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Understanding the Physical Activity of Girls and Boys in India: A Logistic Model of Gender and
Socio-Contextual Determinants of Outdoor Play

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Abstract

Understanding the Physical Activity of Girls and Boys in India: A Logistic Model of Gender and
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By Susannah Downing Gloor

The purpose of this quantitative study was to explore underlying socio-contextual factors that may influence physical activity differences between adolescent boys and girls in Bijapur city, Karnataka, India. This project was set within a larger study that aims to assess how globalization leads to social, economic, and ideational changes that have repercussions for adolescent weight in the rapidly-changing environment of Bijapur. Guided by the Social Cognitive Theory (SCT) and its core tenet of reciprocal determinism, this specific project developed a logistic model to help predict physical activity differences within the context of social and environmental factors that may encourage or discourage certain behaviors depending on gender. The chosen outcome measure was outdoor play. Data collection occurred in early 2012 using a survey of private and public school adolescents (n=399). Data were analyzed using IBM SPSS Statistics 21, and analyses included descriptive statistics, bivariate analyses, and sequential logistic regression. The study concluded that a lower proportion of girls reported participating in outdoor play than their male counterparts. Friend encouragement of play and availability of sports equipment were both identified as socio-contextual determinants of outdoor play at the bivariate level, and these coincided with the SCT constructs of self-efficacy, outcome expectations, and observational learning. A sequential logistic regression found that girls are 71.2% less likely to participate in outdoor play when holding constant these socio-contextual determinants and other sample demographics (age, school type, income, caste, and religion). The results of this study add to the current research on adolescent obesity prevention in India and help fill a gap in existing literature by conducting a preliminary application of some SCT constructs to the issue. Public health practitioners can use initial findings from this study to pursue more research on theory application to obesity prevention behaviors in India. Future interventions could involve a focus on cultural traditions and include female adults such as grandmothers and mothers in public health initiatives on gender and obesity.

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CHAPTER ONE: INTRODUCTION

Statement of Problem

India is home to over 1.2 billion people—a population that is increasing by an average of 1.3 percent each year according to The World Bank (2012). Many of these people live in impoverished conditions, with nearly one-third living at or below India's national poverty line ("Poverty by Country," 2011). Currently, children and adolescents aged 0 to 14 years make up about 29 percent of India's population ("Health Topics by Country," 2012). Unfortunately, India's widespread poverty has contributed to a high burden of undernutrition within this age group.

At the same time, obesity is emerging as a concern in India, similar to many other low- and middle-income countries (Monteiro, Conde, Lu, & Popkin, 2004; Monteiro, Conde, & Popkin, 2002). The social, economic, and ideational transitions occurring in India as a result of globalization have now resulted in a dual burden of obesity and underweight, both of which have important health implications (Popkin, 2004; Wang, Chen, Shaikh, & Mathur, 2009). Many studies have found evidence for this phenomenon, with results pointing to an increase in the prevalence of overweight and obesity particularly among adolescents (Khadilkar, Khadilkar, Cole, Chiplonkar, & Pandit, 2011; Midha, Nath, Kumari, Rao, & Pandey, 2012; Shetty, 2002; Wang et al., 2009). In India, economic development has resulted in changes in individual behavior, especially among the affluent, that is conducive to increased obesity (Arora et al., 2012; Cherian, Cherian, & Subbiah, 2012; Goyal et al., 2010; Khadilkar et al., 2011).

These changes involve new opportunities to be sedentary due to television and computer use, an increased availability of energy-dense processed foods, and the mechanization of

previously laborious household tasks. As the World Health Organization points out, "In many low- and middle-income countries,…moderate to vigorous physical activity may be performed in the context of transport and/or occupational and/or domestic activities" (2010). But in India where household chores used to involve grinding flour and washing clothes by hand, there are now electronic appliances and hired helpers for these tasks, thereby reducing the amount of physical exertion needed for day-to-day life.

This is problematic, as physical inactivity has been identified as the fourth leading risk factor for global mortality, accounting for six percent of deaths globally (WHO, 2010). The trend toward physical inactivity is increasing in many economically developing countries, such as India, partly due to the unhealthy environments and behaviors that rapid urbanization and globalization promote (WHO, 2010). The *Global Recommendations on Physical Activity for Health* advises that youth participate in daily physical activity through outdoor play, games, transportation, and school physical education—not just planned exercise (WHO, 2010). Health benefits of such activity for children and adolescents include enhanced cardiovascular, respiratory, and bone health, reduced anxiety and depression, and lower body fat.

Likely because of the great health benefits of daily exercise for youth, there is a considerable body of research that explores the influence of physical activity interventions on children and adolescents (Biddle, Braithwaite, & Pearson, 2014). However, few studies examine predictors of physical activity among this age group or among Indians. In addition, attention to physical activity in India-based studies mostly includes just the mention of it as a determinant of obesity and the acknowledgement that environmental factors can limit physical activity for health, especially among women and girls (Chopra, Misra, Gulati, & Gupta, 2013; Contractor, Bhanushali, Changrani, Angadia, & Das, 2013; Gupta, Goel, Shah, & Misra, 2012; Seth &

Sharma, 2013). There is less exploration of how these environmental and social factors influence physical activity specifically, and how this can lead to inequality in health status. Chapter 2 addresses these factors more thoroughly.

In looking for an economically-developing setting for an examination of globalization, obesity, and physical activity among adolescents, Bijapur city is a prime location. The city is located in Bijapur district, which is in the north of the southern Indian state of Karnataka. It is the third largest district in Karnataka, with a steadily increasing population of over 1.8 million ("Bijapur District," 2001). The district is divided into five *talukas*, or administrative subdivisions. The largest taluka in Bijapur District is Bijapur taluka, of which Bijapur city is the head. Bijapur taluka has a population of 719, 250 according to the 2011 census, and about 45 percent is urban ("Bijapur District at a Glance 2011-12," 2012). Bijapur city itself has a population of 326,360—a 43 percent increase since 2001—with a sex ratio of 976 per 1000 males ("Bijapur City Census," 2011). Both the city and the surrounding taluka and district are categorized as economically underdeveloped but undergoing important economic, social, and cultural changes as a result of globalization. The area is a transportation hub with major highways and railways running straight through Bijapur city, and it is indeed considered an emerging regional leader in educational and economic development. Bijapur city has a literacy rate of 83.4 percent (higher than the national average of 69 percent), with male literacy rates exceeding those of females by over 10 percentage points ("Bijapur City Census," 2011). In addition, the rapidly changing environment of Bijapur city has begun to expose the residing population to Western lifestyles and ideas, which may be changing the norms and behaviors in terms of diet and activity.

This topic of obesity, physical activity, and globalization in Bijapur lends itself well to an examination through a social-ecological lens. Socioecological frameworks were developed to understand the dynamic interrelations between factors at a variety of levels—including the individual, social, institutional, and environmental, among others. Social Cognitive Theory is one theoretical framework that incorporates this multi-level approach to understand influences on health behaviors, and has been utilized in the past in physical activity interventions (Keller, Fleury, Gregor-Holt, & Thompson, 1999; Keller, Fleury, Sidani, & Ainsworth, 2009). Still, no studies were found that use this theory to research physical activity among otherwise healthy Indians. Some of the obesity research specific to Indian populations incorporated a mild physical activity component, but most of these studies focused on diabetic populations. Likely because undernutrition is still a problem in India, research on adolescent obesity reduction with emphasis on physical activity is slim.

Study Purpose

This research seeks to explore underlying factors that may influence physical activity differences between adolescent boys and girls in Bijapur city, Karnataka, India. This project was set within a larger study that aims to assess how globalization leads to social, economic, and ideational changes that have repercussions for adolescent weight in the rapidly-changing environment of Bijapur. The overall project measures, through an ongoing follow-up study, changes in the behaviors and body mass indices (BMI) of a cohort of adolescent students. Using survey methodology, the larger study attempts to understand individual choices and beliefs while also asking questions that may illuminate broader social and environmental influences on these choices.

This project sought to develop a model to understand adolescents' physical activity behavior using Social Cognitive Theory. To this end, physical activity differences were assessed within the context of social and environmental factors that may encourage or discourage certain behaviors depending on gender. Specifically, the study was designed to answer the following primary research questions:

1. Are there measured differences by gender in the level of self-reported physical activity among these adolescents?

2. What are the social and environmental correlates of physical activity behavior among adolescents?

3. How do the correlations between these socio-contextual factors and physical activity vary by gender?

Significance of the Study

While several studies have shown that obesity is an emerging problem in India, particularly in urban areas, few have delved into specific determinants of this shift outside of individual behavior. This study's emphasis on the outside influences of peer behavior and familial cultural beliefs on adolescents' physical activity is what makes its approach unique. In addition, preliminary examination of the data gathered in Bijapur points to significant variation in behavioral outcomes even after controlling for school and income level, suggesting that not all differences can be explained by socioeconomic status or other purely individual level factors.

This individual project's significance is apparent in its movement away from using dietary choices as the primary indicator of rising obesity—an approach that has left gaps in understanding throughout previous literature. Bijapur is still a relatively traditional city,

untouched thus far by many aspects of globalization. While some western products and services are available there—there are few places in the world that don't have Coca-Cola and chocolate bars stocked in their roadside convenience stores—the vast majority of Bijapur residents cook and eat nearly all meals at home. For adolescents who have begun to eat snacks outside the home at roadside stands or bakeries, these food items are very rarely prohibitively expensive, even for low-income Indians. Thus, diet-related explanations leave much to be desired when analyzing the burden of obesity on adolescents. This project's focus on socio-contextual influences on physical activity—an incredibly important health behavior—may provide insight into the disparities in Indian overweight and obesity by gender.

Research that illuminates facilitators and barriers of physical activity behavior can add to an understanding of the differences in physical activity among boys and girls in India. The information from this research could contribute to the field by providing preliminary support for further research into the disproportionately higher levels of overweight and obesity among Indian girls, which is emerging in various regions of the country. Particularly, the findings from this study may help to develop interventions that enable a socio-contextual environment that is more encouraging of physical activity initiation and maintenance among female adolescents. The results may also be used for further study into various social and environmental determinants of physical activity by supplying information on the ability of the Social Cognitive Theory to explain certain behaviors among Indian adolescents.

Theoretical Framework

The Social Cognitive Theory (SCT) finds support for the associations between both the physical and social environment and individual behavior. One core concept of SCT is the idea of

reciprocal determinism, which posits that a person, their behavior, and the environment continuously interact with one another. The environment influences a person, which in turn affects their behavior, which consequently also contributes to the environment in which that person—and others—operate. SCT also theorizes that the cyclical phenomenon occurs in the opposite direction, with people's behaviors manufacturing an environment conducive to certain behaviors that a person then adopts due to environmental pressures.

Within this cycle there are core constructs at work. At the personal level, self-regulation manifests itself through concepts like goal setting and self-monitoring. Outcome expectations and self-efficacy, an individual's confidence in performing a particular behavior, are also key to SCT. At the environmental level, constructs like observational learning, incentive motivation, and environmental facilitation help illustrate the influence of outside factors on a person's behavior.

In terms of adolescents, physical activity, and obesity, it is clear that more is at work than the simple intention to be active or sedentary. Other environmental and personal factors are likely influencing the physical activity behaviors of adolescents. Thus, SCT can provide a logical framework to help explain certain variation in behavior among this population.

For example, whether an adolescent decides to play actively outdoors after school is likely influenced by person-level factors as well as by their surroundings. Lack of encouragement from friends to be active, coupled with parental directives to stay inside, could reduce an adolescent's feelings of self-efficacy to make more proactive decisions in terms of fitness. Self-efficacy is an important construct according to SCT since it speaks to a person's perceived control over their behaviors and their ability to change those behaviors. Adolescents

with low self-efficacy may be less confident in their ability to be physically active even if other circumstances are suitable.

Likewise, when adolescents grow up in household environments that discourage outdoor play, either for gendered, socioeconomic, or other reasons, they help cultivate an environment that is adverse to physical activity for others. Adolescents whose own parents discourage them from playing actively will not be encouraging their peers to play outdoors after school, which perpetuates the cycle of low self-efficacy. This is reciprocal determinism at work. Furthermore, adolescents who have no peers with whom to play are missing the crucial component of observational learning, according to SCT. With no peers to model healthy physical activity behavior, low self-efficacy to complete the behavior, and an environment not conducive to active play, it is unlikely that adolescents will perform such behaviors.

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                    ┌──────────────┐
                    │   BEHAVIOR   │
                    └──────────────┘
         ┌──────────────┐    ┌──────────────┐
         │ ENVIRONMENT  │    │    PERSON     │
         │ Observational│    │ Self-Efficacy │
         │  Learning    │    │               │
         │  Outcome     │    │               │
         │ Expectations │    │               │
         └──────────────┘    └──────────────┘
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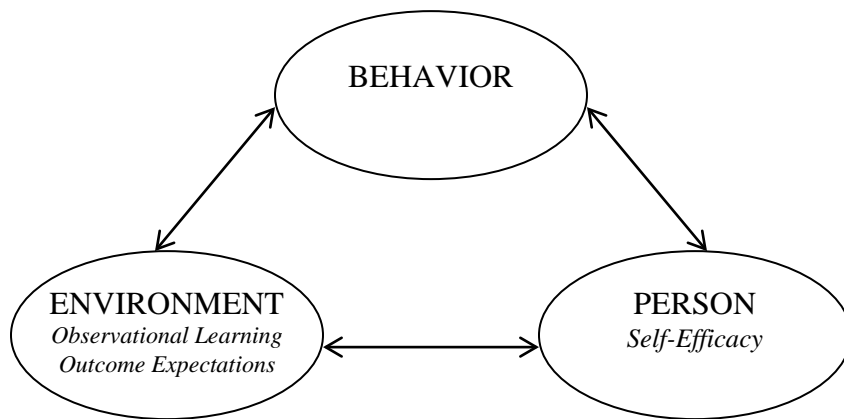
Figure 1. The Social Cognitive Theory

Definition of Terms

Nutrition transition—the shift in dietary consumption that coincides with economic development. Specifically, it is used to describe the recent changes undergone by developing

countries from traditional diets high in cereal and fiber to more Western-influenced diets high in sugars, fat, and foods sourced from animals.

Physical activity—In this study, physical activity is defined as self-reported participation in outdoor play by the sample of Indian adolescent students.

Social Cognitive Theory (SCT)—a theory in the field of behavioral science that was developed by psychologist Albert Bandura in 1986. Its main tenet is that of reciprocal determinism, which is the idea that a person, their behavior, and the environment are all simultaneously interacting with and influencing one another

Self-efficacy—one of the main constructs of SCT. Self-efficacy is a person's perceived control over their behaviors and their ability to modify those behaviors, and is often viewed as necessary for behavioral change.

Outcome expectations—a SCT construct that incorporates a person's beliefs about the consequences of a behavior, or how a behavior change will impact them positively or negatively.

Observational learning—a SCT construct that posits that observing similar individuals or role models performing a new behavior can help encourage behavior change.

Delimitations

This study was delimited to:

1. The population of 407 Indian adolescents who were selected as a representative sample of school-going adolescents in grades 8 – 10 in 2012 in three public and three private schools in Bijapur, Karnataka, India.

2. Selected demographic and self-reported behavior information obtained through a quantitative survey administered in the spring of 2012.

Limitations

The following were limitations to the study:

1. This secondary data analysis relied on self-reported answers to questions about diet and physical activity behaviors. Time constraints prevented the validation of these measures using other data collection methods from the original study.

2. The measure used to operationalize physical activity was not all-encompassing.

CHAPTER TWO: LITERATURE REVIEW

Introduction

   This research aimed to use SCT to explore socio-contextual influences on the difference in physical activity levels by gender in India, as levels of physical activity have a strong association with obesity prevalence and overall adolescent health. This chapter offers a review of the existing literature assessing the relationships between various factors and overweight and obesity in India, and is presented in the following format: (1) epidemiology of overweight and obesity in India; (2) overweight/obesity and person-level factors; (3) overweight/obesity and environment-level factors; (4) application of the Social Cognitive Theory; and (5) summary.

Epidemiology of Adolescent Overweight and Obesity in India

   The World Health Organization (2011) estimates that 30 percent of the world's underweight children reside in South-central Asia, including India. In Karnataka, the state where this study is located, 42 percent of children under the age of three years are considered underweight according to the most recent estimates from 2007 (S. Ghosh, 2007). The burden of underweight is more common in rural areas than in urban environments, and children from the poorest households are more likely to be underweight than those from affluent households (WHO, 2012). This is because poor families cannot afford to provide their children the adequate nutrition for sustained growth and development, which results in undernourishment. This undernutrition encompasses stunting, wasting, and micronutrient deficiencies and is one form of malnutrition (Black et al., 2008). Health implications involve a higher susceptibility to infections

like diarrheal diseases, malaria, and pneumonia, as well as lead to cognitive impairments (UNICEF).

However, India, like many developing countries, has also been experiencing a rise in the prevalence of obesity and overweight in recent years as globalized influences contribute to lifestyle changes (Chopra et al., 2013; Gupta et al., 2012; Khadilkar et al., 2011; Rao, Kamath, Shetty, & Kamath, 2011). Obesity is an issue of concern because it can lead to chronic illnesses such as cardiovascular disease and diabetes. It is also important to note that some studies find obesity prevalence increasing in India while others find it remaining stable (Wang et al., 2009).

Overweight/Obesity and Adolescents

Many studies conducted in India have found that the increasing prevalence of obesity and overweight has especially affected children and adolescents (Arora et al., 2012; Cherian et al., 2012; Chopra et al., 2013; Goyal et al., 2010; Gupta et al., 2012; Khadilkar et al., 2011; Laxmaiah, Nagalla, Vijayaraghavan, & Nair, 2007). While hard to assess completely due to significant regional variation within the country, many studies cite figures between 10 to 15 percent for overweight prevalence among adolescents in India, and figures of 1 to 5 percent for obesity prevalence (Cherian et al., 2012; Goyal et al., 2010; Gupta et al., 2012; Laxmaiah et al., 2007). One meta-analysis conducted in 2011 is consistent with these findings, estimating the overweight prevalence to be 12.64 percent and the obesity prevalence to be 3.39 percent (Midha et al., 2012). "Overweight and obesity prevalence and body mass index trends in Indian children" presents an overall Indian adolescent overweight and obesity prevalence of 18.2 percent by International Obesity Task Force (IOTF) standards (Khadilkar et al., 2011).

Much of the literature has attempted to identify specific determinants of childhood overweight and obesity in India. Most associations thus far have been found between obesity and

eating habits and time spent in front of the television or computer, both of which are individual-level factors. Assessing these factors alone neglects to acknowledge the influence of the environment and society on adolescent behavior. Fewer studies have examined physical activity as an important indicator of overweight and obesity in India, and there is a surprising dearth of research altogether on socio-contextual reasons for lack of physical activity among Indian adolescents. Unlike dietary behaviors and amount of screen time, physical play is impacted less by socioeconomic status since it can be a free activity. It is therefore an interesting area of research to explore how social and environmental influences may affect the amount of physical activity performed, which may in turn correlate with rising adolescent obesity prevalence.

Overweight/Obesity and Person-Level Factors

Socioeconomic Status

The impact of globalization on increasing overweight and obesity in India involves a number of factors. Socioeconomic status is often identified as a major influence on adolescent weight in India, likely because it is associated with particular eating and activity behaviors. Unlike in the developed world, prevalence of obesity and overweight in India is associated with having a higher socioeconomic status (Arora et al., 2012; Cherian et al., 2012; Chopra et al., 2013; Goyal et al., 2010; Gupta et al., 2012; Khadilkar et al., 2011; Laxmaiah et al., 2007; Rao et al., 2011). This distinction is often illustrated through the pubic-private school divide, with multiple studies finding that wealthier students who attend private schools have a higher prevalence of overweight and obesity than their poorer counterparts attending public schools (Arora et al., 2012; Cherian et al., 2012; Goyal et al., 2010; Khadilkar et al., 2011). One cross-

sectional study of 8-18 year olds in New Delhi between 2006 and 2009 found the prevalence of overweight in private schools to be 29 percent and in government schools to be 11.3 percent.

One proposed reason for the association is the impact of socioeconomic status on individual dietary choices; more money provides the opportunity to buy aggressively-advertised, energy-dense and refined carbohydrate foods that are emerging due to the nutrition transition (Gupta et al., 2012; Laxmaiah et al., 2007). For example, one study found that preparing and eating "quick-fix foods" in place of traditional cooking, an emerging habit of the wealthier classes, is a determinant of obesity in India (Chopra et al., 2013). Another piece of research found that obesity in India is positively correlated with junk food consumption and eating out at restaurants, two practices that are also more common among higher socioeconomic classes since both cost more than eating traditional foods at home (Goyal et al., 2010). This relationship is mirrored in the divide between urban and rural regions in India, as wealthier Indians are more likely to reside in urban environments (Cherian et al., 2012; Chopra et al., 2013; Gupta et al., 2012; Khadilkar et al., 2011; Laxmaiah et al., 2007).

Additionally, higher SES provides new opportunities in terms of leisure activities and eating behaviors. More affluent Indians are more likely to have personal vehicles, televisions, and computers in the home, all of which can impact obesity prevalence by taking time away from physical activity. These factors are addressed further in the section on environmental-level influences below.

Gender

Some studies have addressed gender as an important individual-level influence on overweight and obesity prevalence. However, a review of relevant literature shows that the nature of this association is somewhat contradictory. There are discrepancies among studies with

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regard to whether overweight and obesity prevalence is higher among Indian boys or girls. Some studies have found that the prevalence is higher among male adolescents, though the differences by gender are not always statistically significant (Goyal et al., 2010; Khadilkar et al., 2011). Much more research has found that girls disproportionately bear the burden of rising prevalence, and this is often attributed to the differences in lifestyle for women versus men in India (Cherian et al., 2012; Chopra et al., 2013; Gupta et al., 2012; Laxmaiah et al., 2007).

There is no conclusive research that points to distinct differences in eating behaviors among boys versus girls—especially in rural Indian communities where dietary variation is minimal. However, other social and environmental factors are likely at play. For example, Indian women and girls are more often responsible for household chores than men and boys, which limits their ability to participate in outdoor or more physical activities (Chopra et al., 2013; Gupta et al., 2012). As a result, they can be more sedentary. Cultural values may also discourage female adolescents from playing outside once they reach a certain age; this helps explain why the prevalence of overweight increases with age for girls but not for boys (Cherian et al., 2012). Taking cues from these themes, a more pointed examination of how physical activity influences health and weight along gendered lines is long overdue.

Overweight/Obesity and Environment-Level Factors

Globalization and Urban Development

Globalization is associated with improved health around the world, but in some respects it may also have negative implications. In India, as in other developing countries, globalization has made way for a change in food availability and dietary behaviors. This "nutrition transition" is the result of increased availability of meat, milk products, and fats and less consumption of

traditional beans, lentils, and other plant-based foods (Shetty, 2002). In addition, the expansion

of the global marketplace has introduced new foods altogether into Indian communities, both

from the "Western" world as well as from other parts of the country. For example, processed

foods high in sugars and fats, such as Coca-Cola products, packaged snack cookies like Oreos,

and Cadbury chocolates, are becoming more widespread as transnational food companies make

inroads into developing countries (Hawkes, 2007). Specifically, these companies have affected

food consumption by altering food availability in four ways: more processed foods, more fast

food outlets, more large supermarkets, and more food advertising and promotion (Hawkes, 2007).

Furthermore, fried foods like samosas and fried chicken "Manchurian" are traditional foods of

North India but are now more available in smaller communities in the south such as Bijapur.

However, the impact of the nutrition transition differs by area. People living in urban

environments tend to have more money and therefore can afford to consume pricier items such

as meat and other animal products. The more traditional diet of rice and legumes, which in

addition to being less expensive is also low in "visible fats," has thus become the diet of rural

inhabitants and people of lower socioeconomic status (Shetty, 2002). This socioeconomic

dichotomy is just one reason why obesity rates tend to be higher among urban dwellers than their

rural counterparts (Bharati, Deshmukh, & Garg, 2008; Chopra et al., 2013; Gupta et al., 2012).

Globalization also influences physical activity behaviors, though there has been much

less research done on this trend than on the nutrition transition. Economic development and

urbanization have resulted in an increasing mechanization of daily life, which is associated with

more sedentary behavior. For example, it is estimated that personal vehicles now account for

over 80 percent of all vehicles in most large Indian cities (Singh, 2005). In fact, during the year

2000, personal vehicles made up more than 90 percent of the total vehicle population in half of

the cities examined (Singh, 2005). Not only do personal vehicles become more common as cities

get larger and more urban, but more active modes of transportation decline as well. This can

particularly impact adolescents who become accustomed to being shuttled to and from school

with little opportunity for physical activity. One review of urban transportation in India found

that travel by walking fell from 37 percent of total trips in cities with 0.10 to 0.25 million

inhabitants to 28 percent in cities with over 5 million inhabitants (Singh, 2005). Similarly, travel

by bicycle fell from 26 percent in the less populous cities to 9 percent in more populous ones.

In addition, the increased availability of televisions, video games, and computers is

giving rise to sedentary behaviors that negatively impact adolescent weight, especially among

the affluent. In one study conducted in South India, researchers found that children who watched

over 90 minutes of television per day had higher odds of being overweight than children who

watched 45 minutes or less per day (Gupta et al., 2012). Another study found that the risk of

overweight among 12 to 17-year-old urban Indian adolescents was lower for those who walked

or biked to school and for those who participated in household chores (Laxmaiah et al., 2007).

Cultural Beliefs and Traditions

Apart from newer globalized influences on lifestyle, there are also cultural behaviors that

are associated with an increase in obesity prevalence in India. Older family members, such as

grandmothers, often hold stronger traditional beliefs that encourage unhealthy eating. For

example, one study conducted in India found that children in households with grandmothers

present had a higher overall calorie intake than in households without grandmothers (Seth &

Sharma, 2013). One such belief that is often perpetuated by the older generation is that ghee, or

clarified butter, is considered a healthy ingredient in traditional foods and thus used liberally

(Chopra et al., 2013; Gupta et al., 2012; Rao et al., 2011). Ghee is also regarded as expensive and

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an ingredient of the affluent; those who can afford to use it more frequently will do so, particularly when feeding their children.

Relatedly, some Indians believe that a "fat child is a healthy child" or that being overweight is a sign of strength (Gupta et al., 2012; Rao et al., 2011). This is especially true in a country where significant undernourishment still persists (Khadilkar et al., 2011). These beliefs help manufacture an environment conducive to unhealthy weight gain, regardless of individual behavior. Thus, certain traditions can exacerbate the negative influences that globalization already has on health and obesity prevalence in India.

Application of the Social Cognitive Theory

Social Cognitive Theory was developed by Albert Bandura in 1977 as a way to conceptualize how individuals, their environments, and health behaviors interact (Glanz, 2008). Originally created to understand the principles of learning within a social context, it expanded to acknowledge how cognitive processes influence learning from experience, observation, and communication (Bandura, 1986).

Many behavioral scientists believe the use of theory to be necessary to advance health behavior research (Painter, Borba, Hynes, Mays, & Glanz, 2008). SCT is one theory often utilized to understand obesity, as the health issue is seen as having a number of predictors at both the personal and environmental levels. Self-efficacy is one of the most common constructs applied in research that seeks to understand predictors of obesity, including physical activity. According to the theory, perceived self-efficacy is defined as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" and is considered the foundation of human motivation and action (Bandura, 1997). Many studies have

found a relationship between self-efficacy and physical activity for obesity reduction in general settings (Annesi, Smith, & Tennant, 2013; Bohman, Nyberg, Sundblom, & Schafer Elinder, 2013; Ginis, Nigg, & Smith, 2013). These studies have chosen to measure self-efficacy in a variety of ways, for example through validated question scales, self-management and goal-tracking activities, and observations of others coping with barriers. One study did not reference SCT directly but measured the relationship between obesity and key SCT constructs like self-regulation and goal-setting, which provides further evidence that the cognitive functions addressed in SCT apply to obesity-predictive behaviors (Riggs, Huh, Chou, Spruijt-Metz, & Pentz, 2012).

However, application of SCT to either intervention or non-intervention obesity research in India is a large gap in the existing literature. Some studies have used SCT to examine a range of obesity-related behaviors among adolescents, such as dietary patterns and sedentary time, in addition to physical activity (Branscum, Sharma, Wang, Wilson, & Rojas-Guyler, 2013; Lubans et al., 2012; Plotnikoff, Costigan, Karunamuni, & Lubans, 2013; Sharma, Mehan, & Surabhi, 2008). Among these studies, self-efficacy and outcome expectations seem to be the most common constructs applied to physical activity behavior. Most have come to the conclusion that SCT offers a useful framework for examining physical activity among adolescents, but that results are inconclusive about the predictive power of these constructs.

Very few studies using SCT have been conducted with the Indian population, and none were found that address Indian adolescents. Mehta, Sharma, and Bernard (2009) used SCT as a predictor of diet and physical activity among middle-aged Indian women living in the U.S. They found that outcome expectations and self-regulation explained some of the variance in leisure time physical activity, while no SCT constructs had a relationship with dietary behaviors. One

study examined physical activity intention and behavior among Indian adolescent girls, with the research design incorporating both SCT and Theory of Planned Behavior constructs (Ramanathan & Crocker, 2009). Though its small sample size prevents any substantive conclusions from being drawn, that study successfully utilized the SCT constructs of social modeling, self-efficacy, outcome expectations, and facilitation to inform its questionnaire and focus group guide.

From these findings it can be determined that few studies test SCT as a whole, instead utilizing specific constructs to inform their methodology or analysis. Self-efficacy to perform certain obesity-preventative behaviors, positive outcome expectations, and self-control through regulation seem to be the most popular constructs to include when conducting research on this topic. However, little research utilizes SCT when examining obesity prevention among Indian adolescents, even though the body of research for adolescents in general seems to be quite broad. This is a deficiency that is recognized even by the literature itself (Daivadanam et al., 2013). As discussed previously, Indian culture has distinct social norms and traditions that influence behavior, so conclusions from research on broader populations cannot necessarily be extrapolated to Indians. Thus, a more thorough examination of the predictive power of SCT for obesity prevention among Indian adolescents is needed.

Summary

As the globalization and urbanization of Indian cities accelerates, adolescent overweight and obesity—and accompanying chronic illnesses like cardiovascular disease and diabetes—will become an increasing problem. While obesity prevention among children and adolescents is generally a well-researched area, insufficient attention has been paid to people of this age in

India. This has repercussions for the health of the nation moving forward, as overweight and obese adolescents are more likely to become overweight and obese adults.

Some studies have examined the success of using SCT to predict various obesity-preventative behaviors, but application of the theory rarely addresses all of the constructs. Self-efficacy and outcome expectations are utilized most often, but other constructs such as self-regulation and environmental facilitation have also been referenced. These constructs have been used to some extent to predict physical activity performance, but are often associated more with physical activity intention. Few interventions have been developed in this area with a specific SCT basis.

While this project will not apply SCT to an intervention, it attempts to address the void of theoretically-based research on the social and environmental influences of physical activity behavior among adolescents in India by partially applying some SCT constructs to the issue. In addition, its attention to the impact of various SCT constructs by gender offers a unique perspective that has not been adequately examined. This project and analysis is a preliminary step in answering the call posed by much of the literature for more social and behavioral research on Indian adolescents and obesity.

CHAPTER THREE: METHODOLOGY

Introduction

The problem of this study was to determine if socio-contextual influences were associated with different levels of physical activity for girls versus boys in Bijapur, India. This chapter presents the methodology used to plan and implement this study. This chapter has been divided into the following sections: (1) design of study; (2) participants; (3) procedure; (4) measurement; (5) data collection; and (6) data analysis.

Data Source

This study involves a secondary analysis of data collected as part of a larger research project in Bijapur. The overall research was designed to obtain preliminary data to examine the importance of the home environment as a determinant of adolescent underweight, overweight, and obesity risk. It also aimed to explore the discrepancy among these outcomes by gender. The study also aimed to gather data that would enable the creation of a conceptual model for understanding the overall and gender-specific health effects of changes in the home environment, including socioeconomic status; food availability and meal patterns; activity and inactivity levels; and family gender norms pertaining to food, activities, and weight.

The research design was a cross-sectional quantitative study consisting of face-to-face surveys of adolescents, an opposite sex sibling, and their caregiver. For the purposes of this thesis project, only the responses from the adolescents' questionnaires were assessed, though some demographic information was taken from the caregivers' questionnaires. All data collection methods followed standard international guidelines and procedures. Approval from

IRB was sought and obtained in coordination with BLDE University's Ethics Committee (see Appendix A).

Participants and Sampling

A total of 407 Indian adolescents were recruited for participation in the study; 205 were boys and 202 were girls. Students were sampled from three private and three public schools in Bijapur city, and all of the participants were aged between 13 and 16 years at the time of the study. After receiving approval from the district Education Board Committee, the six schools were randomly selected from a list of all schools in the city and invited to participate. The study was explained to the school principals and consent was requested to conduct the study in their schools. Trained interviewers then explained the study purpose and procedures to each sampled child and their selected family respondent. Consent for participation was requested from parents and assent was obtained from children before the start of the study.

Students were specifically selected in order to obtain a representative sample of school-going adolescents in grades eight through ten. This involved stratifying the population of adolescent students by school type and gender, resulting in four groups: boys in public school, girls in public school, boys in private school, and girls in private school. There are fewer students, especially girls, in private schools in India, so private school students and boys were oversampled for the study. This allowed a sample with enough subjects in each group to compare against one another. Weights were then applied to the sample to compensate for this oversampling. Lower weights were assigned to private school students and girls, which resulted in a weighted study sample that was representative of the population of interest.

Procedure

Data Collection

This study used quantitative methods to gather data on health, nutrition, and physical activity behaviors among adolescents in Bijapur, Karnataka, India, incorporating anthropometric data collection and oral, face-to-face surveying of participants. IRB approval was obtained from BLDE University's Ethics Board as well as Emory University's IRB, which deferred to BLDE. Data were collected from adolescent respondents through oral, face-to-face surveying and anthropometric measurements of weight, height, and waist circumference. Data from caregivers and the opposite-sex siblings closest in age to the respondents were gathered using the same methods in the family home. Surveys were conducted in the local language Kannada by translators recruited from BLDE University. Incentives of geography box kits were provided for adolescent participants of the study. Steel metal organizational and decorative boxes were given as tokens of appreciation to caregivers who participated in the study.

Instrument Design

Developing the survey instrument was informed by thorough reviews of the literature and existing surveys and by consultation with nutrition and child health experts. The instrument was developed initially in English, translated independently to the local language, Kannada, and back-translated to English. The study team drew on valid surveys used in the U.S., including the Panel Study of Income Dynamics Child Development Supplement time-use diary; the National Health and Nutrition Examination Survey 24-hour dietary recall; and the National Adolescent Study of Adolescent Health. Questions developed and validated for other settings were adapted for use in India. The types of questions addressed the following areas.

Family and Household

It has been shown that the individuals who reside with a child may affect how resources are distributed to children, the quality of the food, and the supervision and assistance the child receives (Griffiths, Matthews, & Hinde, 2002). For this reason, the survey included a household roster to capture elements of household structure such as family size, gender, and age distribution of children, as well as the presence of maternal or paternal grandparents and other relatives (Moreno et al., 2004). Socioeconomic status was measured with a standard of living index (SLI), validated in NFHS-II. SES has been shown to be negatively associated with obesity in developed countries but positively associated in developing countries (Subramanian & Smith, 2006; Wang et al., 2009). At the same time, household SES is negatively associated with child underweight (Hong, Banta, & Betancourt, 2006).

The questionnaire included items assessing parents' education, since it has been found to be positively associated with child nutrition through income, money management, priority of nutrition in the family's budget, and parenting skills (Rosenkranz & Dzewaltowski, 2008). Mother's education specifically has been shown to have a positive relationship with child nutrition through knowledge, care-seeking behaviors and decision-making (Ramachandran et al., 2002; Wachs, 2008). However, mother's employment has been shown in developed countries to entail less engagement in meal planning and preparation, leading to the consumption of more prepared foods and foods away from home for children, but may also increase the mother's ability to bargain within the family for nutrition for her daughters and sons (Rosenkranz & Dzewaltowski, 2008).

Additionally, studies from India have shown group differences in child nutrition, especially among scheduled tribes (Mishra V.K., Lahiri, & Norman, 1999). These differences are

possibly due to income and social deprivation, and include disparities between boys and girls.

Food and Activity

A validated home food inventory was modified for India to capture food availability and accessibility, which have been shown to affect consumption in children and adolescents (MacFarlane, Cleland, Crawford, Campbell, & Timperio, 2009). Food insecurity, meaning limited or uncertain availability of nutritionally adequate foods due to poverty, can lead to alternating patterns of "feast and famine" (Kendall, Olson, & Frongillo, 1996). It is important to take into account this concept during research, as an estimated 30 to 45 percent of families in India are affected by food insecurity (Nnakwe & Yegammmia, 2002).

In addition, families may have beliefs, attitudes, and practices regarding gender roles leading to different treatment of boys and girls in food allocation and physical activity. The questionnaire thus asked about decision-making matters relating to food and childcare, as the individuals making these decisions—and the gender norms that may act as a basis for their thinking—can affect the nutritional status of adolescents. Family meal time can also affect children's eating behaviors (Rosenkranz & Dzewaltowski, 2008) and weight (Scaglioni, Salvioni, & Galimberti, 2008), which may lead to discrimination in quantity and quality of food for girls. Eating food outside the home, which is associated with obesity and is increasingly common in India (Jeemon et al., 2009), was measured in terms of frequency of eating away from home and the amount of pocket money available for the adolescents.

Physical and socio-contextual components of the home environment affect physical activity in adolescents (Franzini et al., 2009; McNeill, Kreuter, & Subramanian, 2006) by influencing the extent to which boys and girls are allowed to engage in active play, to play with others, and to go outside.

Anthropometric Measurements

Waist circumference, weight, and height were used to assess overweight and underweight in adolescents. Waist circumference was measured since it is an indicator of abdominal adiposity and is associated with cardio-metabolic risk factors in adolescence and adulthood (A. Ghosh, 2007). Circumference of the waist was measured as a continuous linear measurement, collected with anthropometric tape at the level of the adolescent's umbilicus. Weight was measured in kilograms (kg) to the nearest 0.1 kg using a digital weighing scale. Two measurements were taken in a row, with the average of the two used for formal analysis. Height was measured in meters (m) to the nearest 0.5 centimeter using a portable adult stadiometer, with the average of the two measurements being used.

For analysis, the BMI of each subject was calculated by dividing their weight (kg) by the square of their height (m). Age and sex z-scores were used to relate an adolescent's body proportions to other adolescents of the same age and sex from a reference population (Must, Dallal, & Dietz, 1991). This is considered the appropriate measure of over- and undernutrition in children (Himes & Bouchard, 1989). International Obesity Task Force (IOTF) cut-offs, which have been used in India, were also consulted (Cole, Flegal, Nicholls, & Jackson, 2007).

Survey

In addition to anthropometric measurements, data were collected from each participant in the form of a face-to-face interviewer-administered survey. Respondents were asked various questions about the nature of their household, their beliefs and aspirations for the future, their dietary choices, and their physical activity behaviors. The survey questionnaire consisted of 61 questions divided into four subsections addressing family and household structure; personal and familial beliefs; daily activities; and food intake. Individual surveys lasted about 45 minutes and

were conducted at the adolescents' schools by a translator fluent in Kannada. Adolescents also completed a 24-hour time-use recall activity following the oral questionnaire, but data from that activity was not included or analyzed for this project.

Internal Validation

The instruments were pre-tested on a sample of 25 boys and 25 girls aged 13 to 16 years and their primary caregivers. Participants for the pre-test were selected randomly from one public and one private school in Bijapur city. To test for internal reliability during the pre-tests, the instrument was administered twice with a gap of one week to ensure that the respondent did not remember his or her initial answers. This provided an indication of the reproducibility of the instrument. For content validation, two focus group discussions with adolescents and their caregivers were held after initial administration of the survey. Results of these discussions were used to adapt the questionnaire for cultural relevance and to ensure that all unique cultural aspects were captured, as well as to maximize response rates. The study proposal and final instruments were submitted to the Ethics Boards at CCDC and BLDE University for approval. Final ethical clearance by the CCDC Board preceded any work with human subjects.

Measurement

The objective of the analysis was to determine the relationship between socio-contextual factors and the performance of physical activity among girls and boys. Four variables were identified as potential person-level influences on physical activity behavior for adolescents. These variables are gender, age, income, and religion. Three variables were identified as potential environmental influences on physical activity behavior for adolescents. These variables are school type (public or private), availability of sports equipment, and friend encouragement of

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play. This research posits that the environmental factors may negatively impact self-efficacy, which is one of the main constructs of Social Cognitive Theory, by creating an atmosphere that lowers adolescents' confidence in their ability to successfully play actively. The variables were measured as follows.

Behavior-Level (Outcome)

Physical activity was measured in the questionnaire by assessing whether or not the adolescent participates in outdoor play. Participants were asked, "Do you play or do outdoor activities after school hours?" Answer options included either (0) no or (1) yes, resulting in a dichotomous categorical variable.

Person-Level

The gender of each adolescent was recorded as either (0) male or (1) female. Age of the participant at the time of the survey was recorded as a continuous variable as years completed. Income was assessed with the question, "Approximately what is your family's income each month?" Answer options included (1) less than 5000 Rupees/month, (2) 5001-10000 Rs/month, (3) 10000-20000 Rs/month, (4) 20000-30000 Rs/month, or (5) more than 30000 Rs/month. Religion was assessed with the question, "What is your religion?" Answer options included (1) Hindu, (2) Muslim, (3) Christian, (4) Jain, (5) Buddhist, or (6) none.

Environment-Level

The adolescent's school was included in the analysis; participants who attended one of the three government-funded (or public) schools were assigned a value of 0 for the school variable while students at one of the three private schools were recorded as 1. Adolescents were also asked, "Do you have any sports equipment in your home for you to use such as jogging shoes, skipping rope, bicycle, cricket ball and bat, or something else?" Answer options included

either (0) no or (1) yes, resulting in a dichotomous categorical variable. Finally, the observational learning construct of SCT was assessed with the question, "Do your friends encourage you to play outside or invite you to play outside with them?" Answers options initially included either (0) no, (1) yes, or (2) sometimes. Only 1.0% of respondents (n=4) reported an answer of "sometimes," so this answer was not substantive enough to warrant its own category. Therefore, since both answers of "yes" and "sometimes" indicate an environment with at least some opportunity for observational learning, these values were collapsed into one category recoded as (1) yes. The resulting peer influence variable is thus a dichotomous categorical variable with values of (0) no or (1) yes. Students who indicated that they did not play outdoors were asked, "If no, what is the main reason for you not to play outdoors?" Answer options included (1) do chores/help in home, (2) parents don't allow, (3) job, (4) safety, (5) I don't like to play outside, and (6) tuition. As this variable was only applicable to adolescents who reported not playing outdoors, it was used for descriptive purposes only.

Data Analysis

Analysis of study data was performed using IBM SPSS Statistics 21. Preliminary descriptive analyses were conducted to check the distribution of all variables. Bivariate chi-square analyses between various social and environmental influences and the physical activity outcome variable were performed to assess for independent relationships. Variables that covaried significantly with the outcome variable were included in the regression analysis. A final sequential logistic regression was run to assess the differences in the outcome variable by gender while holding all other independent variables constant.

CHAPTER FOUR: RESULTS

Introduction

The problem addressed by this research was to determine if socio-contextual influences were associated with different levels of physical activity for girls versus boys in Bijapur, India. This chapter presents the results and analysis of the study data and has been divided into the following sections: (1) sample characteristics including demographic differences by gender; (2) preliminary analyses including (a) descriptive statistics of independent variables and (b) demographic correlations with the physical activity outcome; (3) main analyses by research aim; and (4) summary.

Sample Characteristics

A total of 399 adolescent students in Bijapur were included in the final study and the sample was weighted to ensure representativeness of the school-going adolescent population in grades eight through ten. All of the following descriptive statistics and resulting analyses were conducted using these weights and are thus considered representative of the population of interest. Students had an average body mass index (BMI) of 17.99 kg/m^2 (SD=3.16). Regarding education, 72.6% attended public school and 27.4% attended private school. The largest represented religion was Hindu (74.2%), followed by Muslim (23.5%). The majority of students came from families with modest incomes of 5,001 to 10,000 Rs/month (37.1%). About 19% reported an income in the lowest bracket of less than 5000 Rs/month, and 7.4% reported an income in the highest bracket of over 30000 Rs/month. Over half of the students (55.6%) identified as "other backward class," a term used by the Government of India to describe castes

that are educationally and socially disadvantaged. Students in scheduled castes and scheduled tribes, two groups recognized by the Constitution of India to be historically disadvantaged, accounted for 23.6% and 2.0%, respectively. Scheduled tribe is a class which is usually reserved for *dalits* (formerly labeled "untouchables"). Nearly 19% reported membership in a general caste within the caste system.

Among the students' demographics, there were statistically significant differences by gender in BMI and caste (Table 1.0). Girls measured an average BMI slightly above the mean value (18.33 kg/m^2, SD=3.03) while boys measured an average BMI slightly below the mean (17.69 kg/m^2, SD=3.24). The largest percentage of both boys (61.4%) and girls (48.9%) reported coming from "other backward classes" in the caste system. A slightly larger proportion of girls (20.1%) than boys (17.6%) reported membership in a general caste. A marginally larger percentage of girls (79.4%) than boys (69.5%) reported being Hindu, while a larger percentage of boys (28.1%) than girls (18.1%) reported being Muslim. More boys (60.2%) than girls (52.2%) reported income in the lowest two income brackets on the survey. By contrast, a larger percentage of girls (25.3%) than boys (17.2%) reported income in the top two brackets of the survey. Since these are school-based surveys, these (albeit statistically insignificant) results could indicate that poor families are more likely to send their boys to school if money is too tight to send all of their children. In addition, a slightly larger percentage of boys (29.9%) than girls (24.6%) attends private school.

Table 1.0. Chi squares* comparing personal demographics of school-going adolescent boys and girls

Variable	Overall	Boys	Girls	Significance
	M (SD)	*M (SD)*	*M (SD)*	
BMI	18.26 (3.31)	17.69 (3.24)	18.33 (3.03)	t (387) = -1.99, p = .047
	%	*%*	*%*	
Religion				
Hindu	74.2	69.5	79.7	x^2 (3) = 6.89, p = .076
Muslim	23.5	28.1	18.1	
Christian	0.3	0.0	0.5	
Jain	2.0	2.4	1.6	
Income				
< 5000 Rs/month	19.4	23.4	14.8	x^2 (4) = 7.83, p = .098
5001-10000 Rs/month	37.1	36.8	37.4	
10000-20000 Rs/month	22.5	22.5	22.5	
20000-30000 Rs/month	13.6	10.0	17.6	
> 30000 Rs/month	7.4	7.2	7.7	
Caste				
General	18.8	17.6	20.1	x^2 (3) = 8.14, p = .043
Other backward classes	55.6	61.4	48.9	
Scheduled caste	23.6	20.0	27.7	
Scheduled tribe	2.0	1.0	3.3	
School Type				
Government/Public	72.6	70.1	75.4	x^2 (1) = 1.37, p = .242
Private	27.4	29.9	24.6	

Results are survey-adjusted.
Sample size (n): Gender (n =393); BMI (n =388); Religion (n =392); Income (n =391); Caste (n =394);
School type (n =394)

Preliminary Analyses

Descriptive Statistics

A total of 392 Indian adolescent students answered questions about physical activity indicators in the survey. Overall, 51.3% reported playing after school. Of those who reported not engaging in outdoor play, the largest proportion (43.5%) indicated that homework was the reason. Relatedly, 9.4% reported that they do not play because of tuition (tutoring). The second-largest proportion indicated that they did not play because their parents do not allow it (25.4%).

When asked whether the student had any physical activity equipment in their home to use, the vast majority reported yes (90.8%). When asked whether their friends encourage them or invite them to play outside, 76.8% of students answered yes.

Demographic Correlations with Physical Activity

A larger percentage of boys (66.5%) reported playing outdoors after school, compared to only 33.9% of girls. Boys also reported different reasons for not playing outside, with 18.8% answering that they did not play due to tuition compared to only 4.4% of girls. A larger percentage of girls than boys reported not playing outdoors due to chores/helping around the house (13.3%), doing homework (44.4%), and parents not allowing them to play (28.9%). When asked about the availability of physical activity equipment, "yes" was answered by a fairly equal percentage of boys (90.4%) and girls (91.2%). However, 34.6% of girls compared to 13.3% of boys indicated that they do not have friends who encourage them or invite them to play. A breakdown of these descriptive statistics can be viewed in Table 2.0 on the next page.

Table 2.0. Chi squares* comparing physical activity behaviors of school-going adolescent boys and girls

Variable	Overall	Boys	Girls	Significance
	%	%	%	
Do you play or do outdoor activities after school hours?				
Yes	51.3	66.5	33.9	x^2 (1) = 41.57, p < .001
No	48.7	33.5	66.1	
If no, what is the main reason for you not to play outdoors?				
Do chores/help in home	10.9	6.3	13.3	x^2 (6) = 11.85, p = .065
Homework	43.5	41.7	44.4	
Parents don't allow	25.4	18.8	28.9	
Job	0.0	0.0	0.0	
Safety	0.7	2.1	0.0	
I don't like to play outside	10.1	12.5	8.9	
Tuition	9.4	18.8	4.4	
Do you have any sports equipment in your home for you to use such as jogging shoes, skipping rope, bicycle, cricket ball & bat or something else?				
Yes	90.8	90.4	91.2	x^2 (1) = 0.07, p = .791
No	9.2	9.6	8.8	
Do your friends encourage you to play outside or invite you to play outside with them?				
Yes	76.8	86.7	65.4	x^2 (1) = 25.02, p < .001
No	23.2	13.3	34.6	

Results are survey-adjusted.
Sample size (n): Gender (n =393); Outdoor play (n =392); Reason to not play (n =137); Availability of sports equipment (n =392); Friend encouragement of play (n =393)

Main Analyses

Chi-square analyses and logistic regressions were conducted to address the three research aims: (1) are there measured differences by gender in the level of self-reported physical activity among these adolescents? (2) what are the social and environmental correlates of physical activity behavior among adolescents? and (3) how do the correlations between these socio-contextual factors and physical activity vary by gender?

Aim 1: Gender Differences in Physical Activity

To address the first research aim, a chi-square analysis was conducted to assess the

relationship between gender and outdoor play. Results show that boys report participating in

outdoor play statistically significantly more than their female peers (x^2 = 41.57, df = 1, p < .001)

(Table 2.0).

Aim 2: Socio-contextual Determinants of Physical Activity

To address the second research aim, chi-square analyses were conducted to assess the

relationship between different socio-contextual determinants and outdoor play. Two of these

determinants showed a statistically significant relationship with the outcome. First, of the

adolescents who indicated that they do not have friends who encourage or invite them to play

outdoors, 74.7% reported that they do not participate in outdoor play compared to 25.3% who

do. Among those who do have friends who encourage them to play, the split was less severe with

40.9% reporting that they do not participate in outdoor play. Results of this chi-square analysis

suggest that there is a statistically significant relationship between friend encouragement of play

and participation in outdoor play (x^2 = 32.07, df = 1, p < .001) (Table 3.0).

Table 3.0. Chi square analysis* comparing the physical activity outcome between adolescents who have friends who encourage them to play versus adolescents who do not

Variable	Overall	No friends who encourage physical play	Have friends who encourage physical play	Significance
	%	*%*	*%*	
Do you play or do outdoor activities after school hours?				
Yes	51.3	25.3	59.1	x^2 (1) = 32.07, p < .001
No	48.7	74.7	40.9	

Results are survey-adjusted.
Sample size (n): Outdoor play (n =392); Friend encouragement of play (n =393)

Second, of the adolescents who do not have physical activity equipment available at home, a majority of 68.6% reported not participating in outdoor play. Among those who do have equipment available to them, only a slightly larger percentage reported playing outdoors (53.4%) (Table 3.1). Thus, the statistically significant relationship between the availability of sports equipment and participating in outdoor play may be more significant for those who do not have equipment available to them (x^2 = 6.14, df = 1, p < .05).

Table 3.1. Chi square analysis* comparing the physical activity outcome between adolescents who have physical activity equipment at home versus adolescents who do not

Variable	Overall	No equipment available at home	Equipment available at home	Significance
	%	*%*	*%*	
Do you play or do outdoor activities after school hours?				
Yes	51.4	31.4	53.4	x^2 (1) = 6.14, p < .05
No	48.6	68.6	46.6	

Results are survey-adjusted.
Sample size (n): Outdoor play (n =392); Availability of sport equipment (n =392)

Aim 3: Gender Differences in Socio-contextual Determinants of Physical Activity

A sequential logistic regression was conducted to assess the differences in physical activity by gender while holding the socio-contextual and demographic variables constant. The variables included in the regression were income, religion, caste, school type, availability of sports equipment at home, and having friends who encourage outdoor play. Additional demographic variables of gender and age were also included in the regression. Because income, caste, and religion were recorded categorically, a reference group was assigned for each variable to determine the differences in physical activity between each category and its reference group. The reference group for income was the largest income bracket of > 3000 Rs/month. The

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reference group for caste was general caste within the caste system. Religion was collapsed into three categories due to the small number of observations recorded as "Christian" and "Jain." Thus, the religion variable used in the regression included answers of (1) Hindu, (2) Muslim, and (3) Christian or Jain. The reference group for this variable was Hindu.

A total of 390 adolescents were included in the regression. Controlling for all of the socio-contextual determinants listed above, results suggest that girls are 71.2% less likely to play outdoors than boys (AOR = .288, df = 1, p < .001) (Table 4.0). Adolescents with sports equipment available at home are 3.29 times more likely to play outdoors than those without equipment available (AOR = 3.287, df = 1, p < .01). Finally, adolescents whose friends encourage them to play outdoors are 3.13 times more likely to play outdoors than those who do not have friend encouragement (AOR = 3.128, df = 1, p < .001). There were no statistically significant differences in outdoor play across ages, income levels, religions, castes, or school type; this shows that the relationship between gender, socio-contextual determinants, and outdoor play is not confounded by these demographic variables. The Hosmer and Lemeshow goodness-of-fit test indicates that this logistic model is a well-fitting model (x^2 = 7.989, df = 8, p=.435).

Table 4.0. Logistic regression* of socio-contextual determinants of outdoor play among school-going adolescents

Variable	B	S.E.	Wald	df	Sig.	Adjusted Odds Ratio
Gender (1 = female)	-1.244	.237	27.516	1	.000	.288
Age	-.048	.117	.165	1	.685	.954
Income reference group: > 30000 Rs/month			4.836	4	.305	
Income < 5000 Rs/month	1.001	.569	3.089	1	.079	2.720
Income 5001-10000 Rs/month	.378	.518	.534	1	.465	1.460
Income 10000-20000 Rs/month	.530	.519	1.042	1	.307	1.699
Income 20000-30000 Rs/month	.329	.544	.365	1	.546	1.389
Religion reference group: Hindu			.377	2	.828	
Muslim	.182	.324	.317	1	.574	1.200
Christian & Jain	-.154	.759	.041	1	.839	.858
Reference group: General caste			3.231	3	.357	
Other backward classes	.018	.334	.003	1	.956	1.019
Scheduled caste	.366	.388	.887	1	.346	1.441
Scheduled tribe	1.404	.916	2.349	1	.125	4.070
School (1 = private)	.099	.344	.082	1	.774	1.104
Have friends who encourage play	1.140	.292	15.247	1	.000	3.128
Availability of sports equipment	1.190	.430	7.663	1	.006	3.287
Constant	-1.333	1.881	.502	1	.479	.264

Results are survey-adjusted.
Sample size n =390

Summary

This study aimed to analyze (1) if there are measured differences by gender in the level of self-reported physical activity among Bijapur adolescents; (2) what the social and environmental correlates of physical activity are among these adolescents; and (3) how the correlations between socio-contextual factors and physical activity vary by gender. The results of the main analyses provide initial support that there may be a statistically significant difference in level of physical activity between boys and girls. In addition, social and environmental factors were identified that have a statistically significant relationship with physical activity; those who do not receive encouragement from peers are less likely to play outside, and lack of access to sports equipment at home in a significant barrier to physical activity. When these determinants and other demographic factors are held constant, the analyses show that girls are statistically significantly less likely than their male peers to engage in outdoor play.

CHAPTER FIVE: DISCUSSION

Introduction

  The problem addressed by this research was to determine if socio-contextual influences were associated with different levels of physical activity for girls versus boys in Bijapur, India. This chapter presents a discussion on the results outlined in the previous chapter and has been divided into the following sections: (1) findings by research aim and how they relate to Social Cognitive Theory; (2) limitations; (3) implications for future research; and (4) summary.

Findings by Research Aim

  Previous research studies have indicated that SCT is an appropriate framework to help explain obesity prevention behaviors. Initial findings from the partial application of SCT in this study further support the use of this theory to help explain physical activity among adolescents. Going further, this research successfully applied a few SCT constructs to analyze physical activity differences among Indian adolescents by gender, a research aim and population that have not been adequately explored. In addition, initial findings from this research help support the SCT tenet of reciprocal determinism, as various socio-contextual determinants were found to relate significantly with physical activity behavior. Results from the previous chapter show that both person-level and environment-level factors interact to influence behavior-level physical activity outcomes for boys and girls in Bijapur, India.

Aim 1: Gender Differences in Physical Activity

  This study found that adolescent girls are less likely to engage in outdoor play than their male peers. The finding is consistent with existing literature that reports that girls in India are

less likely to participate in physical activity due to household duties (Chopra et al., 2013; Gupta et al., 2012). This outcome is also unsurprising given that many studies, including this one, find evidence that girls in India tend to have higher BMIs than boys (Cherian et al., 2012; Chopra et al., 2013; Gupta et al., 2012; Laxmaiah et al., 2007).

Aim 2: Socio-contextual Determinants of Physical Activity

Initial findings from this study provide support that friend encouragement and the availability of sports equipment at home had a significant relationship with whether or not adolescents played outside. When considered through the lens of SCT, these factors can be considered environment-level determinants that interact with person-level constructs to affect a behavioral outcome. For instance, friend encouragement of play is just one marker of the SCT construct of outcome expectations, which exists at the person-level. Indian adolescents who are asked to play outside by their peers may have the expectation of a more affirmative result from this behavior if they participate. A positive outcome expectation may manifest itself as decreased feelings of shyness or a reduction in the stigma that surrounds girls playing outside as they get older. This can be a powerful environmental motivator for physical activity. Unfortunately, the more girls who perform household duties inside, the fewer who are available to invite other adolescent girls to play, ensuring that adolescent females are deprived of friend encouragement and thus potential positive outcome expectations. This can also limit opportunities for observational learning among adolescent females, which is another construct outlined by SCT. Results from the data analysis show that having friend encouragement was not a sufficient condition to ensure adolescent physical activity, as 40.9% of those who had friend encouragement still did not play outside. However, it does seem to be a crucial factor for outdoor play, since 74.7% of those without it did not play outside. These findings mirror the idea posited

by SCT that outcome expectations, while just one construct of many in the theory, is nevertheless an important environment-level determinant of performing a desired behavior.

A second environment-level determinant identified by this research was the availability of sports equipment for performing physical activity at home. Following the SCT concept of reciprocal determinism, this environmental factor has an association with person-level SCT constructs such as self-efficacy. Self-efficacy is how empowered and in control an individual feels to perform a desired behavior, and having the appropriate equipment to be physically active at home can be interpreted as positively impacting the self-efficacy of the adolescent. This is consistent with other studies that have successfully applied the self-efficacy construct to physical activity and obesity among adolescents (Plotnikoff et al., 2013; Sharma et al., 2008). Similar to the findings regarding friend encouragement, availability of sports equipment seemed to be an important but not sufficient condition for playing outdoors. Of those adolescents who had equipment at home, there was a very similar percentage of adolescents who did not play outside (46.6%) and those who did (53.4%). However, of those who did not have any sports equipment available to them, 68.6% reported not participating in outdoor play. These results are again consistent with the SCT premise that self-efficacy is one of multiple important constructs to consider when predicting a behavioral outcome.

Aim 3: Gender Differences in Socio-contextual Determinants of Physical Activity

Parsing out the relationships between socio-contextual determinants of physical activity by gender further illuminates the value of this study's findings. While there was no significant difference in availability of sports equipment between girls and boys, girls were less likely to report that they have friends who encourage outdoor play. In addition, initial analyses show that there were some differences between boys and girls in the reasons they reported for not playing

outside. Higher percentages of girls cited parental restriction and chores as reasons for not participating in outdoor play, while a larger percentage of boys reported that they don't like to play outside or they have tuitions. Further exploration into these reasons could help illuminate their relationship with the SCT constructs of self-efficacy and outcome expectations. Factors such as parental restriction of play could also be interpreted as inhibiting facilitation, which is another environmental construct outlined by SCT but not often explored by physical activity research in India. No studies could be found which assess the impact of facilitation on physical activity or other obesity-prevention behaviors among this population. As preliminary results from this study have helped show, many of the individual constructs prove important but are not adequate to predict the outcome on their own. Thus, a full application of SCT, or at least an application of a wider variety of constructs, to physical activity research in India will ensure a better understanding of behavioral predictors.

Finally, by including markers of a few relevant SCT constructs in the logistic model and holding them constant, initial results show that the relationship between these socio-contextual determinants and physical activity—a prime behavior for obesity prevention and overall health—does indeed differ significantly for adolescent girls and boys in India. This helps support a conclusion that unfortunately, many other social and environmental factors being equal, girls are still less likely to engage in physical activity. While many past studies have acknowledged the importance of addressing social and environmental inhibitors to physical activity for adolescents, few, if any, illustrate how these factors disproportionately negatively impact young women.

Limitations

As with any research, this secondary analysis study was not free from limitations. The reliance of this study on answers to survey questions limits the accuracy of the operationalization of certain concepts such as physical activity. First of all, the survey may suffer from social desirability or other biases due to the nature of self-report. Secondly, a more ideal outcome measure for this analysis would have been a compound scale measure of physical activity. Due to time constraints this individual study was unable to incorporate pedometer readings, self-reported minutes of physical activity performed, or other variables assessing physical exertion, but these may have provided a more comprehensive measure of the adolescent's level of physical activity. Nevertheless, statistically significant findings did arise from data analysis, which provides support that this is a valuable area of research to explore further in the future.

Implications and Recommendations

In a world where research is starting to suggest that adolescent girls in India may disproportionately bear the burden of emerging obesity, more nuanced examinations are needed of the social and environmental factors that influence this phenomenon (Cherian et al., 2012; Chopra et al., 2013; Gupta et al., 2012; Lancaster, 2006). Obesity can be a dramatic health burden, especially for adolescents still undergoing physical and cognitive development. It can lead to health issues that persist later in life, which can increase economic and social costs for communities as obesity and chronic disease-related morbidity increases care and pharmaceutical costs and reduces the benefit an individual can provide to their society. As an issue that has only recently emerged in India, girls' potentially unequal burden of obesity needs to be addressed and mitigated before it intensifies. This study is a good step by providing preliminary evidence that

certain socio-contextual determinants like friend encouragement and availability of sports equipment are significantly impacting girls' ability to be physically active, a behavior that can aid in obesity prevention. This study also supports the application of Social Cognitive Theory to research on adolescent physical activity and gender in India, which is a tremendous gap in current literature.

Research on this issue using a theoretical framework can help orient interventions to be more effective. With a better understanding of the interplay of person-level and environment-level constructs, public health officials can devise programs to target these constructs. Initial findings from this study have helped quantify the negative influence of some socio-contextual factors on the physical activity behavior of girls versus their boy peers, and should be motivation for further exploration into this topic using a greater number of theory-oriented indicators.

General recommendations for future research include analyzing the influence of socio-contextual determinants on a more comprehensive measure of physical activity, as described above. In addition, an assessment of the impact of cultural beliefs about appropriate behavior for girls and boys on obesity prevention behaviors could illuminate other influences at play beyond the variables utilized in this study. Creating a survey instrument focused specifically on these and other socio-contextual determinants of physical activity and implementing it in multiple regions of India would help obtain a broader perspective on gender, obesity, and health throughout the country.

Specific recommendations can also be given for the fields of Behavioral Science and Health Education. This study helps illustrate that physical activity behavior change may require an attention to adolescents' self-efficacy, outcome expectations, and observational learning; future behavioral science initiatives on this topic should focus on determining other valid

measures for these constructs among adolescent girls in India. For example, is self-report data adequate for accurately assessing the constructs, or should outside observation be incorporated into behavioral science data collection to limit bias? How often does an adolescent girl need to observe a female peer engaging in physical activity before she changes her own behavior? Are parents or siblings sufficient as examples, or must observational learning occur solely among female friends in order to have a positive effect? Other SCT constructs should also be explored to help understand their level of impact on physical activity behavior and gender. Potential other constructs of interest are self-regulation, facilitation, incentive motivation, and collective efficacy.

Health education interventions should incorporate components that target theoretical constructs, like using goal-setting, confidence-boosting exercises, and girls-only discussion groups to improve self-efficacy. As 28.9% of girls versus 18.8% of boys indicated that their parents do not allow them to play outside, health educators should further explore household and cultural expectations that may restrict girls from physical activity. Cultural effects could be assessed within focus groups, where a community environment among young women may help alleviate discomfort or embarrassment. Health education about the impact of cultural gender norms can similarly be disseminated within focus groups of older female adults like mothers and grandmothers, who often wield influence over behavior conducted within the household.

Summary

This study yields preliminary conclusions that multiple socio-contextual factors impact Indian adolescents' performance of physical activity in the form of outdoor play, and that these influences may be particularly detrimental for adolescent girls. The study is successful in partially applying

Social Cognitive Theory constructs to understand the reciprocal determinism concept at play in this issue. The results of this study may have important implications for the field of public health, as few studies attempt to understand differences by gender in the influences on obesity prevention behaviors in India. Even fewer utilize a theoretical framework to do so. Future research should examine gender differences with a fuller application of SCT and consider the possibility of using findings to implement theory-based physical activity interventions for girls in India.

APPENDICES

Appendix A: Emory IRB Review Board Letter

EMORY UNIVERSITY | Institutional Review Board

December 20, 2011

Solveig Argeseanu, PhD
Rollins School of Public Health
1518 Clifton Road
Atlanta, GA 30322

RE: **Determination: No IRB Review Required**
    IRB00053570 – *Home environment and school going adolescents' weight status in rural India*
    PI: Solveig Argeseanu

Dear Dr. Argeseanu:

Thank you for requesting a determination from our office about the above-referenced project. Based on our review of the materials you provided, we have determined that it does not require IRB review because it does not meet the definition of research involving "human subjects" as set forth in Emory policies and procedures and federal rules, if applicable. Specifically, in this project, you will be advising an Indian investigator (Shailaja Patil) in the development of a data collection project for the purpose of understanding the effects of secular changes in the home environment on food, activity, and weight in Bijapur, Karnataka, India. Additionally, your team will obtain pilot data from the investigator for the purpose of preliminary data analysis. Ms. Patil and her team will de-identify all data before sharing it with your team. With the data set you access, you will be unable to determine any individuals' identities. Accordingly, IRB review is not required.

45 CFR Section 46.102(f) defines "human subject" as follows:

> Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains (1) data through intervention or interaction with the individual, or (2) identifiable private information.

This determination could be affected by substantive changes in the study design, subject populations, or identifiability of data. If the project changes in any substantive way, please contact our office for clarification.

Thank you for consulting the IRB.

Sincerely,

Tom Penna, MTS
IRB Analyst Assistant
This letter has been digitally signed

Appendix B: Data Use Agreement

Bijapur Home environment and adolescent weight
Data Use Agreement

Data Principal Investigators: Dr. Shailaja S. Patil and Dr. Solveig A. Cunningham
Project Principal Investigators: Dr. Nikhil Tandon and Dr. K.M. Venkat Narayan

These data were collected with funding from the National Institutes of Health to examine the role of the home environment in differences in unhealthy weight between school-going adolescent girls and boys in Bijapur. In using this dataset, all users acknowledge that they understand and agree with the following requirements:

__ Research topics must first be approved by Drs. Patil and Cunningham

__ Users must apply for and receive appropriate Human Subjects approval and follow IRB guidelines and restrictions.

__ The data will be used only in a secure IT environment, specifically those designated by IT at Emory University and BLDE.

__Users may not share the data with other researchers –inquiries about details of the dataset and data use must be directed to Drs. Patil and Cunningham

__ Drs. Patil and Cunnigham will collaborate as co-authors on all publications resulting from the data

__ Authorship will be based on substantial contribution to the manuscript. Each collaborator will be first author on papers for which they developed the concept. Authors will discuss authorship order when they begin each paper and will discuss again before the paper is submitted to a journal and at the revise-and-resubmit stage to re-assess this order if needed.

__ All research reports and publications must be submitted to Project PIs Drs. Tandon or Narayan in the form of advance copies for review and comment prior to publication to ensure appropriate coordination of the research results.

__ Users must acknowledge the NICHD funding in publications and oral and poster presentations as follows: "The project described was supported by Award Number 3D43HD065249-03S1 from the Eunice Kennedy Shriver National Institute of Child Health & Human Development. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Eunice Kennedy Shriver National Institute of Child Health & Human Development".

Name and affiliation of researcher: Susannah Gloor

Project type, if applicable (eg. thesis, dissertation, rotation, practicum): Thesis

Proposed paper title: Understanding the Physical Activity of Girls and Boys in India: A Logistic Model of Gender and Socio-Contextual Determinants of Outdoor Play

Signature of researcher: Susannah D Gloor

Signature of Data PI:

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