SUMMER LEAGUE COLLEGE BASEBALL PLAYERS: DO DIETARY INTAKE AND BARRIERS TO HEALTHY EATING DIFFER BETWEEN GAME AND NON-GAME DAYS?

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ABSTRACT

The purpose of this study was to examine dietary intake and barriers to healthy eating among summer league college baseball players (N=13). A total of nine 24-hour dietary intake records, including three each of non-game (NG), home game (HG), and away game (AG) days, were used to assess dietary intake and eating frequency. A survey was used to identify barriers to healthy eating. Outcomes of this study indicate: (a) participants had suboptimal dietary intake, as indicated by mean ($M \pm SD$) total Healthy Eating Index (HEI) scores of 56 ± 5 (NG), 58 ± 6 (HG), and 56 ± 8 (AG), out of maximum possible score of 100, (b) The highest mean HEI component score for the three situations was for meat (10 ± 1 NG, 9 ± 1 HG, 9 ± 2 AG), out of a maximum possible score of 10, lowest scores included sodium (mean NG, HG, and AG range 2.3 to 2.7), cholesterol (2.8 to 4.9), fruit (3.1 to 4.1), and vegetables (4.6 to 5.1 game days), (c) 50% of dietary parameters assessed had individual effects (HEI grain, vegetable, fruit, total fat, and variety scores, and meal frequency), and (d) 92% of participants reported that having insufficient time to cook healthy was a NG barrier, having to eat out frequently was a barrier for 85% and 54% of participants for AG and NG days, and not knowing how to choose healthy foods when eating out was an AG barrier for 69%. Collectively, results indicate that summer league baseball athletes would benefit from nutrition education designed to improve dietary intake, thus promoting health and physical performance.

INTRODUCTION

Seventy-four percent of the U.S. population have diets that need improvement, and male athletes are no exception to this finding. Inadequate intake of carbohydrate and excess intake of protein (Clark, Reed, Crouse, & Armstrong, 2003), fat, saturated fat, cholesterol, and sodium have been reported among adult male athletes (Hinton, Sanford, Davidson, Yakushko, & Beck, 2004). Suboptimal dietary intake can result in persistent fatigue, poor exercise recovery, illness, and unwanted weight loss (Ray & Fowler, 2004); all of these conditions can be detrimental to sport performance. Furthermore, increased nutrient and energy intake has been found to improve athletic performance (Frentsos & Baer, 1997).

There has been surprisingly little research investigating dietary intake and barriers to healthy eating among baseball athletes, despite the finding that 48% of athletes on a Major League baseball team were found to have dyslipidemia (Cantwell, 2002). Baseball inherently has social, dietary, and environmental factors that could promote suboptimal dietary intake. Palumbo (2000) highlighted a number of these factors in a case report of a minor league baseball program, as the following: players living on a tight budget and making poor meal choices, experiencing stress associated with living away from home and learning to be on one's own, pressure to enhance fundamental playing skills, having diets that provide inadequate energy and fluid intake, and schedules that require frequently eating on the road and competing in a hot, humid environment.

Summer league baseball is a popular avenue taken by college players wishing to improve their skills and performance visibility for professional scouts during the National Collegiate Athletic Association (NCAA) non-competitive season. There are 12 NCAA endorsed and over 100 non-NCAA sanctioned summer leagues. Each league has 10 to 20 teams, each team has 25 to 30 players. The Coastal Plain League (CPL) is a "showcase" wood bat summer league program, sanctioned and certified by Major League Baseball and endorsed by the NCAA. A goal of showcase leagues is to provide scouts easy and frequent access to these professional prospects. CPL teams recruit from the top 10% of college players throughout the country; 50% to 60% of players will be recruited to play professional baseball (L. C. Toombs, personal communication, September 22, 2005).

There are a number of stressors experienced by CPL players that could promote suboptimal dietary intake. In the 2005 season, CPL teams traveled three or more hours to play 50% of games and played 56 games in 70 days. Players practice and compete in the southeastern region of the U.S., where 80% humidity and 90 to 100 °F days are common. Game days consist of a 1.5 to 2-hour warm up, that begins at 3 PM (home game) or 5 PM (away game), and includes stretching, running sprints, and practicing position-specific drills, followed by the game. Traditionally, games begin at 7:05 PM and last two to three hours. The team is responsible for providing meals for their athletes only while traveling to away games and after home games. While traveling, meals are generally purchased at fast food restaurants. Post-game meals are provided by the home team for home team as well as visiting team athletes. The post-game meals are donated by area restaurants (pizza, pasta, sandwiches) or cooked on grills (hot dogs, hamburgers) by home team employees or volunteers. The majority of CPL players are living away from home with host families; host families provide lodging but are not responsible for meals. Finally, because CPL players are members of NCAA programs, they cannot be paid for playing summer league baseball. Thus, financial hardship throughout the summer season occurs for many players.

College athletes spend a great deal of time "on the road" during the competitive season, which results in reliance on fast food and disruption in normal eating patterns while traveling. There is a lack of research investigating dietary intake differences between competition versus non-competition days among college athletes. This research topic is important to investigate among college baseball athletes because they have rigorous competitive season schedules and the opportunity for two competitive seasons (i.e., NCAA and summer league). Understanding differences in dietary intake and barriers to eating healthy among athletes for these situations would be an important scientific contribution to the field of sport management. Sport managers, such as athletic administrators and coaches, are key personnel whom athletes rely on for performance enhancing information. Furthermore, overall wellness of the student athlete reduces the injury prevalence and other health-related problems that impact performance (and thus team competitiveness) and medical expenses.

This research is an extension of a larger research project that investigated body composition and dietary intake of summer college baseball players (Malinauskas, Overton, Corbett, & Carpenter, 2006). The purpose of this study was to investigate dietary intake and perceived barriers to eating healthy among summer league college baseball players, specifically, those playing in a "showcase" league. The research questions under investigation are as follows: (a) identify barriers to eating healthy on non-game and away game days, (b) identify if individual and situation (i.e., non-game, home game, and away game days) effects occur for dietary intake and meal frequency, and (c) identify if suboptimal dietary intake occurs for non-game, home game, and away game days.

METHODS

PARTICIPANTS

Participants were 13 male college baseball players who were members of the same Coastal Plain League (CPL) summer baseball team. This was a sample of convenience where participation was determined on a volunteer basis. After being fully informed regarding the study protocol and the risks involved, participants were asked to sign an informed consent approved by the university's Institutional Review Board for Research with Human Subjects.

PROCEDURES

Participants met individually with a Registered Dietitian (RD) on four occasions throughout the summer league season. On the first occasion, participants had their body composition measured, completed a demographic questionnaire, and received instruction for completing dietary records. Subsequent meetings included review of dietary intake records with the RD. In an effort to provide uniform instruction and data collection, one RD provided instruction and collected all data.

BODY COMPOSITION MEASUREMENT

Anthropometric measurements were taken by one anthropometrist. Participants voided preceding the weight measurement and wore light athletic apparel (generally shorts) for body composition measurements. Weight was measured to the nearest 0.1 kg (Tanita body composition analyzer, Arlington, IL), height (Seca portable height stadiometer, Leicester, England) to 0.1 cm, and skinfolds to 0.1 mm (Harpenden skinfold caliper, Vital Signs model 68875, Country Technology, Inc., Gays Mills, WI) using the three-site (chest, abdomen, thigh) formula and American College of Sports Medicine procedures (Armstrong et al., 2005, p. 62). Skinfold measurements were converted to an estimation of body fat percentage using body density and percent body fat equations (Armstrong et al., 2005, pp. 62-63).

DEMOGRAPHIC QUESTIONNAIRE

A sports nutritionist developed a questionnaire to assess demographic information and potential barriers to healthy eating for non-game and game days among CPL baseball athletes. The questionnaire was reviewed for content validity by four experts in this area of sport, including a former CPL player, a CPL general manager, a CPL team president, and a sport management professor who serves as a consultant to a CPL team. To pilot test the survey, a small sample of nine college baseball players completed the questionnaire. No modifications to the questionnaire were necessary, based on their responses.

DIETARY INTAKE DATA COLLECTION

Dietary intake was measured during the summer league playing season from June to August. Participants were in peak conditioning and playing competition games on a regular basis. Unweighed dietary intake records were recorded for 24-hour periods for a total of nine days, including three non-consecutive non-game, home game, and away game days, respectively. The information provided on each record included amounts and descriptions of all foods and beverages consumed and time of consumption. A three-to-seven-day monitoring period is reported to provide a reasonably accurate and precise estimate of habitual energy and macronutrient intake among athletes (Magkos & Yannakoulia, 2003). Furthermore, dietary intake records have been used to assess nutrient intake of college athletes (Clark, Reed, Crouse, & Armstrong, 2003).

The RD met individually with each participant on four occasions for the purpose of collecting dietary intake data. During the first meeting, the RD provided verbal instruction and written handouts for aiding participants in accurately recording dietary intake data. The handouts included a written summary of the verbal instructions, examples of correct units for reporting food and beverage consumption (e.g., 3 cups vs. 1 bowl of cereal), examples of portion sizes in relation to common household objects, three blank recording forms, and a sample record, to illustrate the specificity and detail of reporting participants were requested to follow. Participants were instructed to staple food packages to the dietary intake records if they ate convenience foods (e.g., Skittles® candy) and report specific menu items from restaurants (e.g., Applebee's® honey BBQ chicken sandwich) and convenience stores (e.g., Wawa® roasted chicken Caesar wrap) on their records. During each of the three subsequent meetings, participants reviewed with the RD three complete records at a time, and received the next set of blank records (meetings 2 and 3). Food models, household measuring utensils (e.g., teaspoon, tablespoon, cup), sport drink containers, and packages from foods commonly consumed by baseball athletes (e.g., sports drinks, sunflower seed packages, energy bars such as Snickers Marathon®) were used by the RD during each meeting to visually illustrate portion sizes.

EATING FREQUENCY ASSESSMENT

Mean number of daily eating occasions were calculated for each athlete for each situation (i.e., non-game, home game, and away game days) using the method described by Drummond and colleagues (1998).

DIETARY INTAKE ASSESSMENT

Mean energy intake and healthy eating index (HEI) scores were calculated for each athlete for each situation using the interactive healthy eating index tool (Interactive Healthy Eating Index, n.d.). The HEI, which contains 10 component scores and a total score, was designed to assess various aspects of a healthful diet as compared to recommendations for the general public, of specified age and gender groups (Basiotis, Carlson, Gerrior, Juan, & Lino, 2002). HEI components 1 to 5 measure the degree to which the diet conforms to serving recommendations for grains (e.g., bread, cereal, rice, pasta), vegetables, fruits, milk (e.g., milk, yogurt, cheese), and meat (e.g., meat, poultry, fish, dry beans, eggs, and nuts), 6 and 7 measure total fat and saturated fat intake as a percentage of total energy (i.e., calorie) intake, 8 and 9 measure total cholesterol and sodium intake, and 10 examines diet variety. Each of the 10 components is assigned a score ranging from 0 to 10, the higher the score, the closer the diet is to meeting recommendations for that component. For males, age 19 to 24 years, the criteria for maximum component scores of 10 are based on a 2900 calories per day diet plan, including 11 servings of grain, 5 vegetable, 4 fruit, 3 milk, and 2.8 (7 ounces total) meat, 30% or less calories from fat, less than 10% of calories from saturated fat, 300 mg or less cholesterol, 2400 mg or less sodium, and 8 or more different items in a day for variety. Criteria for minimum component scores of 0 were 0 servings of grain, vegetable, fruit, milk, or meat, respectively, 45% or more calories from fat, 15% or more calories from saturated fat, 450 mg or more cholesterol, 4800 mg or more sodium, and 3 or fewer different items in a day for variety. Intermediate scores were computed proportionate to the 0 and 10 criteria for each component. Thus, low component scores indicate poor compliance with recommendations for that diet aspect.

The HEI total score is a sum of each of the component scores, having a maximum possible score of 100. A HEI total score greater than 80 indicates a "good" diet, 51 to 80 implies diet "needs improvement", and scores of 50 or lower reflect "poor" diet (Basiotis, Carlson, Gerrior, Juan, & Lino, 2002). The HEI was recently used to examine diet quality and its association with C-reactive protein, an inflammatory marker related to cardiovascular disease (Ford, Mokdad, & Liu, 2005).

ASSESSMENT OF UNDER-REPORTING

The ratio of energy intake (EI) to basal metabolic rate (BMR; EI:BMR) was used to identify under-reporting of dietary intake data. Energy intake was calculated from dietary intake data, basal metabolic rate was estimated from the Dietary Reference Intakes estimated energy requirements for men, which is derived from a regression equation based on the doubly labeled water technique (Food and Nutrition Board, 2002). Participants were excluded if the mean intake for any of the three situations (i.e., non-game, home game, or away game days) had an EI:BMR less than or equal to 0.9 (Farajian, Kavouras, Yannakoulia, & Sidossis, 2004).

STATISTICAL ANALYSIS

Analysis were performed using JMP IN® software, version 5.0 (Sall, Creighton, & Lehman, 2005). Descriptive analysis included means and standard deviations. Subsequent data analysis involved analysis of variance appropriate for one-way repeated measures design with comparison for all pairs that were significantly different using Student's *t* test unadjusted for multiple testing. A significant level of .05 was used for statistical analysis.

RESULTS

Overall, 28 athletes were recruited to participate in the study. However, 11 were ineligible because they were released from the CPL team before complete dietary data was collected. Players were released because of poor performance (*n*=5), medical (*n*=3), and personal (*n*=2) reasons, and being recruited to play for a Major League Baseball organization (*n*=1). An additional four were excluded due to underreporting of dietary intake data. The final sample size was 13, which was a 46% participation rate for male baseball players from the CPL team surveyed. Mean age of participation was 20.5 ± 1.3 years (M ± *SD*). The majority (77%) of participants were White, the remaining 23% were Asian/Pacific Islander, Black, or Hispanic. Asthma was the only chronic or persistent medical condition present, reported by 15% of participants.

In regard to anthropometric measurements of participants, mean height was 72.4 ± 1.8 inches, weight 197.6 ± 26.2 pounds, body mass index 26.6 ± 2.6 kg/m^2, and body fat 12.2 ± 2.6%. Estimated energy needs were 3178 ± 239 calories/day (32.4 ± 1.8 calories/kg) (Food and Nutrition Board, 2002). Mean calorie intake was 3161 ± 709 cal/d (35.4 ± 8 cal/kg) on non-game, 2968 ± 26 cal/d (33.4 ± 7.5 cal/kg) for home game, and 2679 ± 701 cal/d (33.5 ± 8.1 cal/kg) for away game days. Caloric intake did not differ between non-game and home game days, and was 99.5 ± 22% of estimated needs on non-game days, 93.7 ± 20.0% on home game, and 94.0 ± 22.1% on away game days, $F(2, 36)=0.3$, $p=.74$.

Regarding question one, non-game and away game day barriers for healthy eating are reported in Table 1. We defined substantial barriers as those for which a majority of participants reported a "yes" response. Having to eat out frequently was a substantial barrier, as indicated by 85% of participants on away game days and 54% on non-game days. Having insufficient time to cook healthy was reported by 92% of participants to be a non-game day barrier; whereas not knowing how to choose healthy foods when eating out was reported by 69% of participants as an away game day barrier.

Concerning question two, individual and situation effects for dietary intake, based on Healthy Eating Index (HEI) scores, and meal frequency, are reported in Table 2. Significant individual differences were found for HEI grain, vegetable, fruit, total fat, and variety scores, and meal frequency. Significant situation effects were found for HEI grain, vegetable, and saturated fat scores. Grain intake was closest to the recommendation of 11 servings on away game days, as indicated by a mean HEI grain score of 8.6 out of a maximum possible score of 10, which was significantly greater than scores for home game (7.4) and non-game (7.1) days. Vegetable intake was closest to the recommendation of 5 servings on non-game days and the recommendation of less than 10% of calories from saturated fat on home game days (see Table 3).

Referring to question three, mean total HEI score ranged 55.9 to 57.9 out of a maximum possible score of 100, indicating the diet needs improvement for non-game as well as game days (see Table 3). The highest mean HEI component score was for meat, having mean score of 9.7 out of a maximum possible score of 10 for non-game, 8.9 for home game, and 9.1 for away game days. The next highest HEI component scores were grain and variety; whereas the lowest included sodium, cholesterol, fruit, and game day vegetable intakes (see Table 3).

DISCUSSION
The purpose of this study was to investigate dietary intake and perceived barriers to healthy eating among college summer league baseball players. Despite the fact that proper nutrition is essential for athletes to meet energy demands of training and competition, to optimize performance (Dunford, 2006), and reduce oxidative stress (Watson, MacDonald-Wicks, & Garg, 2005), findings from this study indicate that the diets of college summer league baseball athletes need improvement, particularly in the areas of sodium (excess), cholesterol (excess), fruit (inadequate), and vegetable (inadequate) intakes. Most important, suboptimal dietary intake occurred for non-game, home game, and away game days.

An individualized approach to improve the diets of summer league players is supported by the finding that 50% of the dietary parameters assessed had significant individual effects, including HEI grain, vegetable, fruit, total fat, and variety scores, and meal frequency. Drummond and colleagues (1998) found that the percentage contribution of carbohydrate to total energy was positively correlated with eating frequency in adult men. Thus, increasing eating frequency, particularly of food groups that are inadequate, is a specific behavior that an athlete could set daily goals to achieve (e.g., eat three servings of fruit as multiple snacks throughout the day) and easily monitor how successful they are in accomplishing the goal.

The competition season for baseball athletes can generally be summarized as follows: “practice, play, eat, sleep, and travel” (Dunford, 2006; Palumbo, 2000). This rigorous schedule results in a number of stressors that impact the dietary intake of baseball athletes. Findings from the current study indicate that having to eat out a lot of the time was a substantial barrier to eating healthy, irrespective of game day status. Not having enough time to cook healthy (non-game days) and not knowing how to choose healthy foods when eating out were also substantial barriers. These identified barriers could be areas for which nutrition education may be most effective to support improving the diets of college summer league baseball athletes.

The findings have numerous practical applications for sport management practitioners. First, suboptimal dietary intake is common among summer league baseball athletes. Second, nutrition education strategies that focus on identifying healthy food choices while eating out and how to quickly prepare healthy foods at home are needed for college athletes who play summer league baseball. Third, because individual effects for dietary intake components are common, individualized nutrition counseling, in an effort to address dietary inadequacies, is recommended. Finally, individual effects were greater than situation effects. Thus, day-to-day eating (versus game day eating) should be the focus of strategies to improve suboptimal dietary intake to promote health and performance.

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Table 1
Non-game and Away Game Day Barriers for Healthy Eating of Summer League College Baseball Players

	Situation	
	Non-game days	Away game days
Source of pressure	% of participants reporting "yes" response	
I don't have enough time to cook healthy	92%	Not applicable
I don't know how to cook healthy	38%	Not applicable
I don't have sufficient facilities to cook healthy	23%	Not applicable
I don't have enough money to buy healthy foods	38%	38%
I have to eat out a lot of the time	54%	85%
I don't know how to choose healthy foods when I eat out	8%	69%
Healthy foods don't taste good to me	15%	15%
Healthy foods are not convenient for me to buy	0%	23%
Healthy foods are not convenient for me to eat	8%	23%
Healthy foods are too expensive	0%	8%

Table 2
Individual and Situation Effects for Healthy Eating Index (HEI) Scores and Meal Frequency of Summer League College Baseball Players

Variable		*df*	*MS*	*F*	*p*
HEI grain score					
	Individual effect	12	4.62	3.25	.01
	Situation effect	2	8.34	5.86	.01
	Error	24	1.42		
HEI vegetable score					
	Individual effect	12	13.83	9.04	<.01
	Situation effect	2	23.37	15.27	<.01
	Error	24	1.53		
HEI fruit score					
	Individual effect	12	21.74	7.49	<.01
	Situation effect	2	3.78	1.30	.29
	Error	24	2.90		
HEI milk score					
	Individual effect	12	9.59	1.66	.14
	Situation effect	2	8.03	1.39	.27
	Error	24	5.77		
HEI meat score					
	Individual effect	12	0.76	0.39	.95
	Situation effect	2	2.16	1.10	.35
	Error	24	1.96		
HEI total fat score					
	Individual effect	12	6.61	2.60	.02
	Situation effect	2	0.44	0.17	.84
	Error	24	2.54		
HEI saturated fat score					
	Individual effect	12	3.80	1.20	.34
	Situation effect	2	18.40	5.79	.01
	Error	24	3.18		
HEI cholesterol score					
	Individual effect	12	7.59	0.71	.73
	Situation effect	2	15.41	1.44	.26
	Error	24	10.70		

Table 2 (cont.)

Individual and Situation Effects for Healthy Eating Index (HEI) Scores and Meal Frequency of Summer League College Baseball Players

Variable		*df*	*MS*	*F*	*p*
HEI sodium score					
	Individual effect	12	7.74	1.77	.11
	Situation effect	2	0.62	0.14	.87
	Error	24	4.37		
HEI variety score					
	Individual effect	12	6.16	3.75	<.01
	Situation effect	2	5.25	3.19	.06
	Error	24	1.64		
HEI total score					
	Individual effect	12	53.03	1.56	.17
	Situation effect	2	14.88	0.44	.65
	Error	24	33.92		
Meal frequency					
	Individual effect	12	0.45	2.40	.03
	Situation effect	2	0.15	0.80	.46
	Error	24	0.19		

HEI scores are based on the average of three-day dietary food records for each situation. Situation effects refers to differences between non-game, home game, and away game days.

Table 3
Healthy Eating Index (HEI) Scores and Meal Frequency of Non-game, Home Game, and Away Game Days for Summer League College Baseball Players

	Situation ($M \pm SD$)		
HEI component	Non-game days	Home game days	Away game days
Grain	$7.1_a \pm 1.9$	$7.4_a \pm 1.5$	$8.6_b \pm 1.2$
Vegetable	$7.1_a \pm 2.3$	$5.1_b \pm 2.0$	$4.6_b \pm 2.7$
Fruit	3.3 ± 2.9	4.1 ± 3.3	3.1 ± 2.9
Milk	5.2 ± 2.6	3.9 ± 2.9	5.4 ± 2.4
Meat	9.7 ± 0.6	8.9 ± 1.2	9.1 ± 1.7
Total fat	6.1 ± 1.4	6.4 ± 2.2	6.1 ± 2.2
Saturated fat	$5.0_a \pm 2.0$	$7.3_b \pm 1.6$	$5.4_a \pm 1.8$
Cholesterol	2.8 ± 2.7	4.9 ± 3.6	4.2 ± 3.0
Sodium	2.3 ± 2.0	2.7 ± 1.9	2.6 ± 2.0
Variety	8.0 ± 1.7	6.7 ± 2.0	7.2 ± 1.6
Total HEI score	56.4 ± 5.3	57.9 ± 6.0	55.9 ± 7.5
Meal frequency	3.5 ± 0.6	3.5 ± 0.6	3.3 ± 0.3

Means in the same row that do not share sub-scripts differ by situation effect ($p<.01$) using the Student's *t* test unadjusted for multiple testing. HEI scores are based on the average of three-day dietary food records for each situation.