dietitian for Kansas State Housing and Dining Services and instructor for the Department of Hospitality Management and Dietetics, who recently completed her PhD with a dissertation focused on food waste. As my emphasis area in the MPH program was physical activity, I had minimal exposure to global public health nutrition issues. However, after consulting these resources I was to gain an understanding of the food waste issue.

My second objective was to define amounts of food waste in Manhattan area schools, as well as its financial burden. This was accomplished by measuring the amount of food waste that was accrued during the lunch period in two Manhattan elementary schools. After observation, I was able to determine the monetary amount wasted during each lunch period by using the price of an individual school lunch as reference.

The final objective I met was to understand the importance of community collaboration. This objective was accomplished on a number of levels. First, I was able to observe Ginny interact with multiple community collaborators throughout the project, in order to understand the scope of her position. Secondly, I was able to interact first hand with multiple levels of the community and school system; I worked directly with the school meal providers, had meetings with the USD 383 school lunch coordinator, with the Manhattan chapter of the US Alliance for a Healthier Generation, a school principal, and members of the Flint Hills Wellness Coalition. Through these interactions it opened my eyes at how crucial multi-level community collaboration is when trying to create systems change.

One objective of the field experience I did not meet was to effectively apply a school-based health policy to reduce amount of food wasted and promote increased consumption of fruits and vegetables. Although I did extensive research to find evidence based strategies that

would meet this objective, I learned that community collaboration is important as the process of generating policy change in the school system is a long, difficult process that was not feasible to be implemented in a short 3-month period. However, I provided these resources to two food service workers within the schools that I conducted observations.

Activities Performed

Throughout my field experience, my activities were all related to nutrition and food waste at two Manhattan elementary schools. My major project was to measure food waste in school lunchrooms, but I also had three education sessions with children, covering the topics of gardening, food preparation, and food waste and recycling.

Food Waste In Manhattan Lunchrooms

Background. Upon beginning my field experience, Mrs. Bernard had already recruited two schools to perform assessments. The first school, Manhattan Catholic School, is a private school that serves lunch to children pre-school to seventh grade. The kitchen at the school cooks and serves all food, and the food service director buys food for only Manhattan Catholic School. The second school, Lee elementary, served as a summer feeding school site for Manhattan-Ogden USD 383. As a summer feeding site, any child aged 1-18 can receive a meal for free. During the time we were conducting observations at Lee, the feeding program was also serving the Manhattan Girls and Boys club and the Lee academic academy summer school program. Food for Lee elementary is prepared at a central feeding site responsible for the school lunches at all USD 383 Manhattan-Ogden schools.

Methods. In order to develop the observation system, I largely used the resources provided by the USDA and the EPA, which provided detailed information on how to identify and track food waste from different streams (USDA OCE, n.d.; EPA, 2014). At Manhattan Catholic,

we used 3 separate bins to divide children's leftover plate contents after lunch into milk, food waste, and garbage. At Lee we took the separation a step further and divided waste into 5 categories; 1) a sharing table station (e.g., unopened milk, unopened prepackaged foods, uneaten fruit with a thick skin), 2) opened milk and all other liquids, 3) recycling, 4) food waste, 4) all remaining trash.

We performed observations for 10 consecutive days at Manhattan Catholic during the beginning of May, approximately 3 weeks before the end of the spring semester. During the month of June, I observed 9 consecutive days at the summer feeding program at Lee elementary. At the beginning of the lunch period, I set up the sorting station, then for the duration of the lunch period I stood at the sorting station to help kids sort their plate contents into the proper containers. In between transitions of classes into the lunchrooms, I weighed and recorded the waste, and replaced a fresh garbage bag. Each day the number of kids receiving a school lunch was also reported. Food from children who brought sack lunches was included in the measurement.

In addition, at Lee elementary I performed the Smarter Lunchroom Assessment (SLA) (Table 3-1), designed by the Cornell Behavioral Institute (Just & Wansink, 2009). The SLA has been adopted by the USDA as part of a strategy to combat food waste and promote fruit and vegetable consumption in school lunchrooms, and must be completed for a school to qualify as a Healthier US School. The measure includes a variety of questions that detail behavioral economic techniques to promote healthful nutrition behaviors.

Results. Manhattan Catholic generated approximately 897 pounds of food waste and 25 gallons of milk in 10 observation periods. This equals approximately 1/3 of a pound and 1.2

ounces of milk wasted per child per day. The price of 1 lunch at Manhattan Catholic School is \$3.40 (Figure 3-3).

At the Lee summer feeding program approximately 480 pounds of food and 26 gallons of milk was wasted in 9 observation periods. This equals approximately $\frac{1}{4}$ of a pound and 2 ounces of milk wasted per child per day. In addition, food that was not eaten off of the sharing table at the end of the lunch period was thrown in the garbage (not included in totals). Items thrown from the sharing table were 115 chocolate milk, 46 white milk, 12 bananas, 11 bags of carrots, 14 apples, and 39 packets of sauce (Figure 3-4). Approximately 90 pounds of recyclable material was thrown in the dumpster.

Of the 100 possible options to be scored on the SLA, Lee elementary scored less than 30, qualifying it below the bronze category (30-50) on the SLA. In order to be considered for a US Healthier School the school must score at least a 30.

After completing the observations and analyzing the data, I held a meeting with the food service director of Manhattan Catholic School, the food service director of Manhattan-Ogden USD 383, as well as two school lunchroom employees at Lee elementary. At the meetings I held with the food service directors, I provided handouts I had developed in the form of info graphics detailing the results of the observation, as well as strategies to combat food waste (Figure 3-2, 3-3, 3-5). At the meeting with the school lunchroom employees, we discussed the results of the observation as well as their views on the feasibility of adapting evidence-based strategies developed for the Smarter Lunch room. Although they were concerned about the amount of food waste, they were unable to commit to implemented strategies to decrease or redirect waste.

Conclusion. There are numerous strategies that can be undertaken to combat the issue of plate waste, from trying to decrease the amount of food that is wasted, to after the food is wasted

how to keep it from entering landfills. These include but are not limited to the strategies detailed in the SLA (Figure 3-1), donating leftover food to a food pantry, composting, or recycling. Although neither of the schools committed to adopting these strategies for the coming school year, they appeared generally concerned and willing to try and reduce the amount of food waste in their lunchrooms.

Child Education Programs

In addition to conducting food waste assessments, I also had three opportunities to work with children on the topics of food preparation, gardening, and reducing food waste and recycling. My first child education program was at a children's cooking class. Ginny holds multiple children's cooking classes throughout the year to teach children the basics of cooking. At the session I helped with, we baked a variety of muffins with the children, and I was responsible for leading a group of children through the cooking process and answering any questions they had. At my second opportunity, I helped Ginny and the horticulture extension agent, Gregg Eyestone, along with another intern, plant a small garden with the kids of Lee elementary. My final opportunity came when I co-led an education session on the importance of reducing food waste and recycling, as well as strategies the kids could take home to reduce food waste in the home setting.

Products Developed

While at Research and Extension, I developed a number of products focusing on food waste. The first product I developed was an observation protocol. I created this protocol as a compilation of already existing USDA and EPA observations protocols (Figure 3-4). If other schools wish to perform food waste observations, Mrs. Barnard and the extension office will be able to continue to use this observation protocol.

Two of the major products I developed were info graphics that detailed the results of the food waste observations. For each school, I created a poster that could be distributed to food service personnel, parents, teachers, and kids that displayed the results of the food waste observations. These posters have minimal words, bright colors, and easy to understand results, thus are easy to use to quickly report the food waste problem (Figure 3-2, 3-3).

The biggest product I developed is a resource binder that is a compilation of information regarding studies of food waste in multiple settings, assessments of food waste, evidence-based strategies to combat food waste, and step-by-step guides from schools who have implemented food waste preventive strategies and recovery strategies. Though I was unable to help any schools adopt these strategies during my field experience, the resources are available for Ginny, and food service directors, to help schools tackle the food waste problem. As part of this binder, I created a third info graphic that briefly described the steps Manhattan schools can take begin a food waste assessment, prevention, and recovery program (Figure 3-5).

Conclusion

During my time at Kansas State Research and Extension, I learned of the problem of global food waste, the food waste problem in Manhattan, Kansas elementary schools, and the importance of community collaboration. The experience allowed me to take a step out of the lab and work directly with the community, and brought to reality the struggle of coordinating competing interests to create a change that would benefit the health of a population. The field experience also allowed me to build my observation skills, and increase my awareness of the active public health interests groups in my community.

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Table 3-1 Smarter Lunchrooms Self-Assessment: Examples of Smarter Lunchroom Strategies (Just & Wansink, 2009)

Focusing on Fruit	Promoting Vegetables and Salad
✓ At least two types of fruit are available daily	✓ At least two types of vegetable are available daily
✓ Sliced or cut fruit is available daily	✓ Vegetables are not wilted, browning, or otherwise damaged
✓ Fruit options are not browning, bruised or otherwise damaged	✓ At least one vegetable option is available in all food service areas
✓ Daily fruit options are given creative, age appropriate names	✓ Individual salads or a salad bar is available to all students
✓ All targeted entrée names are written and legible on menu boards	✓ The salad bar is highly visible and located in a high traffic area
✓ All targeted entrée names are included on the published monthly school lunch menu	✓ Self-serve salad bar utensils are at the appropriate portion size or larger for all fruits and vegetables offered
✓ Daily fruits are easily seen by students of average height for your school	✓ Self service salad bar options are smaller for croutons, dressing, and other non-produce items

Figure 3-1 Manhattan Catholic Results

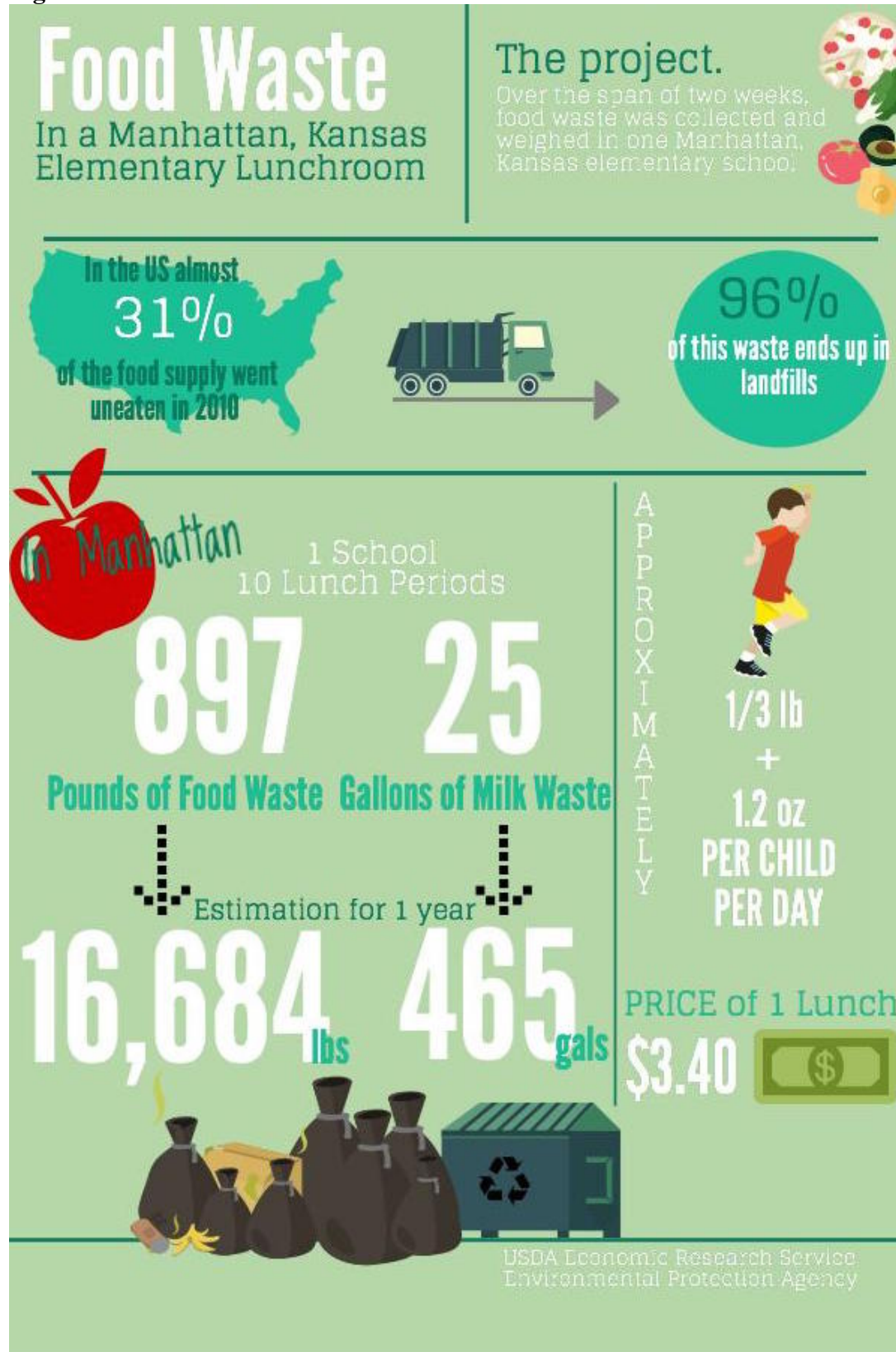


Figure 3-2 Lee Results

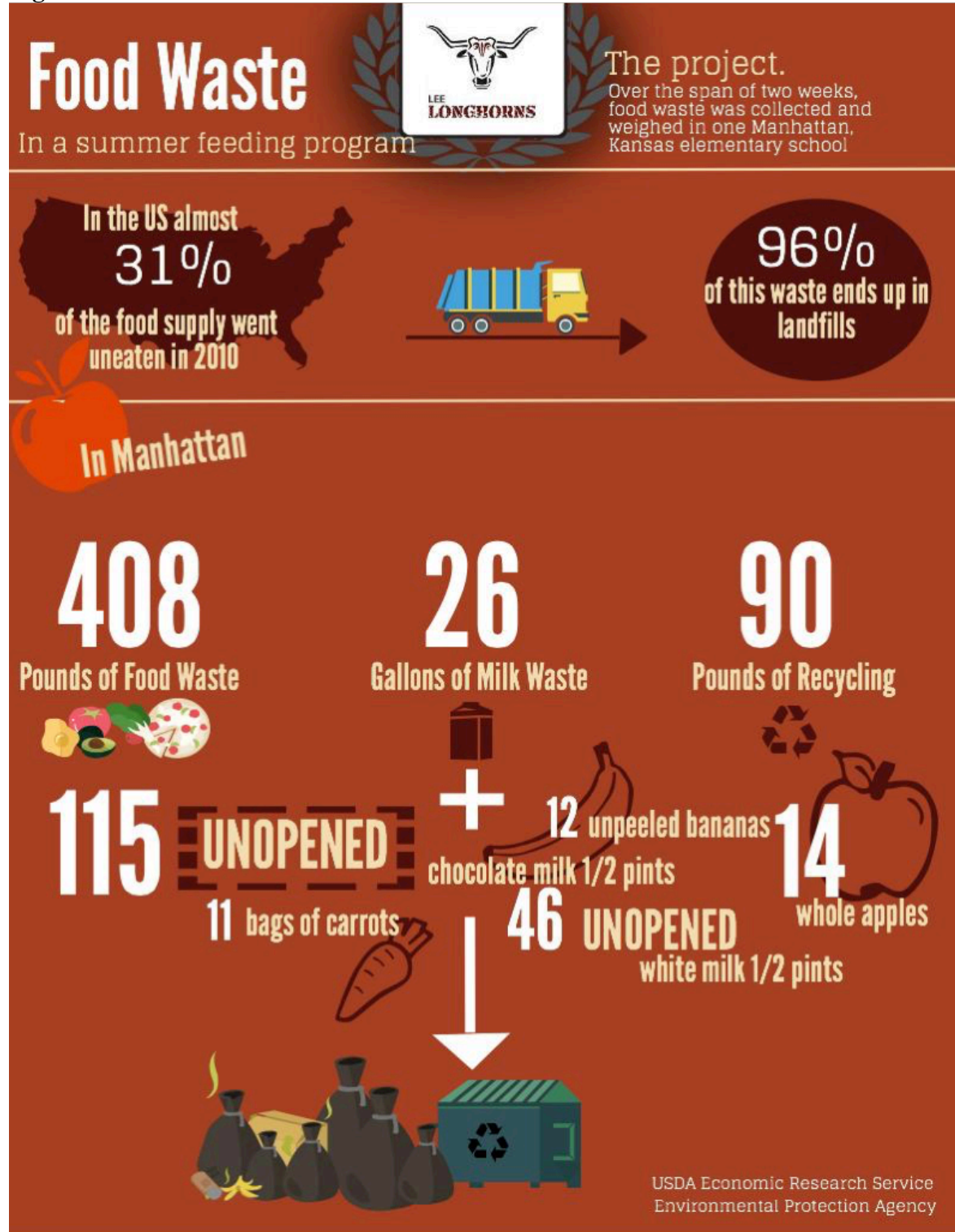


Figure 3-3 Waste Observation Record

	A	B	C	D	E	F	G
1	Trash						
2	Day	lbs of food waste	Liters	Recyclable	Sharing table	# of Kids served	
3	6/1/15	40	9	15	8 white milk, 25 chocolate milk, 9 juice boxes, 6 apples	180	
4	6/2/15	52	13	10	3 white milk, 1 chocolate milk, 8 apples, 9 salsa	190	
5	6/3/15	46	11	10	16 chocolate milk, 6 white milk, 10 sauce	190	
6	6/4/15	36	11	9	23 chocolate milk, 9 white milk	190	
7	6/8/15	45	8	11	5 white milk, 2 chocolate milk	190	
8	6/9/15	55	11	10	13 chocolate milk, 1 white milk, 19 whole bananas, 12 ketchup	190	
9	6/10/15	41	17	10	8 chocolate milk, 6 white milk, 12 bananas, 3 ranch	190	
10	6/11/15	61	13	10	21 chocolate milk, 7 white milk, 11 bags of carrots, 3 ranch, 2 honey mustard	200	
11	6/12/15	32	6	5	3 chocolate milk, 1 white milk	120	
12	Totals	408	99	90	115 chocolate milk, 46 white milk, 12 bananas, 11 bags of carrots, 14 apples, 39 packets of sauce	1640	
13							
14							
15							

Figure 3-4 Strategies to Assess and Reduce Food Waste

Reducing Plate Waste

What Manhattan Schools Can Do






ASSESS

Assess What is Being Wasted and Where it Comes From

-  Record all sources of food waste
-  Separate lunchroom waste into 4 categories: Food, Recycle, Donate, Trash
-  Weigh the pounds of waste in each category to give you an insight of what is being wasted




DECREASE WASTE

Incorporate Strategies Suggested by the USDA

-  Hold recess before lunch
-  Ensure lunch periods are at least 30 minutes
-  Become a 'Smarter Lunch Room'

REDIRECT WASTE

Set a School Goal with the USDA

-  Create sharing table within the lunch room for left over, packaged food, or donate it to the Flint Hills Breadbasket
-  Separate waste into different categories, such as unopened food, food scraps, recyclables, and trash.
-  Compost food scraps

Alignment with Public Health Core Competencies

Throughout my time in the KSU MPH program I was able to accomplish multiple core competencies by conducting research, taking courses, and doing my field experience with Research and Extension.

Biostatistics. I accomplished the biostatistics core competency on a number of levels. First, I completed biostatistics course, which gave me a general overview of statistics and study design. Since then I have used the skills I learned there to critically analyze peer-reviewed evidence on research design and statistics. In addition, I used those skills to design and conduct a thesis research study, as well as analyze the data.

Environmental Toxicology. I was first exposed to the importance of environmental health in my Environmental Toxicology class, where I conducted a review on the effects of ozone exposure during exercise. In addition, while completing my field experience, I learned of the dangers of methane gas, and how food waste contributes substantially to methane gas production. I also touched upon the importance of food safety and how certain practices can lead to food borne illness at a children's cooking class.

Epidemiology. Epidemiology has been a prevalent topic in nearly all of my courses, as well as in my research. Epidemiological studies are responsible for establishing links between behavior and health thus, much of the evidence for the need to study physical activity behaviors stems from epidemiological sources. I used epidemiological evidence regarding a population estimate of children's physical activity levels in my literature review and my thesis, and used population level of nutrition behavior to help meet my learning objective of understanding the global health problem of feeding a growing population.

Health Service Administration. A strong emphasis in the MPH program is the importance of targeting multiple levels of an ecological system to create change. Health service

is an important part of the ecology of systems, which reaches a large number of the population. Though I did not work directly with Health Service, I conducted an interview with the CEO of a regional hospital, and was exposed to his view of healthcare and the steps he was taking to better ensure quality care to all patients.

Social and Behavioral Science. As I was in the emphasis physical activity emphasis of the MPH program, I was exposed to a large number of social and behavioral science courses. From these courses I was able to understand theories and concepts behind human behavior, research methods of social and behavioral science, and the application of these concepts to create interventions translatable to practice. In addition, I have been extensively involved with developing observation systems to describe setting behavior in order to determine the impact on an individual behavior response.

Conclusion

In conclusion, my two years in the MPH program at Kansas State University has provided me with multiple opportunities to enhance my understanding of the field of public health. I have met the core competencies through classwork, research, my field experience, and through interactions with my peers and professors. The information gained through this program will allow me to think critically about public health issues and mechanisms of behavior change, and help create translatable evidence-based practices to improve population health.

