

## Breakfast Consumption and Physical Fitness in Elementary School Children

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### Abstract

**Background and Purpose:** Breakfast consumption is associated with many benefits, including lower rates of school absenteeism and tardiness, improved cognitive function, healthy eating, increased physical activity, and lower body weight, but it is estimated that 20% of children and 31.5% of teens skip breakfast. This study examines the relationship between breakfast consumption and performance on an endurance run among 10-12 year old children. **Methods:** Seventy-two children filled out questionnaires about breakfast and physical activity habits and participated in a researcher-facilitated fitness test. **Results:** Daily breakfast consumers were 3.82 times more likely to be in the healthy fitness zone for the endurance test ((OR) 3.82, 95% CI 1.07-13.73) compared to those who only sometimes consume breakfast. **Conclusions and Implications:** Emphasizing the importance of eating breakfast may be a significant component to reiterate in physical education curriculum and interventions focused on health. Additionally, increasing *in-classroom school breakfast programs* may contribute to improvements in children's physical fitness.

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### Introduction

Breakfast is an important meal of the day, however, a national study found that 20% of children and 31.5% of teens skip breakfast (Deshmukh-Taskar, Nicklas, O'Neil, Keast, Radcliffe, & Cho, 2010). Breakfast is associated with many benefits, both cognitive (Adolphus, Lawton, and Dye, 2013; Rampersaud, Pereira, Girard, Adams, & Metzl, 2005; Hoyland, Dye, & Lawton, 2009) and physical health related. In relation to physical health, a review of the literature examining 47 studies revealed that children and adolescents who regularly consume breakfast have healthier nutritional profiles (i.e. better diet quality and food choices throughout the day that include vegetables and milk, and consumption of fewer sugar sweetened beverages), and lower body weights than their breakfast skipping counterparts (Rampersaud, Pereira, Girard, Adams, Metzl, et al., 2005). While many studies have examined the connection between breakfast consumption and nutritional profiles (Rampersaud et al., 2005), as well as, academic performance in children (for a systematic review, see Hoyland, Dye, & Lawton, 2009), fewer have examined breakfast

consumption and its relation to children's physical activity and fitness.

Some research suggests a link between regular breakfast consumption and more moderate to vigorous physical activity (Corder, van Sluijs, Ridgway, Steele, Prynne, et al., 2014; Vissers, Jones, Corder, Jennings, Van Sluijs, Welch, et al., 2013), and adolescents who regularly consume breakfast exercise more than their non-breakfast consuming peers (Keski-Rahkonen, Kaprio, Rissanen, Virkkunen, & Rose, 2003). A study of 7-10 year old Swiss children who reported consuming breakfast almost every day also showed better scores on fitness tests, including a shuttle run, a 20 meter sprint and the standing long jump than children that sometimes or never consumed it (Baldinger, Krebs, Muller, & Aeberli, 2012). Similarly, 10-16 year old British children who ate breakfast daily were more likely to have higher levels of physical activity and cardiorespiratory fitness compared to skippers, but the relationship between breakfast consumption and cardiorespiratory fitness did not hold for girls (Sandercock, Voss, & Dye, 2010).

Children's physical activity and fitness are important areas to research in part due to the link to healthy body weight, but also as general measures of health. Given the connection among regular breakfast consumption, child weight, and physical activity and fitness, in the present pilot study we examined the relationship between daily breakfast consumption and 10-12 year old children's performance on an endurance run, specifically to determine if daily breakfast consumption is related to performing in the healthy fitness zone on the Progressive Aerobic Cardiovascular Endurance Run (PACER) (Plowman & Meredith, 2013), a measure of fitness that is routinely used in schools in the United States. We predicted that daily breakfast consumers would be more likely to perform in the healthy fitness zone for PACER performance and would have higher levels of self-reported physical activity than those that consume breakfast less regularly.

## Methods

### Sample and Recruitment

This study was approved by California State University, Fresno's Institutional Review Board. Consent forms were given to teachers in 9 classrooms of 4<sup>th</sup>-6<sup>th</sup> grade students in a southern California elementary school. Fourth-sixth grade students were eligible to participate in the study if their teacher was willing to send the consent forms home and dedicate time during their physical education class to allow the students to participate in the researcher facilitated PACER test. One teacher declined to have her two classes participate in the study. Ninety-eight parents returned consent forms for a response rate of 49%. Parents filled out questionnaires asking about their child's birthdate and breakfast habits. Parent responses were used to fill in data if the child left information about his/her birthdate or breakfast consumption blank on his/her form ( $n = 2$ ). Children participated in the PACER and filled out self-report questionnaires on breakfast habits and physical activity on the day of the testing. In the interest of using a minimal amount of classroom instruction time for testing and maximizing parent and child response rate, demographic information, including information on income level,

education, and ethnicity were not collected in the present study.

The school serves K-6 grades and 24.9% of the students are eligible for free or reduced lunch, and as such this school is classified as a low-poverty school (California Department of Education, 2014). In terms of ethnic breakdown, 3.3% of the student body is African American, 16.6% Asian, 5.4% Filipino, 42.4% Hispanic/Latino, 26.7% White, .2% Pacific Islander, and 5.4% are of two or more races (California Department of Education, 2014).

### Measures and Data Collection Procedures

**Child Questionnaire.** On the morning of the fitness testing, children filled out a consent form and brief questionnaire asking about their birthdate, breakfast consumption frequency (*everyday, sometimes, never*) and frequency of physical activity (*not active, somewhat active, very active*). We adapted a question used in previous studies to inquire about the frequency of breakfast consumption (e.g. Fugas, Berta, Walz, Fortino, & Martinelli, 2013; Kastorini, Milionis, Goudevenos, & Panagiotakos, 2011; Keski-Rahkonen, Kaprio, Rissanen, Virkkunen, & Rose, 2003).

**Parent Questionnaire.** Parents filled out a consent form and questionnaire asking about their child's birthdate and frequency of their child's breakfast consumption.

**Endurance Test.** The 20 meter PACER test is part of Fitnessgram's national health-related fitness assessment, and was used to assess children's fitness in this study (Plowman & Meredith, 2013). It is routinely used in California schools as part of the physical fitness testing that is conducted in the 5<sup>th</sup>, 7<sup>th</sup>, and 9<sup>th</sup> grades. The PACER is a test of endurance, such that participants run laps at increasing levels of speed guided by an audio recording. Intervals become progressively shorter and participants must increase their pace in order to complete a lap. Total number of laps completed is recorded.

These runs were performed in the morning over a three-day period. Cones were set up at a distance of 20 meters. Students were paired up

and 7-10 students participated at one time. Students ran until they could no longer keep pace with the beeps of the audio recording. Researchers also counted and recorded laps to ensure accuracy.

**Analyses**

The Cooper Institute provides standards for performance on the PACER for children by age and gender, and the minimum age in which standards are given is age 10, so while all 4<sup>th</sup> graders were allowed to participate, only the data from those who were 10 years old or older were used in this study (The Cooper Institute, 2014). The standards specify the cutoff for boys and girls age 10 is  $\geq 17$  laps, for 11 year old boys and girls  $\geq 20$  laps, and 12 year old boys and girls  $\geq 23$  laps for the healthy fitness zone.

Descriptive statistics were run to show the differences between daily and occasional breakfast consumers (see Table 1). Logistic regression was used to analyze the data. Odds Ratios (OR) with 95% confidence intervals (CIs) were used to estimate the relation between breakfast frequency (always versus sometimes) and age and gender-specific fitness levels (healthy fitness zone versus non-healthy fitness zone). Children were categorized in the healthy

**Table 1**

Sample Characteristics by Daily and Occasional Breakfast Consumers		
	Daily Breakfast Consumers (n= 59)	Occasional Breakfast Consumers (n= 13)
<b>Age</b>		
10	32 (54.2%)	6 (46.2%)
11	22 (37.3%)	6 (46.2%)
12	5 (8.5%)	1 (7.7%)
<b>Gender</b>		
Male	37 (62.7%)	5 (38.5%)
Female	22 (37.3%)	8 (61.5%)
<b>Fitness</b>		
Healthy Fitness Zone	43 (72.9%)	5 (38.5%)
Not in Healthy Fitness Zone	16 (27.1%)	8 (61.5%)
<b>Activity Level</b>		
Very Active	35 (59.3%)	4 (30.8%)
Somewhat Active	24 (40.7%)	9 (69.2%)

or not healthy fitness zones based on The Cooper Institute standards for number of laps completed. P-values  $< .05$  were considered significant. All analyses were conducted using SPSS, version 22.0.

**Results**

The total sample size included 72 10-12 year old children, who filled out questionnaires and participated in the PACER. Eighty-two percent of the children reported eating breakfast daily while 18% reported eating breakfast sometimes. Fifty-four percent reported being very active, while 46% reported being somewhat active. None of the children reported that they *never* eat breakfast or that they are *not active*, so these categories were removed. In regards to fitness performance, 67% were classified in the healthy fitness zone based on their performance on the endurance run (See Table 1 for sample characteristics).

Daily breakfast eaters were 3.82 times more likely to be in the healthy fitness zone for the endurance run compared with those who only sometimes consume breakfast, OR= 3.82, 95% CI= 1.07-13.73. Additionally, those who reported eating breakfast daily also reported being more physically active, OR= 3.18, 95% CI= .86-11.76, although this was at the trend level ( $p = .08$ ). Gender was entered into the model as a control but was not significant in either model.

**Discussion**

The findings of the study supported our hypothesis that children who consume breakfast daily would be more likely to perform within the healthy fitness zone on the PACER. This is consistent with similar research examining children’s breakfast consumption and fitness performance in other countries (Baldinger, Krebs, Muller, & Aeberli, 2012; Sandercock, Voss, & Dye, 2010). Daily breakfast consumers may be more likely to engage in health-protective behaviors, thus explaining the connection to better performance on the PACER, but eating breakfast on the day of testing may also provide more energy to perform

to fatigue on tests of endurance (Williams & Lamb, 2008), as well as more energy throughout the day. One study found that when ‘sometimes’ breakfast eaters consumed breakfast on a specific day, these children completed more moderate to vigorous physical activity on that day (Corder et al., 2014). However, in our study, our hypothesis regarding daily breakfast consumers being more likely to be physically active than occasional breakfast consumers was only supported at the trend level.

### Limitations

This study was correlational in nature, and care should be taken to interpret the results as such. The study was also limited by the small sample size. All children in the study consumed breakfast at least sometimes, thus excluding the *never* eats breakfast category. Some children in this age group do indeed skip breakfast (Deshmukh-Taskar, et al., 2010) so a larger more diverse sample may allow researchers to examine this group in future studies and to determine if this relationship exists in a linear fashion, with even larger differences existing between daily consumers and non-consumers. Lastly, specific content of breakfast was not analyzed, and future studies can determine if eating breakfast the day of testing is related to improved performance. Using dietary journals coupled with parent reports of child food intake may produce more reliable results and provide richer data about the contributions of the nutritional content and quality of breakfast.

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### Conclusion

Given the connection among breakfast skipping, child weight, and fitness, emphasizing the importance of eating breakfast may be an important component to reiterate in obesity prevention and intervention programs and physical education curriculum. In-classroom school breakfast programs, where free breakfast is provided to all students, have been associated with gains in academic achievement, attention, and positive behaviors (Murphy & Pagano, 2001). Adding an educational component on the importance of breakfast consumption may be helpful in improving children's physical fitness, and in-classroom school breakfast programs could be ideal settings for these conversations to take place. Beginning these types of programs early, and including an educational component may increase the chances that regularly consuming breakfast becomes one of many health promoting behaviors that contribute to building and maintaining a healthy body in childhood and adolescence. Similarly, physical education classes are ideal settings for delivering this information, and educating students about this is both free and easy. Learning about the associations between breakfast consumption and fitness performance may motivate some students to eat a morning meal. However, more research is needed to more closely examine the relationship between breakfast consumption and physical fitness, as well as to explore factors that may moderate this relationship.

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