

## ABSTRACT

Title of Thesis: FEASIBILITY OF AN ONLINE SURVEY EXAMINING  
THE PHYSICAL ACTIVITY PATTERNS AMONG  
SOUTH ASIAN ADULTS RESIDING IN THE UNITED  
STATES

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**Background:** Physical inactivity is a major risk factor for cardiovascular disease and diabetes among South Asians (SAs) - Bangladeshi, Bhutanese, Indian, Maldivian, Nepali, Pakistani, and Sri Lankan. **Methods:** An online survey was used to determine the feasibility of examining physical activity (PA) levels of SAs living in the US. The Social Ecological Model was the theoretical basis for identifying individual-level, social environmental, and physical environmental factors that impact PA. **Results:** Ethnicity, intention, self-efficacy, and perceived health benefits of PA were significantly associated with being physically active. Facilitators to PA included achieving improved health; while barriers were lack of time to exercise, unfamiliarity with PA, and nonexistent gender-specific PA facilities. **Conclusions:** This study showed that online surveys can be a promising tool for data collection among SAs. Health promotion programs should include education on the benefits of PA, and provide culturally sensitive facilities that support PA, especially for SA women.

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ACTIVITY PATTERNS AMONG SOUTH ASIAN ADULTS RESIDING IN  
THE UNITED STATES

by

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## **Chapter 1: Introduction**

### **STATEMENT OF THE RESEARCH PROBLEM**

An overarching goal of Healthy People 2020 is to achieve health equity, eliminate disparities, and improve the health of all groups regardless of their race, ethnicity, gender, or nativity (US Department of Health and Human Services [HHS], 2011) by taking action (Thomas, Quinn, Butler, Fryer, & Garza, 2011). To achieve this goal, certain health-related behaviors, such as the types and amounts of physical activity (PA), that particular US subpopulations engage in or do not engage in need to be examined. This will aid us in developing physical activity initiatives that are culturally appropriate and implemented in locations where individuals feel comfortable in participating. Further, the physical activity research agenda will continue to move forward and away from a “one-size-fits-all” approach to physical activity.

One US subpopulation that warrants physical activity research is South Asians. They are individuals who trace their origins to Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka (South Asian Americans Leading Together [SAALT] & The Asian American Federation [AAF], 2012). South Asians (hereafter, SAs) are noted as the fastest growing ethnic group in the US, with over 3.4 million people (SAALT & AAF, 2012). One issue that impacts members of the SA population is the stereotype known as the “model minority.” It states that members of an immigrant population will be in better health despite possible lower socioeconomic status and limited access to health care and that this group does not have major health problems (Chen Jr, & Hawks, 1995). This, however, is not the case for the SA population, which is a heterogeneous group of people with some having higher risk factors (Chen Jr, & Hawks, 1995) such as

lower socioeconomic status, limited access to healthcare, increased likelihood of discrimination based on racism, and language barriers (Vyas, Chaudhary, Ramiah, & Landry, 2013).

Despite the diverse and large number of SAs residing in the US and the vast origin of birth locations, little is known about their PA practices and patterns. Most studies examining PA practices among this group have been conducted in the United Kingdom and Canada (Babakus & Thompson, 2012) with little work being conducted in the US. These United Kingdom and Canadian studies may not adequately capture the PA experiences of SAs living in the US, leaving gaps in the literature. The limited PA research that has been conducted among SAs living in the US has focused on the broader Asian American population and not specifically on SAs (Eyler et al., 1998; Ivey, Khatta, & Vedanthan, 2002; Unger et al., 2004; Yang, Bernstein & Wu, 2003). The Asian American population is large and diverse with individuals who trace their ancestry to the Far East, Southeast Asia, South Asia, or the Pacific Islands (Chen & Hsu, 2002). These subgroups differ from one another as they have unique languages, cultures, religions, and history (Sadler et al., 2003). Therefore, such studies do not represent a clear and relevant understanding of the PA practices for SA Americans.

Engaging in physical activity by any group is essential in preventing and slowing the onset of many diseases such as heart disease and diabetes (Centers for Disease Control and Prevention [CDC], 2015). Studies have shown that South Asians are disproportionately more affected by cardiovascular diseases and diabetes compared to other groups such as Caucasians (Dodani, 2008; Karter et al., 2013; Klatsky, Tekawa, Armstrong, & Sidney, 1994) and therefore it is critical to explore the physical activity

practices of this population. Despite the limited research regarding PA practices among US SAs, most studies indicate that PA levels among SAs are lower compared to the Caucasian population (Babakus & Thompson, 2012; Kandula & Lauderdale, 2005; Palaniappan et al., 2002; Ye, Rust, Baltrus, & Daniels, 2009). Research suggests that more work is needed that focuses on understanding SAs' PA patterns to develop community level interventions (Kandula & Lauderdale, 2005; Vyas et al., 2013; Ye et al., 2009), which are more congruent with SA sense of identity (Fischbacher, Hunt & Alexander, 2004). Therefore, it is imperative that an exploration of the PA practices, patterns, and determinants of PA among the SA population in the US is conducted.

## **RESEARCH QUESTIONS**

This study explored the PA patterns and practices of South Asian adults living in the United States. To assess these patterns and practices, this research was guided by the following research questions.

### **Research Question #1:**

- a) What levels and types of physical activity do South Asian adults residing in the US engage in?
- b) Do the levels of PA vary by age, gender, ethnicity and years living in the US?

Hypotheses:

- i. Men will have higher levels of PA than women.
- ii. Individuals with Indian origin will have higher levels of PA than individuals with Pakistani and Bangladeshi origin.

### **Research Question#2:**

- a) What are the individual (e.g. intention, self efficacy, perceived barriers to PA and

perceived benefits for PA), social (e.g. social support), and physical environment (e.g. availability of facilities.) factors that influence PA levels among South Asians residing in the US?

Hypotheses:

- i. Lack of women only facilities or activities will be a barrier to South Asian women's physical activity practices.
- ii. Lack of PA arranged through and/or at religious and community centers will be a barrier to South Asian's physical activity practices.

## **DEFINITION OF TERMS**

Because certain words have different meanings from one group or culture, and from one academic discipline to another, it is necessary for the purposes of this study to clarify and define the terms used herein.

1. *Physical Activity (PA)*: Any bodily movement produced by skeletal muscles that require energy expenditure (Caspersen, Powell & Christenson, 1985).
2. *Exercise*: is a subcategory of physical activity that is "planned, structured, and repetitive and purposive in the sense that the improvement or maintenance of one or more components of physical fitness is an objective" (Caspersen et al., 1985, p. 128). Even though the term "exercise" is interchangeably used with "physical activity," all exercise is physical activity, but not all physical activity is exercise (Caspersen et al., 1985).
3. *South Asians (SAs)*: South Asians are individuals who trace their origins to Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, or Sri Lanka (SAALT & AAF, 2012).

4. *MET*: MET refers to metabolic equivalent and 1 MET is the rate of energy expenditure while sitting at rest and is equal to an oxygen uptake of 3.5 milliliters per kilogram of body weight per minute. Physical activities frequently are classified by their intensity, using MET as a reference (HHS, 2008).
5. *Intensity of physical activity*: Intensity is the rate at which the activity is being performed or the magnitude of the effort required to perform an activity or exercise. It can be thought of as "*How hard a person works to do the activity*" (World Health Organization [WHO], n.d., p. 16).
6. *Moderate-intensity physical activity*: is an activity that noticeably accelerates the heart rate. For example: brisk walking, dancing, gardening, housework, and carrying/moving moderate loads (20kg). Activities ranging between 3 - < 6 METS are considered moderate intensity (WHO, n.d.).
7. *Vigorous intensity physical activity*: Those activities that require a large amount of effort and cause rapid breathing and substantial increases in heart rate are considered vigorous intensity physical activities. Examples of these activities include: running, walking/climbing briskly up a hill, fast cycling, aerobics, fast swimming, and carrying/moving heavy loads (>20kg). Activities  $\geq 6$  METS are considered vigorous intensity (WHO, n.d.).
8. *Muscle-strengthening activity*: Physical activity and exercise that increase skeletal muscle strength, power, endurance, and mass (e.g., strength training, resistance training, or muscular strength and endurance exercises) are muscle-strengthening activities (HHS, 2008).

9. *Leisure-time physical activity*. Physical activities performed by a person that are not required as essential activities of daily living and are performed at the discretion of the person. These activities include sports participation, exercise conditioning or training, and recreational activities such as going for a walk, dancing, and gardening (HHS, 2008).
10. *Aerobic physical activity*: Also known as an endurance activity, aerobic physical activity is one in which the body's large muscles move in a rhythmic manner for a sustained period of time and improves cardiorespiratory fitness. Examples include: walking, running, swimming, and bicycling (HHS, 2008).
11. *Frequency*: The number of times an exercise or activity is performed. Frequency is generally expressed in sessions, episodes, or bouts per week (HHS, 2008).
12. *Duration*: The length of time in which an activity or exercise is performed. Duration is generally expressed in minutes (HHS, 2008).

## **SIGNIFICANCE OF THE PROJECT**

A major public health issue that affects many US adults is physical inactivity, which is a risk factor for several diseases such as coronary heart disease, type 2 diabetes, metabolic syndrome, and breast and colon cancer (American Heart Association, 2015; CDC, 2015; Lee et al., 2012). Globally, physical inactivity is the fourth leading risk factor for mortality; causing an estimated 3.2 million deaths annually (WHO, 2015). Despite the adverse effects from being physically inactive, PA rates continue to remain low in the US, especially among racial and ethnic minorities (Macera et al. 2005). Thus, increasing our understanding of the importance of physical activity – i.e. controlling weight, strengthening bones and muscles, improving mood and mental health, and

longevity, is an important public health topic that warrants continual research by developing culturally relevant PA programs and evaluating their effectiveness (CDC, 2015).

For one of the fastest growing minority populations in the US, South Asians (SAs), the focus of the research presented here, physical inactivity rates remain high. Thus, putting them at risk for developing the aforementioned diseases (Dodani, 2008; Ivey et al., 2002; Karter et. al., 2013; Shah, Vittinghoff, Kandula, Srivastava, & Kanaya, 2015). Despite this, there is a dearth of research that specifically addresses these disease risk factors and specific preventive and management strategies –such as, physical activity programs – for SAs. (Gupta, Singh & Verma, 2006). Sallis and his colleagues (2006) point out that most PA studies have been conducted with urban and suburban White adults, and highlight the necessity for studies that specifically focus on racial and ethnic subgroups.

South Asians are a geographically diverse population in the US, residing in several areas of the US, prominently in New York, California, New Jersey, Texas, and Illinois (SAALT & AAF, 2012). As such, it can be difficult to collect data from them using traditional research methods such as surveys and in-depth interviews. These difficulties include high cost, geographic limitations, and longer implementation times (Evans & Mathur, 2005). A more efficient way to collect data from SAs with broader geographic coverage is through the use of online surveys (Evans & Mathur, 2005). Online surveys have previously been used with the SA population in the US collecting data on topics such as domestic violence among women (Mahapatra, 2012) and a health needs survey in Washington, DC (Vyas et al., 2013). These studies were successfully

able to collect data through online surveys among this population. Therefore, this study utilized an online survey to examine the physical activity practices and patterns among a sample of South Asian Americans, and highlights the feasibility of conducting research with this group. Key individual, social, and environmental factors that influence PA are also presented, which could be used when developing comprehensive PA interventions that target behavior change at various social ecological levels.

The subsequent chapters of this thesis will address specific areas of the study. Chapter two contains an overview of the theoretical framework and a review of the relevant literature on physical activity, physical inactivity, and the use of online surveys. The methodological approach that guided this study is presented in chapter three. Chapter four discusses the findings of the study and answers to the research questions. In the final chapter, a discussion of the findings, limitations of the study, suggestions for future research, and the study's conclusions are presented.



## **Chapter 2: Background**

### **THEORETICAL MODEL**

The social ecological model was used in this study as the theoretical foundation to identify factors related to physical activity participation in a sample of South Asians residing in US. McLeroy, Bibeau, Steckler, and Glanz (1988) suggest the importance of using the social ecological model in health behavior, as behavior change is difficult to achieve, especially in an environment that does not support change. Using the social ecological model helps detect opportunities to promote participation in health promotion activities (e.g., physical activity programs) by identifying the multiple factors that influence an individual's behavior (McLeroy et al., 1988). The social ecological model can be used to develop comprehensive interventions that target changes at each level of influence on health behavior (Sallis, Owen & Fisher, 2008). The model proposes that health behavior has multiple levels of influence: intrapersonal (biological and psychological), interpersonal (social, cultural), organizational, community, physical environment, and policy (Sallis et al, 2008). Therefore, to maximize behavior change, three areas should be addressed: 1) individuals should be educated and motivated to make those choices; 2) social norms and social support for healthy choices should be strong; and, 3) the environment and social policies need to support healthy choices (Sallis et al., 2008).

According to Buchan, Ollis, Thomas, and Baker (2012), PA research is at the “embryonic state of a paradigm shift towards improving our understanding of complex behaviors through the application of complex ecological interventions” (p. 9). The authors emphasize that in addition to using behavioral models such as The Social

Cognitive Theory and The Theory of Planned Behavior to study PA levels, there is a need to use ecological models, which can lead to more effective and lasting behavioral change by examining this change at multiple levels and influences (Buchan et al., 2012). Sallis and his colleagues (2006) point out that since PA occurs in specific places, such as recreational facilities, parks, or walking trails, identifying the types of places that promote or hinder PA is another reason for using ecological models to study PA. In addition, Fleury and Lee (2006) conducted a literature review on studies that examined correlates of PA among African American women and then applied to a social ecological perspective. They concluded that the social ecological model provided a strong theoretical basis needed when studying PA among this ethnic group.

Although past research has used behavioral theories to study beliefs, attitudes, values, and other individual attributes as factors influencing PA, advancement in this field requires a broader perspective that includes individual as well as social and environmental factors (King, Stokols, Talen, Brassington, & Killingsworth, 2002; Owen, Leslie, Salmon & Fotheringham, 2000; Sallis & Owen, 1999). As Fleury and Lee (2006) contend, research, which has focused solely on individual characteristics and ignored the social and environmental context of behavior, may lessen the effectiveness of behavior change programs. This further underscores the rationale for using the social ecological model in the research reported here to identify those intrapersonal, interpersonal, organizational, community, physical environment, and policy factors that influence PA among SAs (Table 1).

<b>Table 1: Explanatory Variables with respect to their Social Ecological Level</b>		
<b>Explanatory Variables</b>	<b>Description of Variables</b>	<b>Social Ecological Level</b>
Individual-level variables	<ul style="list-style-type: none"> <li>▪ Intention</li> <li>▪ Self-efficacy</li> <li>▪ Perceived benefits and barriers</li> </ul>	Intrapersonal level
Social Environment Variables	<ul style="list-style-type: none"> <li>▪ Social Support</li> </ul>	Interpersonal level
Physical Environment variables	<ul style="list-style-type: none"> <li>▪ Availability of Facilities</li> </ul>	Community level

## **REVIEW OF RELEVANT LITERATURE**

**Benefits of Physical Activity.** Regular PA reduces the risk of cardiovascular disease, stroke, type 2 diabetes, metabolic syndrome, colon and breast cancer, and depression (CDC, 2015; Warburton, Nicol & Bredin, 2006). In addition, regular PA can also help control blood glucose levels in individuals with type 2 diabetes (CDC, 2015). Routine PA also helps strengthen bones and muscles and reduces the risk of hip fractures and falls (Gregg et al., 2000). PA also improves mental health and mood (Penedo & Dahn, 2005). Individuals who are physically active are more likely to achieve a healthier body mass index and composition (WHO, 2010). In summary, regular PA reduces the risk of dying early from the leading causes of death such as heart disease and some cancers. It is also recommended that any type of PA is better than no PA at all (CDC, 2015). It is extremely important that people of all backgrounds, ages, races and ethnicities participate in some form of PA and try to meet the minimum guidelines to gain the health benefits.

**Recommended Amounts of Physical Activity.** The 2008 Physical Activity Guidelines for Americans issued by the US Department of Health and Human Services, and Global Recommendations on Physical Activity for Health developed by the World Health Organization (2010), both provide the same guidelines regarding PA practices for adults ages 18-64 years to improve their health. These guidelines recommend that adults should do at least 150 minutes (2 hours and 30 minutes) a week of moderate intensity physical activity, such as brisk walking or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity (HHS, 2008; WHO, 2010).

A recent European study indicated that ethnicity-specific PA guidelines are essential and suggest that SAs should undertake greater moderate-intensity PA than White Europeans to lessen the chances of developing diabetes, heart disease or stroke (Celis-Morales, Ghouri, Bailey, Sattar, & Gill, 2013). Even though larger studies are warranted to confirm such findings, Celis-Morales and colleagues (2013) recommended that SAs should undertake 200-250 min per week of moderate-intensity PA (MPA) instead of the 150 min per week of MPA.

**Assessment of Physical Activity.** Physical activity is a complex behavior that is categorized by four dimensions and four domains (Rippe, 2011). The four *dimensions* of PA include: 1) type (e.g., aerobic), 2) frequency (e.g., sessions or days per week), 3) duration (e.g., length of session, number of minutes) and 4) intensity (e.g., moderate or vigorous) of activity. Whereas, the four *domains* of PA include: 1) leisure (e.g., recreational), 2) occupational (e.g., farming), 3) transportation (e.g., walking to work) and 4) household PA activities (e.g., gardening) (Rippe, 2011). In

order to measure the dimensions and domains of PA, self-reported physical activity instruments are the most favorable and easiest method in larger, population-based research studies. They are also the most commonly used tools in PA research, as they are inexpensive and have scoring flexibility (Welk, 2002). These instruments gather information about the types of PA behaviors performed in specific periods of time and specific activity domains (Welk, 2002).

**Distribution of South Asian population subgroups in the US.** The largest groups of the South Asian population in the US are Indians (83%), followed by Pakistanis (10%), Bangladeshis (4%), Sri Lankans (2%), Nepalese (1.5%), Bhutanese (0.4%), and Maldivians (0.003%) (SAALT & AAF, 2012). States with the largest South Asian populations are California, New York, New Jersey, Texas, and Illinois (SAALT & AAF, 2012). South Asians are a diverse group with various religious affiliations, including Hinduism, Islam, Buddhism, Christianity, Sikhism, Jainism, and Zoroastrianism (Pew Research Center, 2012). Although there is vast diversity among the SA population regarding religion, language, immigration history, socioeconomic status and education (Inman & Tewari, 2003), they largely share many common characteristics including customs, values, and family expectations (Maker, Mittal, & Rastogi, 2005). For example, specific customs and values include formality in interpersonal relationships and deep respect for religion (Kim, Atkinson & Yang, 1999). Family expectations include respect for elders, primary allegiance to the family and dependence upon the family (Kim et al., 1999).

**Health Issues among South Asians in the US.** South Asians along with Pacific Islanders and Filipinos have the highest prevalence and incidence of type 2 diabetes among all racial and ethnic groups, including minorities traditionally considered at high risk - African Americans, Latinos, and Native Americans (Karter et. al., 2013). South Asians are also at risk for premature coronary artery disease (CAD), and have a higher rates of metabolic syndrome (Dodani, 2008), characterized by having three or more of these medical conditions: abdominal obesity, high fasting glucose level, high blood pressure, high serum triglycerides and low high-density lipoprotein (HDL) levels (AHA, 2015). Metabolic syndrome is associated with risk of cardiovascular disease, diabetes, stroke and diseases related to fatty buildups in arterial walls (AHA, 2015). In addition, a more recent cross-sectional analysis of US South Asians without cardiac disease showed that they had a high prevalence of prediabetes (33%) and diabetes (25%) (Shah et al., 2015). The study further showed that lower income, less education, less exercise and more time watching television was associated with higher prevalence of diabetes among this population (Shah et al., 2015). Additionally, SAs have some of the highest rates of overweight and obesity among Asian American groups (Lauderdale & Rathouz, 2000). Thus, there is a growing need for increasing PA to reduce the risk of diabetes, obesity, coronary heart disease and metabolic syndrome among the SA population.

**Physical Inactivity among South Asians.** Research shows that PA levels among the SA population are lower than Caucasians (Babakus & Thompson, 2012; Fischbacher et al., 2004). Another study showed consistent results of low levels of PA in Asian Indians, Pakistanis and Bangladeshis and these levels were inversely

correlated with body mass index (BMI), waist measurement, systolic blood pressure, and blood glucose and insulin levels (Hayes et al., 2002). Furthermore, SAs were found to be more inactive during their leisure time (Ranasinghe, Ranasinghe, Jayawardena, & Misra, 2013). After adjusting for potential confounding variables such as SES, smoking, diabetes, and existing cardiovascular disease, Williams, Stamatakis, Chandola & Hamer (2011) found that physical inactivity explained more than 20% of excess coronary heart disease mortality in the South Asian population.

***Demographical differences.*** A systematic review of twenty six studies relating to PA among SA women in the United Kingdom, Canada, US (particularly in California), New Zealand, Australia, India and Guadeloupe suggest that South Asian women have low levels of PA compared with SA men (Babakus & Thompson, 2012). Fischbacher and colleagues (2004) noted the same pattern of SA women being less physically active than SA men. Further, they concluded that regardless of gender, Bangladeshis reported the lowest levels of PA and Indians the highest, and older SAs reported lower levels of PA (Fischbacher et al., 2004). The hypotheses for the first research question of this study were developed based on these findings: *Do the levels of PA vary by age, gender, ethnicity and years living in US?*

Bhatnagar and Foster (2015) in their recent systematic review examined generational differences in PA among South Asian men and women residing in the United Kingdom and concluded that these second-generation SAs were more active than the first-generation, but were still less active than the white British. This generational difference in PA could be due to evidence that the United Kingdom-born SAs have a higher socioeconomic position than their parents (Bhatnagar & Foster, 2015). Thus, these

second generation South Asians have more disposable income to pay for gym memberships, live in neighborhoods where they can safely walk, jog, and be physically active. On the other hand, research that investigated the correlates of PA among SA Indian immigrants in the US, showed that these immigrants who were more acculturated spent more time in leisure time PA (Daniel, Wilbur, Fogg & Miller, 2013). Collectively, these studies show that PA levels and patterns among the South Asian population varied by gender, age, ethnicity, and acculturation.

***Facilitators to Physical Activity.*** Jepson et al. (2012) qualitatively explored the motivations and facilitators to PA among SA adults living in Scotland. Although several reasons for motivating them to participate in PA were similar (enjoying or wanting to participate in walking, swimming and going to the gym) to other populations, there were subtle cultural differences in the way SAs were socialized and the activities they enjoyed. Religion and the “centrality of cross-generational family relationships” played particularly important roles in how they socialized. Social interaction and enjoyment were key motivators for both men and women in this group regardless of ethnic, religious or linguistic group. While men enjoyed social activities including cricket, walking (mostly in their neighborhood with their friends), badminton, and going to the gym, women engaged in or wished to engage in walking and swimming; dance was seen as a form of exercise that they enjoyed and allowed for social interaction with others (Jepson et al., 2012). Yet, when compared to the United Kingdom SA population, it was noted that the desire to walk, cycle and participate in sports and recreational activities was low in the SA population (Zaman & Jemni, 2011).



In the work of Jepson et al. (2012), many of the participants stated that they spent a significant amount of time at their religious centers; they prefer such places to be their point of access to PA out of convenience and from a social perspective. Another study concluded that for this population for whom group norms and social values were very important, initiatives that obtain community endorsement may help lessen people's apprehensions that others will perceive them as selfish if they take out time for themselves to participate in PA (Lawton, Ahmad, Hanna, Douglas, & Hallowell, 2006). Hence, the survey of this study reported here included questions that asked participants to state what their community could do or change that would help increase their PA levels (see Appendix A).

***Barriers to Physical Activity.*** A qualitative study that utilized in-depth interviews to understand the barriers to PA amongst people of Pakistani and Indian origin with type 2 diabetes showed that several women indicated the lack of culturally sensitive facilities as they did not feel comfortable swimming or going to the gym because of cultural taboos and religious beliefs about exposing their bodies to members of the opposite sex (Lawton, et al., 2006). The women further indicated the lack of “women only” facilities with female instructors (Lawton, et al., 2006). Another cultural barrier to British Bangladeshis was their belief about physical activity having the potential to worsen illness and promote physical weakness. Instead, ritual Muslim prayers (namaz) were mentioned as a healthy form of exercise (Greenhalgh, Helman, & Chowdhury, 1998). Research shows that the common barriers among SAs were lack of time, social rules, cultural expectations, such as prioritization of obligations to kin, restrictions on women leaving the home, lack of understanding of benefits of PA, communication gap with healthcare professionals (e.g.,

relying on relatives for translation of information), cultural beliefs, and lack of culturally sensitive exercise facilities (Babakus & Thompson, 2012; Horne & Tierney, 2012; Lawton et al., 2006). Through the open-ended questions in the survey (see Appendix A) of the study reported here, the participants were given a chance to describe the barriers they faced that prevented them from engaging in PA.

Although research has consistently shown lower PA levels among SAs and cultural differences regarding PA patterns and practices, understanding physical activity among this group and developing effective ways to increase their PA levels is imperative (Fischbacher et al., 2004). Even though many of these studies were not conducted in the US, the findings, however, have “a wider application to South Asian migrants living elsewhere, given the associated health risks [of physical inactivity] that transcend international boundaries” (Jepson et al., 2012, p. 1). One of the few US studies also highlighted the importance for the development of culturally tailored PA programs to reduce sedentary behavior among SAs (Shah et al., 2015).

***Correlates of Physical Activity.*** Daniel and Wilbur’s (2011) integrative review of the correlates of PA in healthy SA Indian immigrants in the United States and other western countries indicated that being female, less acculturated, having poor health, and less time since immigration were negatively correlated with PA. Few studies with this population focused on social support, environmental factors, or included intrapersonal factors such as self-efficacy or confidence in their ability to overcome barriers to participating in PA activities (Daniel & Wilbur, 2011). Self-efficacy and facilities for PA have consistently been strong correlates of PA in many studies conducted with different ethnic populations (De Bourdeaudhuij, Sallis & Saelens, 2003; Dishman et al., 2004;

McNeill, Wyrwich, Brownson, Clark & Kreuter, 2006; Pan et al., 2009). It is recommended that future research regarding PA conducted with more diverse groups such as SAs should evaluate modifiable factors, such as psychological, interpersonal, environmental correlates (Daniel & Wilbur, 2011; Eyler et al., 2002). Hence, this study measured individual, social and environmental factors associated with PA.

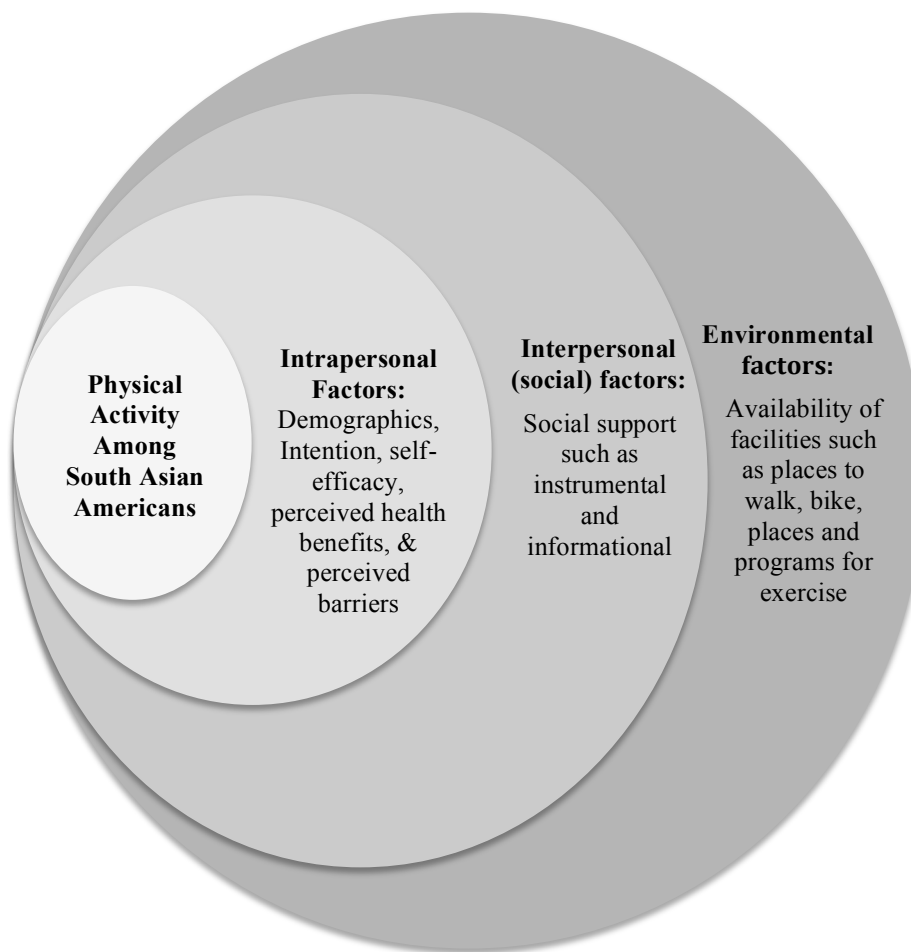
**Online Surveys.** With advances in technology, online surveys are becoming more and more popular as they have considerable advantages over other, more traditional formats for collecting data- mail and telephone surveys (Evans & Mathur, 2005). Online surveys have low administrative costs, increase speed and timeliness to collect data, convenience, ease of data entry and analysis, easy to follow-up with participants, control of answer order, and wide geographic coverage (Evans & Mathur, 2005). Further, online surveys can be accessed on laptops, tablets and smart phones. Still, online surveys tend to attract certain groups such as educated, young adults and predominantly men, which contribute to selection bias (Bethlehem, 2010; Evans & Mathur, 2005); however, each year these gaps are closing in industrialized countries as more individuals are completing this type of survey when asked to do so (Evans & Mathur, 2005). This is a departure from past data collection methods when research participants only had access to surveys via paper and completed them using pen or pencil; surveys were landline telephone based, or in the case of earlier forms of online surveys, using a fixed desktop computer. Research also shows that response rates for face-to-face surveys and landline telephone surveys are slowly declining (Fuchs, 2008). With mobile technology, research participants are able to complete surveys for studies, save the information, and complete the survey at a later time.

**Online Survey Research with South Asians in US.** Mahapatra's study (2012), on domestic violence among SA women residing in the US, provided SA women with an option of either taking a paper and pencil survey or an online one; 264 out of 268 women completed the online survey. Although domestic violence is a sensitive topic to discuss compared to physical activity, it can still be concluded that online surveys were readily accepted as the method of choice among SA women in the US. A very recent study that used online surveys compared the perceptions of mental illness between South Asian Americans and White American young adults (Mokkarala, O'Brien, & Siegel, 2016). The researchers were able to successfully recruit SA's by posting survey links on the Facebook pages of several SA student organizations at universities throughout the US (Mokkarala et al., 2016).

Online surveys were also used among members of SA community-based organizations (CBOs) in the US to understand how these CBOs are addressing the health needs of SA Americans and resulted in a 33% response rate for their online survey (Chaudhary, Vyas & Parish, 2010). Another study conducted online and in-person surveys among the SA population living in Washington, DC area and assessed the health needs of this community (Vyas et al., 2013). They found that out of 709 participants who completed the survey, 452 (64%) of them completed the online survey with more females, and a younger age group (mean age was 34.3 years) (Vyas et al., 2013). They also found that Internet was the largest primary source for health information among this population (Vyas et al., 2013). These studies show that online surveys could be a useful tool in collecting data among the South Asian population in the US. However, this study

further assessed the feasibility of using an online survey to gather data regarding PA patterns among this population.

Based on the background and the literature review, this study was guided by the Social Ecological model and was designed to understand the individual-level, social environmental and physical environmental factors that impact PA among SA adults residing in the US (Figure 1).



**Figure 1.** Application of the Social Ecological Model to PA Participation among SAs Living in the US

## **Chapter 3: Methods**

### **STUDY SAMPLE, DESIGN AND MEASUREMENT**

This study examined the feasibility of conducting an online survey among SA Americans regarding their PA patterns. Eligibility criteria included being South Asian or of South Asian descent, a United States resident, ages  $\geq 18$  years, and able to read and understand English. As the majority of South Asians living in the US are from India, Pakistan, and Bangladesh, these three ethnic groups were targeted. However, people from other South Asian countries were also able to participate in the study as long as they met the study's eligibility criteria. The online survey was live from March 8, 2016 till March 28, 2016.

**Instrument.** The survey used in this study (Appendix A) was developed to collect (1) information on the PA patterns among US SAs and, (2) to identify individual, social and environmental factors that influence PA among this population. The survey was adapted from the short form version of the International Physical Activity Questionnaire (IPAQ) (2011) (Appendix B). The IPAQ was designed to be adaptable to all cultures, languages, and age groups, and has been shown to have an acceptable test-retest reliability and criterion validity (Craig et al., 2003). It can also be used for international surveillance of several PA domains in the adult population.

To measure PA through the IPAQ's self-reported questionnaires, three dimensions of PA dose: intensity, duration and frequency were assessed. The IPAQ consists of a long form and a short form. Both forms can be conducted in English and ask questions about the specific types of PA performed within each of these four domains: occupational activity, commuting activity, household activity, and leisure-time activity

(HHS, 2008). However, the long form requires the respondent to provide more detail in each domain, which increases the length of time to complete the IPAQ. The short form includes the same questions as the long form; however, it does not require the participant to answer the four domains, and takes less time to complete (International Physical Activity Questionnaire [IPAQ], 2011). Therefore, the IPAQ short form was used for this study to measure PA among SAs.

In order to gather information regarding individual, social and environmental factors that influence PA among this study's population, the 2002 Physical Activity Monitor assessing these factors was adapted. This instrument was based on the work of the Canadian Fitness Lifestyle Research Institute (Pan et al., 2009). It has been used in previous studies reported from Canada and Malaysia (Pan et al., 2009; Sreeramareddy, Kutty, Jabbar, & Boo, 2012) (see Appendix C). Both these studies examined the influences of individual, social and environmental factors on PA participation and used the IPAQ short form for PA measurement (Pan et al., 2009; Sreeramareddy et al., 2012). Permission to use the instrument was granted by Dr. Sreeramareddy (C. T. Sreeramareddy, personal communication, September 29, 2015) (Appendix D). This instrument included questions about intentions to be physically active, self-efficacy for PA, perceived health benefits of PA, barriers to PA, social support for PA and availability of PA facilities.

Socio-demographic measures, such as gender, age, ethnicity, zip code, years living in the US, occupation, and years of paid work in the US were also collected. For the scope of this study and to minimize the length of the survey, various other socio-

demographics such as marital status, number of children, education level, or income level were not collected.

To allow the participants an opportunity to add additional information outside of the closed-ended questions, open-ended textboxes were located at the end of the online survey. Participants could, in their own words, discuss the types of their PA, the barriers of and facilitators to PA and their community needs to increase their PA. The open-ended questions helped with triangulating the data to provide a deeper understanding about PA behavior. Triangulation involves the use of different data collection methods, such as qualitative and quantitative, to check the consistency of results and how these results complement various aspects of the same phenomena (Carter, Bryant-Lukosius, DiCenso, Blythe, & Neville, 2014). Further, the information gathered from the open-ended textboxes provided vital information that might not have otherwise been captured through the use of quantitative questions alone.

**Protection for Human Subjects.** This study was approved by the Institutional Review Board (IRB) at the University of Maryland, College Park. This IRB approval (Appendix E) was granted through the expedited review as there were no known risks to the participants and no vulnerable populations were asked to participate in this study. The informed consent was developed based on the IRB template. Once the participants clicked on the electronic survey link, they were able to view the consent form and were given an option to print the consent form for their records. The participants were asked to electronically sign the consent form before they began the survey. Participants were not asked any identifying information (e.g., name, address). However, those who chose to participate in the raffle drawing and/or wanted to receive a copy of the study's results



were asked to provide an email address, which was only saved for the purpose of the raffle drawing and receipt of study results.

The survey was built using Qualtrics (2015) online survey software that was password protected. All survey data and participant email addresses for a raffle (described below) were stored on a password-protected computer. The principal investigator was the only person who had computer access to this data.

**Recruitment of Participants.** The participants were recruited through various means, including social media posts on Facebook; as Facebook is a successful way of recruiting targeted demographic groups like SAs (Bhutta, 2012; Samuels & Zucco, 2013). A Facebook community page titled, “Physical Activity Survey Request” was created to invite SAs to complete the online survey (See Appendix F). This Facebook page included information about the survey and a link where eligible participants could complete the survey. A flyer (Appendix G) was designed to recruit participants through Facebook and was located on the Facebook page. South Asian groups at various US universities were contacted via their Facebook groups using this flyer. Participants were also recruited through SA contacts known to the principal investigator on Facebook and by individually messaging them with a brief description, and the survey link.

Additionally, emails were sent to members of various South Asian cultural associations, groups, and nationwide communities to request their help in forwarding the survey link to their members: South Asians Americans Leading Together (SAALT), South Asian Public Health Association (SAPHA), Sakhi for South Asian Women, Asian American Health Initiative, The South Asian Total Health Initiative (SATHI), South Asian Heart Center, Asian & Pacific Islander Caucus for Public Health (APIC), and

Imamia Medics International (IMI). An email was received from SAALT that suggested the principal investigator reach out to The National Coalition of South Asian Organizations. Therefore, emails were sent to fourteen of those organizations connected to the Coalition. An email was sent to faculty and students from the principal investigator's department, Behavioral and Community Health, requesting their assistance with sending the survey's link to their professional networks.

As the principal investigator is South Asian, emails, text messages, and messages on Whatsapp (an instant messaging app for smartphones) were sent to her contacts throughout the SA community. Those contacts that received emails from the principal investigator received a text message reminder to complete the survey. In addition, using snowball sampling (Gideon, 2012), the principal investigator requested various contacts to also forward the survey to people they knew to increase participation. Participants were also informed about the study in person at community gatherings held in New Jersey and New York (due to their close geographical proximity to the principal investigator's residence).

In this study's survey, participants were asked about the method of recruitment with an option to select more than one of the following options: 1) Social Media: Facebook, 2) Email from an organization or a community, 3) Email from a relative/friend/acquaintance, 4) Text message from a relative/friend/acquaintance, 5) Received the link for the survey in-person, 6) Through a flyer invitation, and 7) Other.

**Incentives.** Incentives have been noted to increase low response rates of online surveys (Evans & Mathur, 2005). The participants were informed that upon completion

of the survey, they would be given opportunity to submit their individual email address for a lottery to win one \$100 Amazon gift card.

**Sample Size Considerations.** To achieve an appropriate power for this study, the required sample size was calculated using an online sample size calculator for logistic regression with a binary covariate (“Power/Sample Size Calculation,” n.d.). This calculator is based on the algorithms that are described by Demidenko (2008). Among 53% females in the study population, the proportion of meeting sufficient levels of PA was expected to be 38% based on a similar study that examined gender, as a predictor of meeting sufficient levels of PA (Sreeramareddy et al., 2012). Assuming a type I error rate of 0.05 and a power of 0.8, the required sample size is 271 to detect an odds ratio of 2.0 between males and females for meeting sufficient levels of PA. Assuming a response rate of 25%, 1084 people needed to be invited to take the survey in order to get 271 respondents. The aim was to collect almost 47% men and 53% women.

## **OPERATIONAL DEFINITIONS OF VARIABLES**

**Socio-demographic Measures.** The participants were asked socio-demographic factors that included – gender, age, ethnicity, zip code, years living in the US, occupation, and years of paid work in the US.

**Physical Activity Measures.** In order to measure PA, the English version of the short, self-administered IPAQ was used. The participants were asked about the frequency, duration and levels of PA during the previous seven days. The number of days, hours and minutes they participate in PA among the four domains of PA – occupational activity, commuting activity, household activity, and leisure-time activity – were assessed. The levels of PA were measured by asking the number of days over the

past week did they do 1) vigorous PA, 2) moderate PA, and 3) walking. Sufficient PA was used as a PA index and was defined as achieving a minimum of 840 MET-minutes/week (Note: MET or metabolic equivalent is frequently used to classify PA). One MET is the rate of energy expenditure while sitting at rest [HHS, 2008]) of any combination of walking, moderate intensity or vigorous-intensity activities. This definition of sufficient PA, as an index for PA, was derived from the Malaysian and Canadian studies from which the current survey is adapted (Pan et al., 2009; Sreeramareddy et al., 2012). Therefore, this study had a dichotomous outcome variable – sufficient PA and insufficient PA. The last section in the IPAQ, which includes questions about the time spent sitting, was not included in the survey, as they are not related to the research questions of this study.

### **Social Ecological Measures.**

#### ***Individual-level variables.***

*Intention.* Intention to be physically active was measured by asking the participants: “To what extent do you intend to be physically active over the next six months?” They were asked to rate their intention via a 7-point Likert scale where 1 is no intention at all and 7 is fully intend to be physically active.

*Perceived health benefits from PA.* Perceived health benefits from PA were assessed by four items. The participants were asked: “To what extent do you agree with the following statement? Regular PA helps to: 1) prevent heart disease, 2) prevent cancer, 3) reduce stress, and 4) maintain the ability to do everyday tasks in older age.” They were asked to rate their agreement with each of the above four statements on a 7-point Likert scale where 1 is I do not agree and 7 is I agree very strongly.

*Perceived personal barriers to PA.* Perceived barriers to PA were assessed by eight items from the Malaysian study survey and two additional items were developed based on the literature (Jepson et al., 2012; Lawton et al., 2006). Participants were asked: “How important are each of the following in keeping you from participating regularly in physical activity?”: 1) lack of time; 2) lack of energy (too tired); 3) lack of physical skills; 4) lack of interest or motivation; 5) feeling uncomfortable or ill at ease; 6) long-term illness, disability, injury; 7) fear of being injured; and, 8) costs.” The two items that were developed based on the work of Jepson et al. (2012) and Lawton et al. (2006) are: 1) Lack of same-gender facilities for PA with same gender instructors and 2) lack of PA activities done through/at their community/religious centers. The participants were asked to rate these ten items based on a 7-point Likert scale where 1 is not at all important and 7 is very important.

*Self-Efficacy.* Self-efficacy was assessed by asking how confident the participants are about doing: 1) 30 minutes of moderate PA three to four days a week and 2) 60 minutes of light PA each day. The participants were asked to rate this on a 7-point Likert scale where 1 is not at all confident and 7 is very confident.

***Social environmental variables.***

*Social Support.* The participants were asked: “Rate the following items based on how important they are in helping you to be physically active:” Social support was assessed by the following five items: 1) Information on PA, health and well-being, 2) help in planning daily schedule, 3) Professional help in choosing best types of activities, 4) Specific instruction or coaching in different activities, and 5) affordable services to link with other people. They were asked to rate these items on a 7-point Likert scale where 1 is not

important at all and 7 is very important. The original survey from the Malaysian study included three additional items: convenient public transportation; affordable facilities, services and programs; and affordable support services such as child care, parking. However, these three items were inadvertently excluded from this online survey.

### ***Physical environmental variables.***

*Facility availability.* To determine the availability of physical activity facilities, participants were asked: “How many of the following five types of infrastructure are available in your local community or near to the place where you live?” 1) Number of places to safely walk, 2) Number of places to safely ride a bicycle, 3) Number of publicly owned multi-purpose recreation trails, number of facilities, places and programs for specifically exercise and sports and, 4) Number of other places that could be used for PA. The options were none at all, a few, some and many.

### **Qualitative Measures**

For the first qualitative question, a three-column table was created to match their type of activity with the reason for engaging in it, and with whom (See Appendix A). The first column stated, “Activity that you engage in at least once per month (e.g., cycling, yoga, running).” The second column stated, “Reason for engaging in this activity.” The question in the third column was, “Who do you do this activity with?” The participants were also asked about the physical activities that they liked to engage in, but were not able to and the barriers to those PA. This was assessed by the following questions: (a) “Please provide a list of some of the exercises/physical activities that you would like to engage in, but do not?” (b) Please provide a brief statement of what prevents you from engaging in these activities? Lastly, the participants were asked about their community

needs, “Please provide a brief statement of what in your community could be done or changed that would be most helpful in increasing the physical activity levels in your community?” This last question was adopted from the “US Determinants of Exercise in Women Phone Survey” (Evenson, Eyler, Wilcox, Thompson, & Burke, 2012).

## **ANALYSIS PLAN**

**Quantitative Analysis.** For the research questions proposed in this study, the following quantitative analyses were conducted. The data from the online survey was downloaded as an SPSS file and statistical analyses were run using the IBM SPSS Statistics Standard Version 23.

***Partial Completers vs. Completers.*** To compare the response characteristics of those who completed the online survey with those who partially completed it, chi-square tests and independent sample t-tests were conducted. For independent sample t-tests for age, a Shapiro-Wilk’s test (Razali & Wah, 2011; Shapiro & Wilk, 1965) was conducted and showed that age was not normally distributed. Therefore, a nonparametric Mann-Whitney U-test was run.

***Research Question #1a.*** *What levels and types of physical activity do South Asian adults residing in the US engage in?*

In order to answer the first part of the question, this study defined PA level as “sufficient PA” or “insufficient PA”. The total MET-hours were calculated based on the Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) – Short and Long Forms (2005). The guidelines propose that the MET-hours should be calculated by multiplying the total hours of walking, moderate PA, and vigorous PA with their respective MET value, and then adding all three. The MET value

for walking = 3.3, moderate PA = 4.0, and vigorous PA = 8.0. After calculating the total MET-hours, the study population was categorized into either sufficient or insufficient levels of PA. According to these scoring guidelines provided by a previous study (Sreeramareddy et al., 2012), the cut off values for these two levels of PA are shown in Table 2. In addition, physical activity levels were also classified into three categories: low, moderate and high, based on the scoring system provided by IPAQ (2005) as shown in Table 2.

<b>Table 2: Criteria used for Classifying PA Levels</b>	
<b>Criteria for Sufficient and Insufficient PA</b>	
<b>PA level</b>	<b>Criteria</b>
Sufficient PA	▪ Achieving a minimum of 840 MET-minutes/week
Insufficient PA	▪ Not meeting criteria for sufficient PA
<b>Criteria for Low, Moderate and High PA<sup>1</sup></b>	
<b>PA level</b>	<b>Criteria</b>
Low	▪ Not meeting criteria for moderate and high PA
Moderate	▪ Achieving a minimum of 600 MET-minutes/week
High	▪ Achieving a minimum of 3000 MET minutes/week

However, while cleaning the PA data that was entered, one challenge occurred. The following questions were asked about the duration of physical activity performed in the previous seven days:

Question 1: During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling? Think about only those physical activities that you did for at least 10 minutes at a time.  
 \_\_\_\_\_ Days per week

Question2: How much time in total did you usually spend on one of those days

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<sup>1</sup> These criteria are based solely on the MET mins/week. The IPAQ has additional requirements for each criterion.



doing vigorous physical activities?

\_\_\_\_\_ # of hours

\_\_\_\_\_ # of minutes

Many people answered “5” days per week for question 1 and “5” hours for question 2.

Similarly, respondents answered “3” days and “3” hours and “2” days and “2” hours and so forth. It was assumed that many of these participants misunderstood the question and answered question 2 assuming that it was asking about number of hours per week instead of per day. According to the Guidelines for Data Processing and Analysis of the IPAQ – Short and Long Forms (2005), which is provided by the IPAQ Research Committee, it was recommended that "in some cases duration (time) will be reported as weekly (not daily). This data should be converted into average daily time by dividing by 7" (p.10). However, the number of hours should be converted into daily time by dividing it by the numbers of days the respondents entered. The cut off values for vigorous, moderate and walking were set for 1 hour, 1 hour and 15 minutes, and 1 hour and 30 minutes, respectively. This means that respondents who entered more than 1 hour for question 2 about vigorous activity, was divided by the number of days they entered in question 1. According to most guidelines (HHS, 2008; WHO, 2010), the recommended time for vigorous activity is 25 minutes for at least 3 days per week (a total of 75 minutes) or 30 minutes of moderate activity for at least 5 days per week (a total of 150 minutes). One study that used IPAQ, their mean value was 19 minutes/day (SD=38) for vigorous activity, 56 minutes/day (SD=46) for moderate and 50 minutes/day (SD=47) for walking (Hagstromer, Ainsworth, Oja, & Sjostrom, 2010). Even though, 30 minutes of vigorous activity seems reasonable for a person to do, the cut off values were set higher to not underestimate any person’s activity that they reported. Also, since the participants had entered the same number in both days and hours, it was interpreted that they entered

weekly hours instead of daily hours.

Due to this limitation in this study, the frequency of days per week without the duration was also reported for all participants based on a previous study (Al-Hazzaa, 2007). Chi-square tests were calculated for adults (stratified by gender) with levels of activity (walking, moderate and vigorous activity) based on the number of days per week.

***Research Question #1b.*** *Do the levels of PA vary by age, gender, ethnicity and years living in US?*

Firstly, age and years of paid work were entered in the model as a continuous variable; gender as a dichotomous categorical variable; ethnicity, years living in the US, region, and occupation as categorical variables. To answer this question, logistic regression models were conducted with age, gender, ethnicity, and years living in the US regressed to levels of PA. Although the research question did not inquire about other response characteristics, logistic regression models were also conducted with geographic region, occupation, years of paid work in the US, and recruitment channel to assess any associations. Estimated unadjusted Odds Ratios were reported.

***Research Question #2.*** *What are the individual (e.g. intention, self efficacy, perceived barriers to PA and perceived benefits for PA), social (e.g. social support), and physical environment (e.g. availability of facilities.) factors that influence PA levels among South Asians residing in the US?*

To answer this question, a logistic regression analysis was conducted to determine which of the independent variables (individual, social and physical environmental factors) had a statistically significant effect on the dichotomous dependent variable

(sufficient PA or not) and estimated unadjusted Odds Ratios were reported. To assess if the influence of these variables on PA varied by gender, the analysis was then stratified by gender to report adjusted Odds Ratios. In this case, independent variables were adjusted for age, ethnicity, years living in the US, region, occupation, and years of paid work in US. Intention, self efficacy, perceived barriers to PA, perceived benefits for PA, social support, and availability of facilities were entered into the model as continuous variables.

**Qualitative Analysis.** The answers to the last four open-ended qualitative questions, the respondent ID and gender were imported into an excel spreadsheet from the SPSS data file.

***Research Question #1a. What levels and types of physical activity do South Asian adults residing in the US engage in?***

The second part of the question regarding types of PA that SAs engage in was answered through the qualitative open-ended questions. Due to the large number of responses, frequency count tables were created to organize the data to find out the most common answers for the open-ended qualitative questions (See Appendix H). These tables indicate the frequency for the top ten types of physical activities that US SAs engaged in and the activities they wanted to engage in, but were unable to.

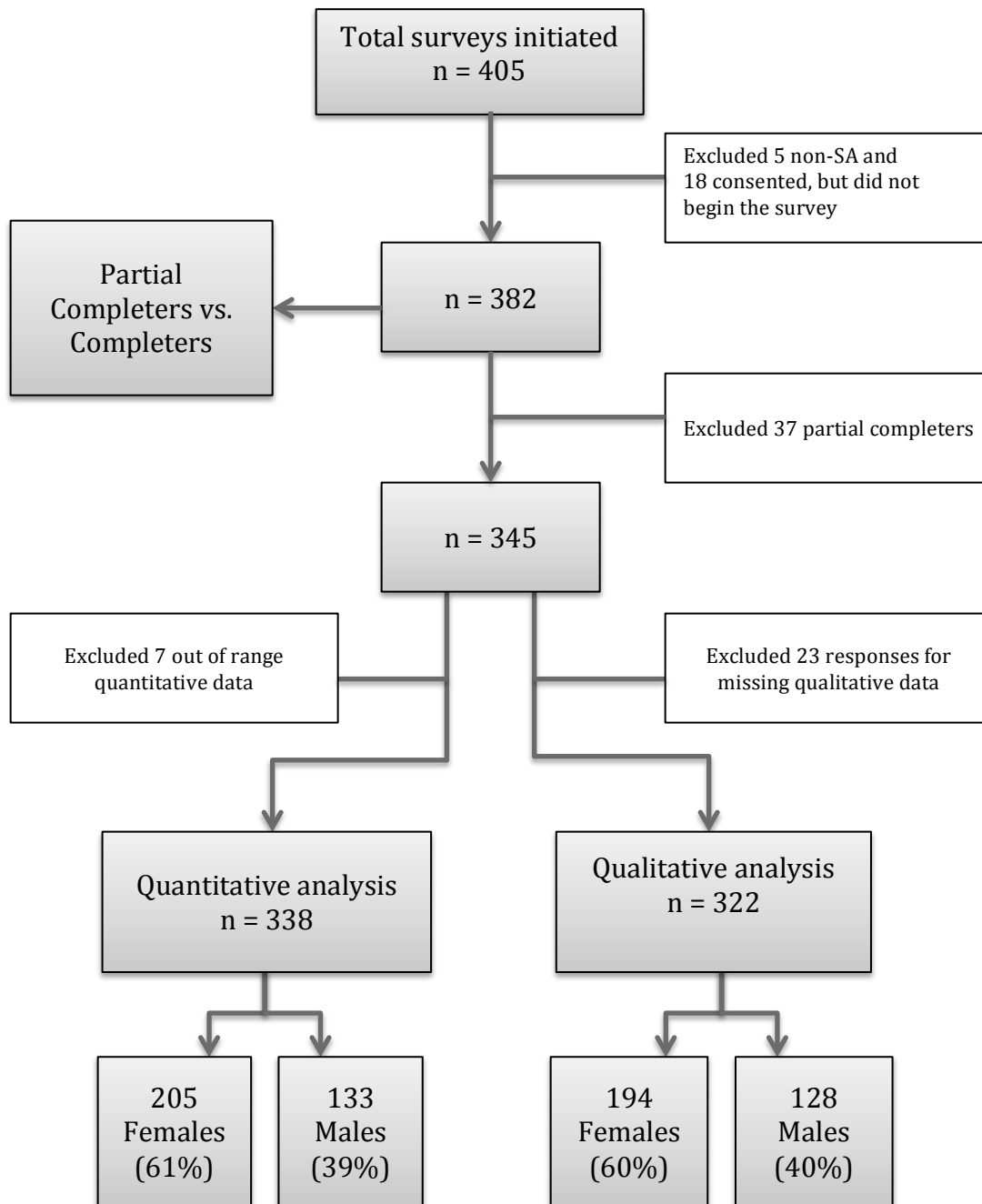
Through content analysis (Hsieh, & Shannon, 2005) of the participants' responses, these responses were grouped into categories and sub-categories based on similarity (semantic affinity). These categories were then grouped into individual, social

and environmental levels according to the Social Ecological Model. This qualitative analysis did not analyze these open-ended questions based on gender, age or other demographic characteristics. Selected quotes that captured the participants' insights and perceptions were also included in the results.

## **Chapter 4: Results**

A total of 405 people initiated the survey. Five participants were eliminated from the analyses because they were not of South Asian origin. Eighteen participants who electronically signed the consent form, but did not begin the survey were excluded from the analyses. Of the 382 remaining responses, the response characteristics of 37 partial completers (people who stopped at any point in answering the quantitative questions) were compared to 345 completers (people who completed the survey) (Figure 2). Using the chi-square test, the association between gender and completing the survey was statistically significant. The association showed that males were more likely to have incomplete surveys compared to females. The nonparametric Mann-Whitney U test showed that there was no difference in age between partial completers and completers (since the  $p > 0.05$ ). There was no statistically significant difference between different recruitment strategies, ethnicity, region, occupation or years living in the US and completing the survey. Findings from both the quantitative and qualitative analyses are presented below. After comparing the response characteristics of partial completers with completers, the 37 partial completers were excluded from the analysis.

**Figure 2: Flowchart of Participants for quantitative and qualitative analysis**



## FINDINGS FROM THE QUANTITATIVE ANALYSIS

Seven survey responses were excluded from the 345 completed surveys because the participant entered out of range numbers (e.g., When asked about the number of days they engaged in PA in the last seven days, these participants entered 10, 30, or 200 days). Therefore, a total of 338 respondents participated in the survey and were included in the quantitative statistical analysis (see Figure 2). The results that follow are from the first twenty quantitative questions from the survey (see Appendix A).

**Sample Characteristics.** Of these 338 participants, 205 (60.7%) were female and 133 (39.3%) were male. Participants ranged from the age 18 to 75 years, with a mean age of 32.9 (SD = 8.7) and median age of 31 years. Fifty-four percent were Pakistani, 41.5% were Indian, 2.4% were Bangladeshi, and 2.1% classified themselves as being “Other.” This category included four mixed nationalities (e.g., Indian and Pakistani), one Sri Lankan, and one Nepalese. Since there was a lower percentage of Bangladeshis in the study (8 people), Bangladeshis were categorized under the “Other” category. The majority of the participants were either US born SAs or were foreign born SAs living in the US for 10 years or more. Most of the participants had professional occupations with mean years of 8.1 years (SD= 7.2) of paid work in the US.

**Recruitment Channel.** One hundred and three (30.5%) participants heard about the survey through an email from a friend, relative or acquaintance, 84 (24.9%) through a text message from a friend, relative or acquaintance, and ninety-five (28.1%) through Social Media (Facebook). The quantitative results for the research questions of this study are as follows:

*Research Question#1*

- a. What levels and types of physical activity do South Asian adults residing in the US engage in?*
- b. Do the levels of PA vary by age, gender, ethnicity and years living in the US?*

**Physical Activity Levels.** Based on the operational definition of achieving a minimum of 840 MET minutes/week, 259 (76.6%) participants had achieved a sufficient amount of PA. Female participants and those participants of Pakistani ethnicity tended to engage in insufficient amounts of PA (Table 3).



<b>Table 3: Physical Activity by demographic variables of the study population</b>				
<b>Variables</b>	<b>Total Sample n=338 (100.0%)</b>	<b>Insufficient PA n=79 (23.4%)</b>	<b>Sufficient PA n=259 (76.6%)</b>	<b>p-value</b>
Gender, <i>n (%)</i>				
Female	205 (60.7)	50 (63.3)	155 (59.8)	0.602
Male	133 (39.3)	29 (36.7)	104 (40.2)	
Age, <i>mean (SD)</i> <i>Median [Q1-Q3]</i>	32.74 (9.8) 31.00 [26-36]	32.87 (8.7) 31.00 [28-35]	32.71 (10.1) 31.00 [25-37]	0.891
Region, <i>n (%)</i>				
Northeast	147 (43.5)	35 (44.3)	112 (43.2)	0.112
South	94 (27.8)	25 (31.6)	69 (26.6)	
Midwest	38 (11.2)	4 (5.1)	34 (13.1)	
West	58 (16.9)	14 (17.7)	44 (17.0)	
Ethnicity, <i>n (%)</i>				
Pakistani	182 (53.8)	54 (68.4)	128 (49.6)	<b>0.012</b>
Indian	140 (41.5)	23 (29.1)	118 (45.3)	
Others	15 (4.5)	2 (2.5)	13 (5.0)	
Years living in the US, <i>n (%)</i>				
US Born SA	129 (38.2)	28 (35.4)	101 (39.0)	0.844
Foreign Born SA >=10yrs	154 (45.6)	38 (48.1)	116 (44.8)	
Foreign Born SA 0-9 yrs	55 (16.3)	13 (16.5)	42 (16.2)	
Primary Occupation, <i>n (%)</i>				
Professional	204 (60.4)	54 (68.4)	150 (57.9)	0.353
Student	75 (22.2)	14 (17.7)	61 (23.6)	
Homemaker	26 (7.7)	6 (7.6)	20 (7.7)	
Others	33 (9.8)	5 (6.3)	28 (10.8)	
Years of Paid work in U.S, <i>mean (SD)</i>	8.05 (7.2)	9.06 (7.5)	7.75 (7.1)	0.164
Hear about the Survey, <i>n (%)</i>				
Social Media	95 (28.1)	19 (24.1)	76 (29.3)	0.340
Email from an organization	35 (10.4)	5 (6.3)	30 (11.6)	
Email/Text from a friend/acq.	187 (55.3)	49 (62.0)	138 (53.3)	
Others	21 (6.2)	15 (5.8)	6 (7.6)	
Intention, <i>mean (SD)</i>	5.95 (1.3)	5.19 (1.7)	6.18 (1.1)	<b>&lt;0.001</b>
Self-efficacy, <i>mean (SD)</i>	5.52 (1.4)	4.75 (1.8)	5.76 (1.2)	<b>&lt;0.001</b>
Perceived barriers to PA, <i>mean (SD)</i>	3.14 (1.1)	3.14 (0.9)	3.13 (1.2)	0.955
Perceived health benefits to PA, <i>mean (SD)</i>	6.29 (0.8)	6.09 (0.9)	6.35 (0.7)	<b>0.011</b>
Social Support, <i>mean (SD)</i>	4.78 (1.5)	4.91 (1.4)	4.74 (1.6)	0.389
Facility Availability, <i>mean (SD)</i>	3.03 (0.7)	2.97 (0.7)	3.05 (0.7)	0.400

In Table 4, the proportion of participants who engaged in walking, moderate- and vigorous-intensity physical activities, based on the number of days per week is presented. Slightly more females (9.3%) than males (8.3%) did not walk for at least 10 minutes at a time on any single day of the week. Slightly more females (41.2%) than males (35.3%) walked regularly every day. Moreover, the percent of males and females who did not participate in any type of moderate-intensity physical activity lasting for at least 10 min on any single day of the week was 33.1% and 32.2%, respectively. Regarding vigorous activity, slightly fewer males (22.7%) than females (31.7%) did not engage at all in vigorous physical activity for at least 10 minutes at a time.

<b>Table 4. Proportions (%) of SA adults who engaged in walking, moderate and vigorous PA at least 10 min at a time, based on the number of days per week</b>									
	<b>Walking<sup>1</sup></b>			<b>Moderate activity<sup>2</sup></b>			<b>Vigorous activity<sup>3</sup></b>		
# of days per week	All	Men	Women	All	Men	Women	All	Men	Women
0 days	8.9	8.3	9.3	32.5	33.1	32.2	28.2	22.7	31.7
1-3 days	16.9	20.3	14.7	40.2	40.6	40.0	39.8	42.4	38.0
4-6 days	35.3	36.1	34.8	18.9	19.5	18.5	28.8	31.8	26.8
7 days	38.9	35.3	41.2	8.3	6.8	9.3	3.3	3.0	3.4
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<sup>1</sup> Walking: $\chi^2=2.332$ ; p-value= 0.507 <sup>2</sup> Moderate: $\chi^2=0.680$ ; p-value= 0.887 <sup>3</sup> Vigorous: $\chi^2=3.414$ ; p-value= 0.334									

Table 5 summarizes the physical activity levels of the SA males and females residing in the US, based on the three activity categories: low, moderate, and high. Approximately 65% of SAs were moderately active, whereas 15% had low levels of PA and 19% had high levels of PA. Low levels of PA were slightly higher in females.

<b>Table 5. Physical Activity Levels of SA Adults</b>			
<b>Activity Category</b>	<b>All n=338 (100.0%)</b>	<b>Males n=133 (100.0%)</b>	<b>Females n=205 (100.0%)</b>
Low PA	52 (15.4)	17 (12.8)	35 (17.1)
Moderate PA	221 (65.4)	89 (66.9)	132 (64.4)
High PA	65 (19.2)	27 (20.3)	38 (18.5)
$\chi^2=1.175$ ; p-value= 0.562			

Table 6 shows that the odds for males was 1.157 times that for females to meet sufficient levels of PA, but the association between gender and physical activity was not statistically significant. The odds of Indians being physically active was 2.146 times that for Pakistanis and the association between these two ethnicities and physical activity was statistically significant. Age, regions in the US, years living in the US, primary occupation, years of paid work in the US were not statistically associated with levels of PA in this study.

*RQ 1b. Hypothesis i.*

*H<sub>0</sub> (null hypothesis): Men will not have higher levels of PA than women.*

*H<sub>A</sub> (alternative hypothesis): Men will have higher levels of PA than women*

As noted in Table 6, the *p*-value was greater than 0.05, the null hypothesis cannot be rejected. Based on this sample, the evidence is insufficient to conclude that PA levels of SA men and women were different.

*RQ 1b. Hypothesis ii.*

*H<sub>0</sub> (null hypothesis): Individuals with Indian origin will not have higher levels of PA than individuals with Pakistani and Bangladeshi origin.*

*H<sub>A</sub> (alternative hypothesis): Individuals with Indian origin will have higher levels of PA than individuals with Pakistani and Bangladeshi origin.*

Since there were only eight Bangladeshi participants, this hypothesis was not tested for Bangladeshis. As Table 6 displays, the  $p$ -value was less than 0.05, and therefore the null hypothesis was rejected. This sample of SAs provides evidence that Indians were engaging in higher levels of PA than Pakistanis.

<b>Table 6: Logistic Regression Analysis of demographic, individual, social and physical environmental variables and sufficient PA among SAs in US.</b>			
<b>Variables</b>	<b>Unadjusted Odds Ratio</b>	<b>95% Confidence Interval (CIs)</b>	<b>p-value</b>
Gender			
Female	Ref		
Male	1.157	0.687, 1.947	0.583
Age	0.998	0.973, 1.024	0.898
Region			
Northeast	Ref		
South	0.862	0.476, 1.563	0.626
Midwest	2.656	0.881, 8.007	0.083
West	0.982	0.482, 2.000	0.960
Ethnicity			
Pakistani	Ref		
Indian	2.146	1.240, 3.715	<b>0.006</b>
Others	2.742	0.598, 12.567	0.194
Generation			
US Born SA	Ref		
Foreign Born SA >=10 years	0.846	0.485, 1.476	0.556
Foreign Born SA 0-9 years	0.896	0.423, 1.896	0.773
Primary Occupation			
Professional	Ref		
Student	1.569	0.812, 3.031	0.181
Homemaker	1.200	0.458, 3.146	0.711
Others	2.016	0.741, 5.486	0.170
Years of Paid work in US	0.166	0.945, 1.010	0.166
Hear about the Survey			
Email from an organization	Ref		
Social Media	0.667	0.228, 1.947	0.458
Email/Text from a friend/relative/acquaintance	0.469	0.172, 1.278	0.139
Others	0.200	0.109, 1.590	0.200
Intention	1.697	1.398, 2.060	<b>&lt;0.001</b>
Self-efficacy	1.605	1.341, 1.921	<b>&lt;0.001</b>
Perceived barriers to PA	0.994	0.797, 1.241	0.961
Perceived health benefits to PA	1.477	1.085, 2.011	<b>0.013</b>
Social Support	0.929	0.787, 1.097	0.388
Facility Availability	1.164	0.818, 1.654	0.399

*Research Question #2. What are the individual (e.g. intention, self efficacy, perceived barriers to PA and perceived benefits for PA), social (e.g. social support), and physical environment (e.g. availability of facilities.) factors that influence PA levels among South Asians residing in the US?*

**Factors Associated with PA.** Table 3 displays the mean values of individual (intention, self-efficacy, perceived health benefits to PA and perceived barriers to PA), social (social support) and environmental (availability of facilities) factors for insufficient and sufficient PA. Table 6 displays the logistic regression results of intention, self-efficacy, perceived barriers to PA, perceived benefits of PA, social support, and availability of facilities on sufficient PA. Both these tables indicate that greater levels of intention, self-efficacy and perceived health benefits to be physically active were associated with higher odds of doing sufficient PA in the last seven days ( $p$ -values  $<0.05$ ). Perceived barriers to PA, social support and availability to facilities for PA were not associated with PA in this study.

As displayed below in Table 7, unadjusted and adjusted odds ratios were reported for the individual (intention, self-efficacy, perceived health benefits to PA and perceived barriers to PA), social (social support) and environmental (availability of facilities) factors, overall and stratified by gender. All of these factors were adjusted for age, ethnicity, years living in the US, region, occupation and years of paid work in the US. These results show that greater levels of intention were associated with higher odds of achieving sufficient PA in the last seven days for the total sample and for both genders. Self-efficacy and perceived health benefits to PA were also positively associated with sufficient PA for the total sample and women, but the association was not significant

among men. The unadjusted and adjusted odds ratios for perceived barriers to PA, social support and availability to facilities for PA suggested that they were not associated with PA in this study.

<b>Table 7: Unadjusted and Adjusted OR stratified by gender</b>						
	<b>Whole Sample</b>		<b>Men</b>		<b>Women</b>	
<b>Exposure Variables</b>	<b>Unadjusted OR (95% CI)</b>	<b>Adjusted OR (95%CI)+</b>	<b>Unadjusted OR (95% CI)</b>	<b>Adjusted OR (95%CI)+</b>	<b>Unadjusted OR (95% CI)</b>	<b>Adjusted OR (95%CI)+</b>
Intention	1.697* (1.398, 2.060)	1.728* (1.407, 2.121)	1.680* (1.234, 2.285)	1.636** (1.165, 2.296)	1.706* (1.328, 2.190)	1.743* (1.321, 2.298)
Self-efficacy	1.605* (1.341, 1.921)	1.582* (1.309, 1.911)	1.308 (0.989, 1.729)	1.257 (0.931, 1.697)	1.852* (1.447, 2.372)	1.896* (1.436, 2.503)
Perceived Barriers to PA	0.994 (0.797, 1.241)	0.993 (0.783, 1.261)	0.957 (0.681, 1.482)	1.005 (0.610, 1.654)	1.036 (0.788, 1.362)	1.059 (0.774, 1.447)
Perceived Health Benefits for PA	1.477* (1.085, 2.011)	1.417** (1.015, 1.980)	1.258 (0.796, 1.989)	1.335 (0.790, 2.255)	1.795** (1.158, 2.782)	1.848** (1.146, 2.980)
Social Support	0.929 (0.787, 1.097)	0.887 (0.743, 1.059)	0.779 (0.589, 1.030)	0.759 (0.558, 1.033)	1.048 (0.847, 1.297)	1.000 (0.792, 1.262)
Facility Availability	1.164 (0.818, 1.654)	1.049 (0.719, 1.530)	1.483 (0.803, 2.735)	1.228 (0.627, 2.407)	1.027 (0.668, 1.579)	0.904 (0.561, 1.456)
+ Adjusted for age, ethnicity, years living in the US, region, occupation, and years of paid work in US. * p<0.001 ** p<0.05						

## RQ 2. Hypothesis i.

*H<sub>0</sub> (null hypothesis):* Lack of women only facilities or activities will not be a barrier to South Asian women's physical activity practices.

*H<sub>A</sub> (alternative hypothesis):* Lack of women only facilities or activities will be a barrier to South Asian women's physical activity practices.

Lack of women only facilities was one of the items used to test for the perceived barriers to PA. When this item was analyzed for women, it was not significantly associated with the sufficient levels of PA. Results from the logistic regression analysis revealed an OR of 0.984 and 95% CI: 0.852, 1.137 with a *p*-value of 0.827. Since the *p*-value was greater

than 0.05, the null hypothesis cannot be rejected. Based on this sample, the evidence is insufficient to conclude that lack of women only facilities or activities will be a barrier to South Asian women's physical activity practices.

*RQ 2. Hypothesis ii*

*H<sub>0</sub> (null hypothesis):* Lack of PA arranged through and/or at religious and community centers will not be a barrier to South Asian's physical activity practices.

*H<sub>A</sub> (alternative hypothesis):* Lack of PA arranged through and/or at religious and community centers will be a barrier to South Asian's physical activity practices.

Lack of PA arranged through and/or at religious and community centers was another item used to test for the perceived barriers to PA. When this item was analyzed for all participants, it was not significantly associated with the sufficient levels of PA. Results from the logistic regression analysis revealed an OR of 0.975 and 95% CI: 0.862, 1.103 with a *p*-value of 0.686. As the *p*-value was greater than 0.05, the null hypothesis cannot be rejected. Based on this sample, the evidence is insufficient to conclude that lack of PA arranged through and/or at religious and community centers will be a barrier to South Asian's physical activity practices.

## **FINDINGS FROM THE QUALITATIVE ANALYSIS**

Among the 345 completed survey responses, twenty-three survey responses were excluded from the qualitative analysis because these participants left the open-ended questions empty. Therefore, a total of 322 survey responses were included in the qualitative analysis (see Figure 2). The following results are derived from the last four open-ended questions in the survey - questions 21 through 24 (Appendix A) and are



linked to Research Question 1a: *What levels and types of physical activity do South Asian adults residing in the US engage in?*

**Types of PA.** To assess the most frequent types of physical activities that US SAs engaged in, and the activities they wanted to engage in, but were unable to, frequency tables were created (Appendix H). When participants were asked about the types of activity they engaged in at least once per month, the majority of the participants stated running, walking, yoga, sports (e.g., tennis, soccer, and cricket), cycling, weights, dancing (Zumba), and/or Pilates. Some of the other less common activities were hiking, swimming, rowing, boxing or yard work. On the other hand, when asked about the activities they wanted to engage in, but were unable to, the most common activities stated were swimming, yoga, cycling, running, sports, weight training, and/or dance (Zumba).

When asked what helped or prevented the participants from engaging in the above-mentioned activities, a number of facilitators (such as improved health) and barriers (such as lack of time) to PA were identified. In addition, the participants were asked what in their community could be done or changed that would be most helpful in increasing their PA levels. Through content analysis of the participant responses, these three factors, that include facilitators to PA, barriers to PA, and community needs to increase PA were grouped into categories and sub-categories based on similarity. These categories were then classified according to the levels of Social Ecological Model (Table 8).

<b>Table 8: Classification of Facilitators to PA, Barriers to PA and Community Needs for PA using the Social Ecological Model.</b>		
	<b>Social Ecological Model</b>	<b>Categories</b>
<b>Facilitators to PA</b>	Individual Level	<ul style="list-style-type: none"> <li>• Improved Health</li> </ul>
	Social Level	<ul style="list-style-type: none"> <li>• Social and Cultural Support</li> </ul>
	Environmental Level	<ul style="list-style-type: none"> <li>• Environmental Support</li> </ul>
<b>Barriers to PA</b>	Individual Level	<ul style="list-style-type: none"> <li>• Time Availability</li> <li>• Unfamiliarity</li> <li>• Physical Limitations</li> </ul>
	Social Level	<ul style="list-style-type: none"> <li>• Lack of Social and Cultural Support</li> </ul>
	Environmental Level	<ul style="list-style-type: none"> <li>• Lack of Facilities</li> </ul>
		<ul style="list-style-type: none"> <li>• Cost</li> <li>• Weather Challenges</li> </ul>
<b>Community Needs</b>	Individual Level	<ul style="list-style-type: none"> <li>• Awareness</li> </ul>
	Social Level	<ul style="list-style-type: none"> <li>• The Need for Intervention</li> </ul>
	Environmental Level	<ul style="list-style-type: none"> <li>• Culturally Sensitive and Gender Specific PA Facilities</li> <li>• Availability of locations for PA</li> <li>• Affordable and Accessible PA Facilities</li> </ul>

### **Facilitators to PA**

***Improved Health.*** At the individual level of the social ecological model, the main category for facilitators to PA was to achieve improved health. This category was divided into two subcategories - i.e., physical health and mental (emotional) health. For improved physical health, participants mentioned that they participated in PA to lose or maintain weight, burn calories, and increase metabolism. One of the participants mentioned that they engaged in walking “to reduce the diabetic effect.” For some people, PA was used as a means to help with their digestion. Other common reasons to engage in PA were to stay

fit, build stamina and strength. These aspects show that the people who participated in PA were aware of the physical health benefits. The other subcategory was improved mental and emotional health. Many participants expressed that they felt good after a particular exercise. For example, one participant mentioned engaging in running because “it feels amazing afterwards.” Some participants mentioned yoga because it was relaxing. Many participants believed that exercise helped them to relieve stress and feel “fresh” afterwards. Another key motivator to PA for many participants was the enjoyment aspect, especially enjoyment from participating in sports.

***Social and Cultural Support.*** At the social level of the social ecological model, the reason why some participants engaged in PA was to spend time with their friends (especially while playing sports), and their partner. For some, it was running or walking in the park with their children. As one person said, “...like to do it with someone, it motivates me to have a friend join me.” This shows that their social network potentially motivated them to engage in PA. When asked about whom they do these activities with, many people answered their spouse, family, friends, kids, coworker or personal trainer. One female participant mentioned that she engaged in dancing because of religious reasons. This shows that this particular cultural and religious aspect helped them be physically active.

***Environmental Support.*** Many participants were able to be physically active because they had access to a nearby gym, and/or an affordable gym. Some said they walked or rode a bicycle to work. A few of them said that they lived in the city where they had to walk to get to places. Therefore, at the environmental level of the social

ecological model, availability of facilities or living in an environment that supports walking helped them to be physically active.

## **Barriers to PA**

***Time availability.*** At the individual level, the most common barrier to PA for a majority of the participants was lack of time. Many participants mentioned that due to long work hours and other work commitments, they were unable to take part in activities that they were interested in engaging. Another barrier was the time commitment involved in learning a new physical activity (e.g., martial arts). Lack of discipline and/or time management were obstacles few participants noted as barriers to engaging in PA.

***Obligation towards Family.*** Family obligations were a subcategory for time availability. Many female participants mentioned lack of time as a barrier due to marriage, children, and household responsibilities. One female participant said:

“I’m a full time professional with demanding work hours and two young kids at home. A large portion of childcare and household responsibilities fall on me so I don’t feel like I can sacrifice my kids’ needs for my own need to stay in shape. I need every our (*hour*) that we pay our nanny to be able to get to work so it doesn’t leave time during the day to exercise. Time is really the only barrier.”

Similarly, many other women mentioned that taking care of their children and household work does not leave enough time for them to participate in PA.

***Unfamiliarity.*** Another category at the individual level of the social ecological model was unfamiliarity. For example, a male participant mentioned being unfamiliar with PA due to the absence of culture around exercise:

“Many forms of physical fitness popular in the United States are unfamiliar to me because I did not grow up partaking in them. My parents never knew these activities personally and there was not a strong culture of health around fitness growing up.”

This unfamiliarity was also due to lack of awareness, lack of experience, lack of skills and a lack of guidance. Another male participant stated, “I feel like I have a total lack of skill and no sense of direction in the gym, nor a sense of planning. ...not really sure where to start, same goes for my diet.” Some participants were uncomfortable, self-conscious, intimidated, and felt “fear of judgment from previous experiences” or a fear of injury with certain types of PA. One female participant noted, “Need instruction on how to properly lift weights; little intimidated about [P]ilates.”

***Physical Limitations.*** Some of the participants mentioned being unable to engage in PA due to knee, back, or heel pain. Lacking stamina or fitness to participate in PA were also noted as being physical limitations to engaging in PA. One female participant stated, “engaging in physical activity will make [me] tired and unable to be as productive for the rest of the day.”

***Lack of social and cultural support.*** At the social level, lack of social and behavioral support was a barrier to PA for some individuals. Participants mentioned, “lack of company” (especially for sports) and a “lack of partner” prevented them from engaging in some of the activities. One person stated, “Afraid to do classes alone. Need a friend that has a flexible work schedule like me and that lives close by and is interested in coming along.” One female participant stated, “stress at home” as a social environmental barrier to participating in PA.

One female participant stated, “...religious preference making the uniforms inappropriate to wear” especially for swimming. Another participant mentioned, “being Muslim [I] would prefer to have a female only facility.” This shows that having certain religious beliefs was a barrier for some women who wanted to participate in PA.

### ***Lack of facilities***

*Lack of facilities, in general.* At the environmental level, lack of facilities was identified as a barrier to PA for this population. People mentioned not having a convenient space or a nearby facility. One male participant stated that he is unable to play sports as “there aren't any fields/courts close enough where I can go to.”

*Lack of gender specific and culturally sensitive facilities.* Many women expressed that the reason they could not engage in physical activities, especially swimming and yoga, was due to lack of “female only spaces” for exercising and “it is hard and sometimes uncomfortable to go to a local gym/community gym to swim in a covered way.” They also expressed that they preferred same gender instructors. One female participant stated,

“Tai-Chi: I started this activity at a local center and although I could get a female trainer, the bulk of the training and practice came from group classes and the majority of individuals in these group classes were men. I tried to get a female friend to come [come] with me as some of these activities can be very close and involve touching but was unsuccessful. I felt like without really being involved in the group classes it was not worth the amount I was paying.”

Privacy and gender-specific spaces were important barriers to participating in PA for some women.

***Cost.*** Several participants mentioned that the exercise classes they wanted to engage in, and the gym memberships were expensive and not affordable. One female participant noted that she would like to engage in yoga or spinning but “Some of the classes are too expensive.”

***Weather challenges.*** For a few participants, inclement weather was a barrier to PA. For example, a participant mentioned that they cannot engage in swimming because, “During the winter season, the pool is closed.”

## Community Needs

***Awareness.*** One of the most common answers for community needs was awareness of and education about PA. First, participants wanted education on the importance of physical activity, and to be more aware of the health benefits of PA. The other aspect was the education on the guidelines about PA. One male participant stated,

“Community culture needs to shift/change - wont be able to change individual attitudes AND SUSTAIN changes without shifting community norms. Also education of what vigorous physical activity means - most people's perception of ‘exercise’ is incorrect in tems [terms] of what may garner health benefits.”

A female participant stated, “Give education to a men [to men] that they have to give permission to their wife's.” Some people emphasized the importance of awareness among women and educating children about the benefits of PA by starting at a younger age. A few participants indicated the need to educate older age groups as well, “Changing mindset (it is not okay to not be able to walk a few blocks if you are >50 yrs old). Decreasing fear of injury by haing [having] access to proper age-appropriate exercise routines.”

People also talked about the need for encouragement and excitement to emphasize the importance of PA in a “more compelling way.” In addition, one female participant stated, “More awareness and inclusive atmosphere for people who aren't athletic or shy about engaging in physical activities.” They also shared the need for instructors guiding them about appropriate exercises for them, and for role models in their own community, highlighting the significance of physical activity. As one male participant noted, “I think even though there are many doctors and other health professionals in our community and I think they need to put a bigger emphasis on physical health and activity.” People also

shared, that their South Asian family and friends did not give much importance to PA, like their non-SA friends and coworkers did. Furthermore, a female participant stated:

“I think seeing stats on how much your body needs exercise and what particular exercises are helpful to health in South Asians [Asians] would also help the community. Many times just seeing white people in ads for these can make someone easily brush it off since they don't relate.”

This indicated the need for physical activity awareness initiatives that are more inclusive and relatable to this community.

***The Need for PA Intervention.*** Many people mentioned the need for PA programs arranged by leaders of their community and/or religious centers, as these locations would make the participants feel more comfortable with exercising. They expressed their desire for having basic beginner classes, so members can become familiar with exercise. They also shared that community-sponsored events such as marathons, cycling, Zumba classes should be arranged. Further, they emphasized to involve the entire family in PA by hosting “more family fun runs (5K, 10K) for the community.”

People also talked about the need for arranging group activities such as creating social groups for walking, biking and hiking together, and starting sports leagues for men and women of all ages. One woman stated, “I'd like to see more people my age get engaged -- that will automatically interest me -- most programs seem to be for kids. Have short [short] classes - half hour or one hour, once a week. Send me frequent flyers about them/send emails.” Another female participant shared her view by stating:

“I think in general South Asians are not as physically active as they should be, so having group activities or fun events (cricket, park outings, etc) is a way to encourage families to have gatherings. Instead of only having community dinner events, it would [would] be cool to have 5K walks/runs, and other outdoor activities, but ultimately it always ends up being up to individuals to do more.”



A male participant expressed his thoughts by stating, "...translators must be provided or those who are fluent in South Asian languages must be guiding and organizing [organizing] [these] activities." One female participant suggested the idea of using social media to arrange activities, "People could plan a hike together, by making a group on any social media and plan a special activity each week. We could also collect funds and have fitness classes at the center at flexible hours."

***Culturally Sensitive and Gender Specific Physical Activity Facilities.*** Many women expressed the need for gender appropriate facilities. For example, one female participant stated, "If we had gender-segregated community events that centered solely on physical activity, I think we could actually get a lot more people involved. Yoga classes, aerobics, etc. Maybe also separated by age groups." Another female participant noted, "Having all female gym facilities would be helpful because being in the Islamic hijab gear while working out is not comfortable. It is also uncomfortable doing many workouts (i.e., squats) while males are around." Some male participants highlighted the same issue, "Women in my community in particular do not have safe spaces in which to engage in single-sex physical activity." They also suggested that there is a need to provide gender-segregated pools, gyms, yoga classes, fitness classes and organized sports.

***Availability of locations for physical activity.*** Many participants expressed the need for more public spaces, such as parks, sidewalks, biking trails and walking trails to increase physical activity. In addition, they talked about having more tennis courts, and more area fields to play sports. A female participant commented on the community she lives in by saying, "...update and clean up the parks in our area so they could be used

more frequently.” Further, the participants expressed to have indoor facilities where they could engage in PA in the winter months, during the months when temperatures are higher, and during pollen season.

Some people suggested the need for gyms at their religious centers, “Have a gym located in the Church or Mosque you belong to so you can be active in services & [in the] gym.” One female participant stated,

“I think mosques and the Muslim communities should invest resources into purchasing or creating a Muslim friendly gym or female friendly gym that is affordable. I think it should be an institution just like the mosque is because it promotes community building [building] and health which is very much needed. At a smaller scale there are groups here that have networked with the Boys and Girls club to allow women only swim hours but it is so impacted and hard to get a spot bc [because] there is such a high demand.”

Another female participant remarked, “I think providing physical activity options where they're [there] is a day care, playground, option for children to engage in the activity would help increase physical activity levels among people with children.” Other female participants shared this viewpoint of having daycares at facilities to help be more physically active.

***Affordable and Accessible Physical Activity Facilities.*** Many participants voiced the need for more affordable PA classes and accessible facilities to become active. One participant noted, “Because I come from a low-income community, people do not have the resources to participate in many physical activities...Initiaties [initiatives] like those going on in Toronto public housing should be replicated in the United States.” Many participants expressed the need for free or low cost training sessions, exercise classes, gym memberships, and swimming pools. They also mentioned gyms and pools having

flexible hours (e.g., facilities open after work hours and for 24 hours) and being open all year round.

## **Chapter 5: Discussion**

### **SUMMARY AND IMPLICATIONS OF CENTRAL FINDINGS**

This study explored the feasibility of conducting an online survey that examined the physical activity (PA) patterns and associated factors among South Asians (SAs) living in the US. The online survey was live from March 8, 2016 till March 28, 2016 and 405 people responded. This indicates that online surveys can be a promising tool for data collection from this population. Among the different recruitment strategies used, emails and text messages from someone the SAs knew and social media were the most popular. This can be explained by the widespread usage of electronic devices – e.g., smartphones, tablets and laptops – making access to the survey convenient. That is, the survey was accessible from anywhere and at any time.

Approximately 60% of the participants were female and completed the survey; while male participants were more likely to have incomplete surveys. The results showed that being of a certain ethnic background, intention, self-efficacy, and perceived health benefits to PA were associated with PA. The qualitative results showed that the most common facilitator to PA was achieving improved physical and emotional health. The barriers to PA highlighted lack of time for PA, unfamiliarity of exercise, and lack of culturally sensitive and gender specific facilities. Moreover, when asked about their community needs, many participants wanted increased awareness of PA and PA educational programs arranged through their community centers and religious institutions.

As noted, more females than males, and younger participants with a mean age of 32.9 years completed the survey. These findings are similar to a previous study among

SA Americans in Washington, DC metropolitan area, that showed slightly more females and a younger age group (mean= 34 years) completed an online health needs survey (Vyas et al., 2013). This indicates a shift from past research where online surveys recruited more male respondents than female ones (Evans & Mathur, 2005). The majority of participants in this online survey reported here were of Indian and Pakistani descent, which represents 93% of the SA population in the US. However, this study was unable to recruit sufficient individuals with Bangladeshi ethnicity. Among SAs, Bangladeshis have the highest rates of limited English proficiency (with 1 in every 2) and live in linguistically isolated households (with 1 in every 3) (SAALT, 2007). Since this survey was only available in English, this could possibly explain the lower participation by Bangladeshi individuals. Another factor could be the lack of contacts the Principal Investigator had with the Bangladeshi community. In addition, most participants who completed the survey were either professionals or students. South Asians who work for lower wages in popular occupations such as cashiers, taxi-drivers, and restaurant workers did not complete the survey (SAALT, 2007). Moreover, this study was a convenience sample of young, female, professionals/students who were proficient in English. These participants may not be representative of the general population of SAs, which limits this study's generalizability.

The results reported here showed that almost three quarters of the participants met the requirements for achieving sufficient levels of PA and nearly a quarter of them had insufficient levels of PA. Yet, before concluding that a large majority of this sample was meeting sufficient levels of PA, few considerations must be made. The questionnaire used for this study, International Physical Activity Questionnaire, assesses PA taking

place in all domains of daily life including leisure time PA, domestic activities, work-related PA and transport-related PA. This results in higher median MET-mins than would have been estimated from leisure time participation alone. Since the public health recommendations of physical activity are based on leisure time PA, the IPAQ developers state that using this questionnaire will indicate that most adults in a population will achieve these recommendations (IPAQ, 2005). Therefore, IPAQ recommends categorizing PA levels into three categories of low, moderate and high. In this study levels of PA were not categorized into these three levels, since the aim was to assess the influence of associated factors on two outcome variables, sufficient and insufficient. Consequently, the Principal Investigator could not conclude how many participants from this study were achieving the minimum levels of recommended PA provided by the Public Health guidelines (HHS, 2008; WHO, 2010).

This study examined if gender, age, ethnicity and years living in US impacted the levels of PA among SAs. Results indicate that demographic variables such as gender and age were not significantly associated with PA. SA women did not have significantly lower levels of PA than men. This is dissimilar to previous research examining PA patterns among SAs, where it was found that SA women had lower levels of PA compared to SA men (Babakus & Thompson, 2012; Fischbacher et al., 2004) and older SAs reported lower levels of PA (Fischbacher et al., 2004). The absence of an association between age and PA could be due to the lack of older aged participants and the mean age of participants being 32.9 years indicating a younger age group who completed this online survey. Moreover, the research reported here found that individuals with Indian ethnicity were engaging in higher levels of PA than individuals with Pakistani ethnicity,

which was similar to what Fischbacher and colleagues (2004) noted. Most recently, Bhatnagar and Foster (2015) and Daniel et al. (2013) found that SAs that are more acculturated in Britain and the US had higher levels of PA. Acculturation in this study was measured by the number of years living in the US, but these findings from this research could not confirm this, as most of the respondents were either US born or foreign born and had lived in the US for more than 10 years.

The influence of individual, social and physical environmental factors on PA levels was another area this study examined. Intention to increase PA, self-efficacy, and perceived health benefits to PA were positively associated with PA participation among this population. These findings were similar to previous studies among Canadian adults (Pan et al., 2009) and young Malaysian adults (Sreeramareddy et al., 2012); where intention, self-efficacy, and perceived health benefits were positively associated with PA. The strongest factor that influenced PA in the research reported here was intention regardless of gender, age, ethnicity, years living in the US, region, occupation, or years of paid work in the US. This shows the importance of intention to increase PA levels. In addition, there was a positive association between self-efficacy and perceived health benefits with PA participation among the female participants, but not among male participants. Since self-efficacy measures confidence in one's own ability, it is an important factor that influences PA.

Bélanger-Gravel and Godin (2010) state that when people are more aware and motivated, they would have higher intentions to be physically active, which could lead to higher levels of PA. Qualitatively, a majority of the participants from the research

reported here emphasized the need for awareness about PA and its importance with regard to health benefits. As one participant stated,

“Stressing the importance of health in young children as well as older generations. I believe getting them to try it first is the biggest obstacle, but once they form a habit they will realize how beneficial it is and how great their bodies will feel. We need [need] to create more awareness and strive for inclusion in different facilities.”

Similarly, many other participants thought they needed guidance and wanted to have beginner classes for all ages at their community centers so they could become familiar with certain exercises and exercise equipment. As such, if people are comfortable exercising in certain locations, their confidence may increase along with a higher self-efficacy to do so, which can lead to increased levels of PA.

There was no association between perceived barriers of PA participation, which is dissimilar to what Pan and colleagues’ Canadian study (2009) found; where perceived barriers were related to PA especially among women and younger people. Responses to the open-ended survey questions of this research reported here, however, did reveal participants’ barriers to PA. Lack of time was a common barrier noted by female participants, social rules and cultural expectations were a contributing factor. These social and cultural norms included responsibility towards their children, husband, marriage or household. As one woman noted,

“I’m a full time professional with demanding work hours and two young kids at home. A large portion of childcare and household responsibilities fall on me so I don’t feel like I can sacrifice my kids’ needs for my own need to stay in shape...Time is really the only barrier.”

In another study among SA women who resided in Canada, many of the women thought that it would be selfish for them to take care of their own health before taking care of their family (Choudhry et al., 2002). Therefore, there should be a focus on how PA



improves their family's health as opposed to just their individual health and could be a more effective way to encourage this segment of the population to engage in PA without feeling selfish in doing so (Juarbe, Turok, & Pérez-Stable, 2002; Lawton et al., 2006). A potentially effective way to increase SA women's engagement in PA would be to have PA interventions that involve their children and husbands. This would provide these women with social support and motivation to take part in PA. In addition, work places that provide on-site gyms and facilities that provide daycare could also help eliminate these challenges faced by women.

Pan and associates (2009) and Sreeramareddy and colleagues (2012) also found that availability of facilities was associated with PA participation among the Canadian and Malaysian population, but the results reported here did not find any significant association. The survey only assessed availability of facilities, whereas convenient, accessible and safe facilities for PA might be more strongly associated with PA than availability as noted by Huston, Evenson, Bors, and Gizlice (2003). As such, people will not be able to use available facilities if they are inconvenient, very costly, and not safe. For example, one participant stated, "The biggest issues facing the community are a lack of affordable or free, safe facilities that promote physical activity and health/well being."

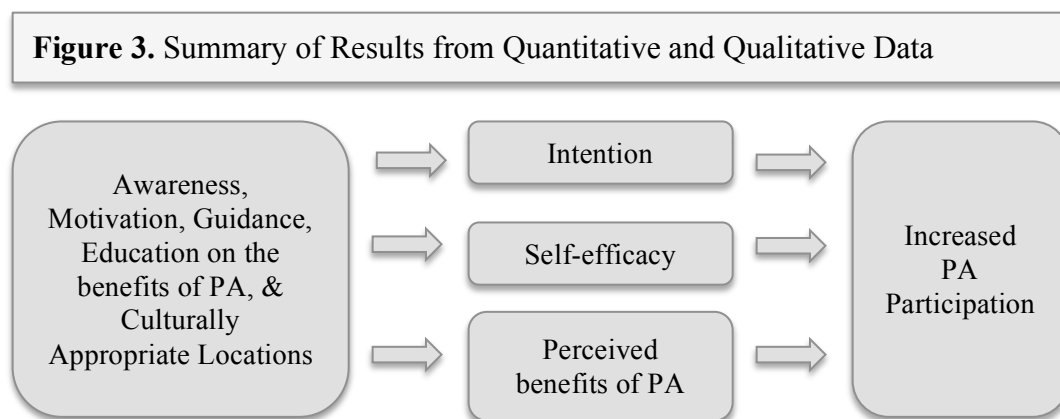
In addition, many women expressed that they were not able to engage in PA due to lack of female-only exercise facilities. A preference for female-only facilities is driven by cultural norms and religious beliefs related to modesty, clothing and the segregation of men and women. This finding is similar to a previous qualitative study by Lawton and colleagues (2006) among Pakistani and Indian women in the United Kingdom; where several women indicated that lack of women-only facilities, and female instructors

prevented them from engaging in PA. Similarly, Dave and colleagues' (2015) Chicago, Illinois study explored SA women's perspective on PA during different life stages using focus groups. They found that most Muslim SA women and some non-Muslim SA women preferred to exercise in women-only facilities. The study reported here did not specifically ask participants about their religion. However, some participants did explicitly self-identify as Muslim and further stated that they preferred women-only facilities and female instructors. The study also indicated that women with Indian ethnicity were more physically active than Pakistani women. Since the vast majority of Pakistanis are Muslims, it could be possible that Pakistani Muslim women face unique barriers due to their religious beliefs compared to non-Muslim Indian women. Research conducted in the United Kingdom showed that by organizing women-only time at public exercise facilities (including swimming pools), SA Muslim women engaged in higher levels of PA (Carroll, Ali, & Azam, 2002). Therefore, in addition to increasing awareness about PA and its health benefits among this population, arrangement of women-only classes and facilities could increase PA participation among these women.

It has been recommended by previous studies by Daniel & Wilbur (2011) and Eyler and colleagues (2002) that future research regarding PA conducted with SAs should evaluate modifiable factors, such as psychological, interpersonal, environmental factors and this recommendation was addressed in the study reported here. To the best of the Principal Investigator's knowledge, this is the first study measuring and assessing the individual, social and physical environmental factors that are associated with PA participation among SAs using the Social Ecological Model. At the intrapersonal level of the model, intention, self-efficacy and perceived health benefits to PA were associated

with PA. However, at the social and physical environmental level, social support and availability of facilities were not associated to PA. These results slightly align with previous findings by Giles-Corti and Donovan (2002) who analyzed the intrapersonal, social, and physical environmental variables with exercise and found that associations were strongest for individual variables and weakest for physical environmental variables. Although the quantitative results did not find these associations, but our qualitative data indicated that at the social environmental level, people wanted detailed guidance on the types of PA and community awareness programs to educate and motivate them on the importance of PA. At the physical environmental level, SA women expressed the lack of culturally sensitive facilities to engage in PA. Furthermore, at the policy level, use of appealing language and images to address barriers that are unique to this population should be addressed.

Figure 3 summarizes the results from the quantitative and qualitative data acquired from this study. It concludes that by providing awareness, motivation and culturally appropriate locations to SA adults in the US is needed to increase their PA levels. This, in addition, may increase their intention, self-efficacy and the perceived health benefits to PA, which were associated with higher levels of PA in this study.



## LIMITATIONS

This research is not without limitations. The study was cross-sectional, conducted with a convenience sample of SAs, and causal inferences cannot be made. These findings are simply descriptive. Furthermore, results from this study were self-reported; where respondents could potentially over-estimate their PA levels due to social desirability; the tendency to provide responses that are viewed as being more favorable to others instead of choosing their true responses (Grimm, 2010). This study also noticed the participants' misunderstood the questions related to the duration of physical activity: "How much time in total did you usually spend on one of those days doing vigorous physical activities?" Many participants misunderstood the question assuming that it was asking about number of hours per week instead of hours per day. According to the Guidelines for Data Processing and Analysis of the IPAQ – Short and Long Forms (2005), it was recommended that in some cases duration (time) will be reported as weekly (not daily) and should be converted to daily time. As such, these results should be interpreted with caution.

The survey was only conducted in English and SAs who were not English proficient were excluded from the study. This group of SAs could be at a higher risk for physical inactivity, but this information could not be ascertained. The nature of this online survey suggests that individuals with no Internet access or lacking proficiency with technology (especially older age groups) could not participate in this research. Therefore, this study was unable to examine variation in PA levels across different age groups.

The vast majority of participants in this study were of Indian and or Pakistani descent. Individuals of Bangladeshi descent were notably in the minority. While efforts were made to reach out to Bangladeshi organizations, contacts, and groups on social media, we were unable to collect a substantial number of members from this ethnic group. Moreover, this study did not measure and analyze marital status, number of children, income level, education level, self-rated health, religion and additional factors around acculturation (immigration status, language spoken at home) that could be associated with PA levels. Despite these limitations, this study offers important insights about the needs and challenges faced by US SAs and propose future efforts to help increase PA participation among this population.

#### **DIRECTIONS FOR FUTURE RESEARCH AND INTERVENTION**

Although an online survey proved to be a useful tool in collecting data from the SA community, future research should include surveys that are completed using paper and pencil, and are conducted via the telephone based surveys in combination with online surveys to obtain data from broader populations of SAs. In addition, these surveys should be translated into SA languages to ensure coverage of the non-English speaking population. It would be prudent if the developers of the International Physical Activity Questionnaire would either reword the question about the daily duration of PA or emphasize specifically what the terms “daily duration of PA” mean to ensure participants interpret the questions correctly. Since self-reported surveys suffer from reporting bias due to the social desirability bias and the cognitive challenge associated with recalling the frequency and duration of PA (Sallis & Saelens, 2000), objective measures of PA using activity trackers could be more effective in collecting accurate PA levels. Future research

should collect qualitative data through focus groups and in-depth interviews regarding PA among SAs living in areas with the largest SA populations such as New York, California, New Jersey, Texas and Illinois (SAALT & AAF, 2012). Further exploration should be conducted to assess the needs of this community by ethnicity, religion, gender, socioeconomic status and age groups.

Findings from this study can be shared with SA community centers and religious organizations to guide them in developing culturally tailored physical activity interventions. Detailed guidance on the type, frequency and duration of activities to achieve health benefits should be addressed in future interventions. Leaders and role models (e.g., Imams) from communities could be of valuable assistance in disseminating these messages. These interventions should also focus on group-based activities that would involve children and families. Although, awareness and education are very important, providing access to culturally appropriate locations and arranging programs that are more suitable for this population is also essential. Efforts must be made to have community centers, especially religious institutions' involvement to increase PA levels in this population. This is important because PA intervention developed through community involvement will take into account SA values and religious and cultural norms.

Encouraging SA community leaders especially from Muslim institutions to work with local recreational centers to have women-only swimming pool hours may be a good next step. In some locations, such resources may already be available in which case raising awareness in the SA community is important. Lastly, encouraging SA communities to invest in their own recreational centers; where SA religious and cultural norms are taken into account would ultimately encourage higher levels of PA in these communities.

## CONCLUSIONS

This study assessed the feasibility of conducting online surveys regarding the physical activity practices and its associated factors among South Asians living in the US. The results from this study showed that online surveys can be a promising tool for data collection among SAs. Health promotion programs should include education on the benefits of PA, offer guidance to boost PA, and provide culturally sensitive facilities that support PA, especially for SA women.

This research is unique since it is the first study, to the Principal Investigator's knowledge, that measures and assesses the individual, social and physical environmental factors that impact PA participation among SAs using the Social Ecological Model. This study not only conducted quantitative analysis of the questions, but also explored SAs perspectives on PA through the qualitative analysis of information provided in the survey's open text boxes. The Principal Investigator of this research intends on sharing the findings from this research with the South Asian Public Health Association and other SA community and religious organizations that she is familiar with and who have expressed interest. This can create awareness to help increase PA among SAs living in the US, which in turn can lead to improved health, fitness, and quality of life; thus, reducing the deleterious impact physical inactivity has on health.

## Chapter 6: Appendices

### APPENDIX A: Questionnaire to Measure Physical Activity Patterns and Associated Factors Among South Asians living in US.

To review my online survey, click on this Anonymous Survey Link:

[https://umdsurvey.umd.edu/SE/?SID=SV\\_9nLdpLIEKLSZ15j](https://umdsurvey.umd.edu/SE/?SID=SV_9nLdpLIEKLSZ15j)

You can copy this link, then paste it into an email or website.

This online survey was imported into a word document as shown below:

#### Consent Page

Project Title: The Feasibility of Conducting an Online Survey regarding Physical Activity Patterns among South Asian Adults Residing in the United States.

Purpose of the Study: This research is being conducted by Syeda Rabab Haider, MPH student under the guidance of Dr. James Butler III, at the University of Maryland, College Park. We are inviting you to participate in this research project because you are a South Asian adult, ages 18 years and above, able to read and understand English, and who resides in the United States. The purpose of this research study is to examine the physical activity patterns among South Asian adults residing in the United States.

Procedures: The procedures involve:

- Having you agree to participate in the survey – the informed consent process.
- Once you agree to participate, you will be asked 25 questions about your demographic information (e.g., ethnic background, age, gender, etc.), time you spend being physically active, and any factors which may have an impact on the physical activities you may or may not engage in.
- This is an online survey and you can participate in it either on a computer, tablet or a smartphone.



- An example of a question is: “During the last 7 days, on how many days did you walk for at least 10 minutes at a time? This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.”
- Completion of this survey should take about 15 minutes.

Potential Risks and Discomforts: There are no known risks from participating in this research study.

Potential Benefits: There are no direct benefits from participating in this research. However, possible benefits include the experience of completing an online survey, learning about factors that affect physical activity, understanding how active or inactive South Asians are and the types and levels of physical activity they engage in. We hope that, in the future, other people might benefit from this research through improved understanding about interventions and programs that can be done in the community to increase physical activity for South Asians living in the United States.

Confidentiality: Any potential loss of confidentiality will be minimized by storing data in a secure location and on a password protected computer. If we write a report or article about this research project, your identity will be protected to the maximum extent possible. Your information may be shared with representatives of the University of Maryland, College Park or governmental authorities if you or someone else is in danger or if we are required to do so by law.

Compensation: If you complete the survey, you will be offered the opportunity to enter a raffle drawing for a \$100 Amazon gift card.

Right to Withdraw and Questions: Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop

participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify. Your answers to the survey will still be submitted and analyzed even if the survey is not completed.

If you decide to stop taking part in the study, if you have questions, concerns, or complaints, or if you need to report an injury related to the research, please contact the investigators:

Principal Investigator: Syeda Rabab Haider; email: [rababzehra@gmail.com](mailto:rababzehra@gmail.com)

Co-Investigator: Dr. James Butler III; email: [jbutler9@umd.edu](mailto:jbutler9@umd.edu)

Participant Rights: If you have questions about your rights as a research participant or wish to report a research-related injury, please contact the:

University of Maryland College Park Institutional Review Board (IRB)

Office 1204 Marie Mount Hall

College Park, Maryland, 20742

E-mail: [irb@umd.edu](mailto:irb@umd.edu)

Telephone: 301-405-0678

This research has been reviewed according to the University of Maryland, College Park IRB procedures for research involving human subjects.

Statement of Consent: Your agreement indicates that you are at least 18 years of age; you have read this consent form or have had it read to you; your questions have been answered to your satisfaction and you voluntarily agree to participate in this research study. You may print a copy of this consent form. If you agree to participate, please click “I Agree/Consent” below.

Consent to Participate

☐ I Agree/Consent.

☐ I do not want to be a part of this research.

If I do not want to be a part o... Is Selected, Then Skip To End of Survey

Q1 How did you hear about this survey?

- ☐ Social Media: Facebook, Instagram, Twitter
- ☐ Email from an organization or a community
- ☐ Email from a relative/friend/acquaintance
- ☐ Text message from a relative/friend/acquaintance
- ☐ Received the link for the survey in-person
- ☐ Through a flyer invitation
- ☐ Other. Please specify: \_\_\_\_\_

Q2 Please indicate your gender:

- ☐ Female
- ☐ Male

Q3 What year (yyyy) were you born in?

Q4 What is your zip-code?

Q5 What is your ethnic background?

- ☐ Indian
- ☐ Pakistani
- ☐ Bangladeshi
- ☐ Other. Please specify: \_\_\_\_\_

Q6 Which generation do you belong to?

- ☐ US-born South Asian
- ☐ Foreign-born South Asian living in the US  $\geq 10$  years
- ☐ Foreign-born South Asian living in the US for 5–9 years
- ☐ Foreign-born South Asian living in the US for 0–4 years

Q7 What is your primary occupation?

- ☐ Professional
- ☐ Sales
- ☐ Management
- ☐ Public Service
- ☐ Clerical
- ☐ Laborer
- ☐ Service worker (Customer Service)
- ☐ Retired
- ☐ Homemaker
- ☐ Student
- ☐ Unemployed
- ☐ Other. Please specify \_\_\_\_\_

Q8 How many years did you do paid work in the US?

We are interested in finding out about the kinds of physical activities that South Asians residing in the United States do as part of their everyday lives. The questions are about the time you spent being physically active in the last 7 days. They include questions about activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Please answer each of the questions given below even if you do not consider yourself to be an active person.

In answering the following question,  
Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.

Q9 During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling? Think about only those physical activities that you did for at least 10 minutes at a time.

- ☐ Days per week: \_\_\_\_\_
- ☐ None

If None Is Selected, Then Skip To In answering the following question, ...

In answering the following question,  
Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.

Q10 How much time in total did you usually spend on one of those days doing vigorous physical activities?

- ☐ Number of hours: \_\_\_\_\_
- ☐ Number of minutes: \_\_\_\_\_

In answering the following question,  
Moderate physical activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

Q11 Again, think only about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

- ☐ Days per week: \_\_\_\_\_
- ☐ None

If None Is Selected, Then Skip To During the last 7 days, on how many d...

In answering the following question, Moderate physical activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

Q12 How much time in total did you usually spend on one of those days doing moderate physical activities?

- ☐ Number of hours: \_\_\_\_\_
- ☐ Number of minutes: \_\_\_\_\_

Q13 During the last 7 days, on how many days did you walk for at least 10 minutes at a time? This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.

☐ Days per week: \_\_\_\_\_

☐ None

If None Is Selected, Then Skip To Please rate in terms of a scale fro...

Q14 How much time in total did you usually spend walking on one of those days?

☐ Number of hours: \_\_\_\_\_

☐ Number of minutes: \_\_\_\_\_



Q15 Please rate in terms of a scale from 1 as no intention at all to 7 as fully intend to be physically active.

	1 is "no intention at all"	2	3	4	5	6	7 is "fully intend to be physically active"
To what extent do you intend to be physically active over the next six months?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q16 To what extent do you agree with the following statements?

	1 is "I do not agree"	2	3	4	5	6	7 is "I agree very strongly"
Regular physical activity helps prevent heart disease	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Regular physical activity helps prevent cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Regular physical activity helps reduce stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Regular physical activity helps maintain the ability to do everyday tasks in older age	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q17 How important are each of the following in keeping you from participating regularly in physical activity?

	1 is "not at all important"	2	3	4	5	6	7 is "very important"
Lack of time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of energy (too tired)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of physical skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of interest or motivation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling uncomfortable or ill at ease	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Long-term illness, disability, injury	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Fear of being injured	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost of attending a gym/fitness center	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of same- gender facilities for physical activity with same gender instructors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack of physical	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

activities arranged through and/or at your community/religious centers							
--	--	--	--	--	--	--	--

Q18 How confident do you feel that you could regularly do a total of:

	1 is "not confident at all"	2	3	4	5	6	7 is "very confident"
30 minutes of moderate physical activity three or four times a week	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
60 minutes of light physical activity each day	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q19 Rate the following items based on how important they are in helping you to be physically active: 1 being not important at all to 7 being very important

	1 is "not important at all"	2	3	4	5	6	7 is "very important"
Information on physical activity, health and well being	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Help in planning daily schedule	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Professional help in choosing best types of activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Specific instruction or coaching in different activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Affordable services to link with other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q20 How many of the following types of infrastructure are available in your local community or near to the place where you live? Please select the appropriate box provided in the table below

	none at all	a few	some	many
Number of places to safely walk (including sidewalks, walking trails and so on)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of places to safely ride a bicycle (such as designated bicycle lanes or special paths)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of publicly owned multi-purpose recreation trails, number of facilities, places and programs for specifically exercise and sports (including fitness centers,	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>pools, arenas, tennis or racket ball courts, etc)</p> <p>Number of other places that could be used for PA (such as school gym used after hours or public places where kids can skateboard).</p>	<p>○</p>	<p>○</p>	<p>○</p>	<p>○</p>
--	----------	----------	----------	----------



Q21 Please fill out the following table:

	Activity that you engage in at least once per month (eg., cycling, yoga, running)	Reason for engaging in this activity	Who do you do this activity with?
1)			
2)			
3)			
4)			

Q22 Please provide a list of some of the exercises/physical activities that you would like to engage in, but do not?

--

Q23 Please provide a brief statement of what prevents you from engaging in these activities?

--

Q24 Please provide a brief statement of what in your community could be done or changed that would be most helpful in increasing the physical activity levels in your community?

--

Q25 If you would like to be entered into a raffle to win \$100 Amazon gift card for your participation, please enter your email below. The winner will be contacted upon completion of the data collection process

Q26 If you would like to receive the results of the data collection please enter your email below:

Thank you for taking the time to complete this survey.  
Your responses have been recorded.

## Appendix B: International Physical Activity Questionnaire

# INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (August 2002)

## SHORT LAST 7 DAYS SELF-ADMINISTERED FORMAT

### FOR USE WITH YOUNG AND MIDDLE-AGED ADULTS (15-69 years)

The International Physical Activity Questionnaires (IPAQ) comprises a set of 4 questionnaires. Long (5 activity domains asked independently) and short (4 generic items) versions for use by either telephone or self-administered methods are available. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health-related physical activity.

#### ***Background on IPAQ***

The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. The final results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity.

#### ***Using IPAQ***

Use of the IPAQ instruments for monitoring and research purposes is encouraged. It is recommended that no changes be made to the order or wording of the questions as this will affect the psychometric properties of the instruments.

#### ***Translation from English and Cultural Adaptation***

Translation from English is supported to facilitate worldwide use of IPAQ. Information on the availability of IPAQ in different languages can be obtained at [www.ipaq.ki.se](http://www.ipaq.ki.se). If a new translation is undertaken we highly recommend using the prescribed back translation methods available on the IPAQ website. If possible please consider making your translated version of IPAQ available to others by contributing it to the IPAQ website. Further details on translation and cultural adaptation can be downloaded from the website.

#### ***Further Developments of IPAQ***

International collaboration on IPAQ is on-going and an ***International Physical Activity Prevalence Study*** is in progress. For further information see the IPAQ website.

**More Information**

More detailed information on the IPAQ process and the research methods used in the development of IPAQ instruments is available at [www.ipaq.ki.se](http://www.ipaq.ki.se) and Booth, M.L. (2000). *Assessment of Physical Activity: An International Perspective*. Research Quarterly for Exercise and Sport, 71 (2): s114-20. Other scientific publications and presentations on the use of IPAQ are summarized on the website.

## INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

\_\_\_\_\_ **days per week**

☐

No vigorous physical activities



**Skip to question 3**

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

☐

Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

\_\_\_\_\_ **days per week**

☐

No moderate physical activities



**Skip to question 5**

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

\_\_\_\_\_ **days per week**

☐ No walking → **Skip to question 7**

6. How much time did you usually spend **walking** on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

☐ Don't know/Not sure

**This is the end of the questionnaire, thank you for participating.**



**Appendix C: Malaysian Study Survey (Sreeramareddy, Kutty, Jabbar & Boo, 2012.)**

**IPAQ: SHORT LAST 7 DAYS SELF-ADMINISTERED FORMAT**

We are interested in finding out about the kinds of **physical activities** that people do as part of their everyday lives. This is part of a large study being conducted in many countries around the world. Your answers will help us to understand how active we are compared with people in other countries.

The questions are about the time you spent being physically active in the last 7 days. They include questions about activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Your answers are important to us.

**Please answer each of the questions given below even if you do not consider yourself to be an active person.**

**THANK YOU IN ADVANCE FOR PARTICIPATING.**

In answering the following questions,

- **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal.
- **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

**1a.**

During the last 7 days, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling,?

Think about *only* those physical activities that you did for at least 10 minutes at a time.

\_\_\_\_\_ **days per week or none**

**1b.**

How much time in total did you usually spend on one of those days doing **vigorous** physical activities?

\_\_\_\_\_ **hours** \_\_\_\_\_ **minutes**

**2a.**

Again, think *only* about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

\_\_\_\_\_ **days per week or none**

**2b.**

How much time in total did you usually spend on one of those days doing **moderate** physical activities?

\_\_\_\_\_ **hours** \_\_\_\_\_ **minutes**

**3a.**

During the last 7 days, on how many days did you **walk** for at least 10 minutes at a time? This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.

\_\_\_\_\_ **days per week or none**

**3b.**

How much time in total did you usually spend walking on one of those days?

\_\_\_\_\_ **hours** \_\_\_\_\_ **minutes**

The last question is about the time you spent sitting on weekdays while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk, visiting friends, reading traveling on a bus or sitting or lying down to watch television.

**4.**

During the last 7 days, how much time in total did you usually spend *sitting* on a **week day**?

- \_\_\_\_\_ **hours** \_\_\_\_\_ **minutes**

We need some personal information of the survey participants to carry out our analysis in meaningful ways. From the information you provide we not be able to identify your responses you have provided to the questions in the earlier sections.

**Tick (γ) mark most appropriate response**

**Age (in completed years):**..... **Gender:** Male ☐ Female ☐

**Marital status:**

- Single (never married) ☐
- Currently Married ☐
- Currently into relationship ☐
- Seperated/divorced ☐

**Monthly Family income:**

- RM < 2000 ☐
- RM 2000-4000 ☐
- RM 4000-6000 ☐

RM 6000-10,000 ☐

RM >10,000 ☐

**Educational status:.....**

**Employment status:**

Currently enrolled as full-time student in a university

Currently employed for full time job

Currently employed as part-time job

Unemployed

In the next few sections we will ask you to rate some of the factors which has probable impact on the day-to-day physical activities and exercise you perform. Kindly read the instructions carefully and choose the appropriate item using tick (✓) mark

**How do rate yourself (your own) about your overall health?**

Excellent ☐

Very Good ☐

Fair ☐

Poor ☐

Very poor ☐

**Your intentions to be physically active**

**Please rate in terms of a scale from 1 as no intention at all to 7 fully intend to be physically active).**

To what extent do you intend to be physically active over the next six months?"	no intention at all						fully intend to be physically active
	1	2	3	4	5	6	7

**The perceived health benefits from physical activity**

To what extent do you agree with the following statement?"

	I do not agree						I agree very strongly
	1	2	3	4	5	6	7
Regular Physical Activity helps prevent heart disease							
Regular Physical Activity helps prevent cancer							
Regular Physical Activity helps reduce stress							
Regular Physical Activity helps maintain							

the ability to do everyday tasks in older age							
---	--	--	--	--	--	--	--

### Perceived personal barriers to PA

"How important are each of the following in keeping you from participating regularly in physical activity?"

	not at all important						very important
	1	2	3	4	5	6	7
lack of time	1	2	3	4	5	6	7
lack of energy (/too tired)	1	2	3	4	5	6	7
lack of physical skills	1	2	3	4	5	6	7
lack of interest or motivation	1	2	3	4	5	6	7
feeling uncomfortable or ill at ease	1	2	3	4	5	6	7
long-term illness, disability, injury	1	2	3	4	5	6	7
fear of being injured	1	2	3	4	5	6	7
Cost of attending a Gym/fitness center	1	2	3	4	5	6	7

### Self-efficacy

How confident do you feel that you could regularly do a total of 30 minutes of moderate Physical activity three or four times a week?	not at all confident						very confident
	1	2	3	4	5	6	7

How confident do you feel that you could regularly do a total of 60 minutes of light Physical activity each day?	not at all confident						very confident
	1	2	3	4	5	6	7

### Social support

Please tell how important are instrumental support (tangible aid and service) and informational support (advice, suggestions and information) that influences people to engage in Physical Activity. Rate the following items in the table as 1 not important at all to 7 very important.

	not at all important						very important
information on PA, health and well beings	1	2	3	4	5	6	7
help in planning daily schedule	1	2	3	4	5	6	7
professional help in choosing best types of activities	1	2	3	4	5	6	7
specific instruction or coaching in different activities	1	2	3	4	5	6	7
convenient public transportation	1	2	3	4	5	6	7
affordable facilities, services and programs	1	2	3	4	5	6	7
affordable support services such as child care, parking	1	2	3	4	5	6	7
affordable services to link with other people	1	2	3	4	5	6	7

### **Availability of facilities for physical activities in your surroundings**

How many of how many of the following five types of infrastructure are available in your local community or near to the place where you live? Please tick in the appropriate box provided in the table below

	none at all	a few	some	many
number of places to safely walk (including sidewalks, walking trails and so on)				
number of places to safely ride a bicycle (such as designated bicycle lanes or special paths)				
number of publicly owned multi-purpose recreation trails, number of facilities, places and programs for specifically exercise and sports (including fitness centres, pools, arenas, tennis or racquet ball courts, etc)				
number of other places that could be used for PA (such as school gym used after hours or public places where kids can skateboard).				

## Appendix D: Approval Email from Researcher to use their Survey

Move to inbox

More

Request to use your survey: "Physical activity and associated factors among young adults in Malaysia: An online exploratory survey"

Inbox x

**Rabab Zehra** <rababzehra@gmail.com>  
to chandrashekhar.

9/29/15

Dear Dr. Chandrashekhar Sreeramareddy,

I am emailing you regarding your article "Physical activity and associated factors among young adults in Malaysia: An online exploratory survey" that has been published in the Bioscience Trends.

I am currently a graduate student in the MPH program at the University of Maryland and I am working on my thesis. I am planning to do a quantitative study to explore the physical activity patterns among South Asian adults in the United States. I am also planning to use the social ecological model as my framework. In my research, I came across your article and I wanted to request a copy of the survey you designed and used for your study. It is very similar to what I want to explore among this population. I would really appreciate if you could email me the survey and give me permission to use it. It will be cited properly.

I would really like to use your online survey as you have used the social-ecological model to assess demographic, individual, social and physical environmental factors. I am also planning to use the IPAQ to measure Physical activity.

Basically I want to do a very similar study as yours but my population is different.

I would really appreciate all your help.

Thank you,

Regards,  
Rabab Haider  
MPH student

**chandrashekhara t.s.** <chandrashekharats@yahoo.com>  
to me

9/29/15

Dear Rabab Zehra,

Thank you for your interest in my paper. Find the attached survey instrument. Scroll down the file to view the factors on socio-ecological model.

Good Luck for your MPH thesis/research

Regards

Dr. Chandrashekhar T Sreeramareddy  
**MBBS, MD, DTMPH, MSc International Health**

## APPENDIX E: IRB Application Approval



1204 Marie Mount Hall  
College Park, MD 20742-5125  
TEL 301.405.4212  
FAX 301.314.1475  
irb@umd.edu  
www.umresearch.umd.edu/IRB

DATE: March 7, 2016

TO: Syeda Rabab Haider, MPH  
FROM: University of Maryland College Park (UMCP) IRB

PROJECT TITLE: [846334-1] Feasibility of an Online Survey regarding Physical Activity among South Asian Adults Residing in the United States

REFERENCE #:

SUBMISSION TYPE: New Project

ACTION: APPROVED

APPROVAL DATE: March 7, 2016

EXPIRATION DATE: March 6, 2017

REVIEW TYPE: Expedited Review

REVIEW CATEGORY: Expedited review category # 7

Thank you for your submission of New Project materials for this project. The University of Maryland College Park (UMCP) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

Prior to submission to the IRB Office, this project received scientific review from the departmental IRB Liaison.

This submission has received Expedited Review based on the applicable federal regulations.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of March 6, 2017.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Unless a consent waiver or alteration has been approved, Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others (UPIRSOs) and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

Please note that all research records must be retained for a minimum of seven years after the completion of the project.

If you have any questions, please contact the IRB Office at 301-405-4212 or [irb@umd.edu](mailto:irb@umd.edu). Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within University of Maryland College Park (UMCP) IRB's records.



## Appendix F: Facebook Page for Recruitment

The screenshot shows a Facebook page for 'Physical Activity Survey Request'. The page is currently unpublished, as indicated by a blue banner at the top stating, 'This page has not been published. Learn about unpublished pages and Publish this page when you are ready.' The page cover features a large blue banner with the text 'Looking for Volunteers to Participate in An Online Survey' and 'Examining the Physical Activity patterns among South Asian adults residing in the United States'. Below the banner is a row of four images: a person in a traditional orange and white outfit, a group of people exercising outdoors, a person running on a path, and a group of people walking in a park. The page name 'Physical Activity Survey Request' and 'Community' are displayed below the images. The left sidebar contains tabs for 'Timeline', 'About', 'Photos', 'Likes', and 'More'. The 'About' tab is selected, showing a 'View Pages Feed' section and an 'ABOUT' section with the text: 'I would like to invite you to participate in an online survey examining the physical activity patterns among South Asian adults residing in the US.' and a link to 'Add your website'. The 'PHOTOS' tab is also visible, showing a grid of images. The right sidebar shows a 'Recent' section for the year 2016. The top navigation bar includes the Facebook logo, the page name, a search bar, and user avatars. The bottom navigation bar includes links for 'Page', 'Messages', 'Notifications', 'Publishing Tools', 'Settings', and 'Help'.

Physical Activity Survey Request

Rabab Home 20...

Page Messages Notifications Publishing Tools

Settings Help

This page has not been published. [Learn about unpublished pages](#) and [Publish this page](#) when you are ready.

Promote

Looking for Volunteers to Participate in  
An Online Survey

Examining the Physical Activity patterns among South Asian adults residing in the United States

Physical Activity Survey Request  
Community

Create Call to Action

Timeline About Photos Likes More

Like Message

About Physical Activity Survey Request

Page Info

PAGE INFO

Category Other : Community

Name Physical Activity Survey Request

Facebook Web Address www.facebook.com/pasasurvey

Start Date Enter your start date

Short Description I would like to invite you to participate in an online survey examining the physical activity patterns among South Asian adults residing in the US.

**Physical Activity Survey Request**

---

Impressum	<a href="#">Input Impressum for your Page</a>	<div>Promote ▾</div>
Long Description	<p>Hello everyone!</p> <p>My name is Rabab Haider. I am a graduate student majoring in Behavioral and Community Health at the University of Maryland's School of Public Health.</p> <p>As an integral part of my Masters of Public Health (MPH) degree thesis requirement, I am conducting a research study via an online survey to examine the physical activity patterns among South Asians adults residing in United States.</p> <p>I am requesting you to participate in this research study by clicking on the link below to complete the brief, online survey. Those who complete the survey will be offered an opportunity to enter a raffle drawing to receive a \$100 Amazon gift card. Completion of this survey should take approximately 15 minutes.</p> <ul style="list-style-type: none"> <li>- You must be 18 years of age or older.</li> <li>- You must be a South Asian living in the United States.</li> </ul> <p>Survey Link:</p> <p>I would really appreciate if you could assist me by inviting your family and friends from the South Asian community living in United States to this Facebook page.</p> <p>Should you have questions and/or require additional information, please do not hesitate to contact me at: rababzehra@gmail.com</p> <p>Thank you!</p>	
Website	<a href="#">Enter your website</a>	
Official Page	<a href="#">Enter the official brand, celebrity or organization your Page is about</a>	
Facebook Page ID	225955541079309	

Chat (Off)

## Appendix G: Survey Recruitment Flyer

I would like to invite you to participate in:



# An Online Survey

Examining the Physical Activity patterns among South Asian adults residing in the United States

You must be:

- South Asian or of South Asian descent
- 18 years and above
- Be able to read and understand English



- Survey takes about 15 minutes to complete
- Take the survey on a computer, tablet or a smartphone

Chance to  
Win a \$100  
Amazon Gift  
Card



SCHOOL OF  
PUBLIC  
HEALTH

For any questions & concerns  
Please email:  
rababzehra@gmail.com  
IRB #846334-1

For Survey link and more information, click here:  
[https://umdsurvey.umd.edu/SE/?SID=SV\\_9nLdpLIEKLSZ15j](https://umdsurvey.umd.edu/SE/?SID=SV_9nLdpLIEKLSZ15j)

## Appendix H: Frequency and Summary Tables for Qualitative Data

#	Activity that you engage in at least once per month	Frequency	Reason for engaging in this activity ( <i>most common answers</i> )	Who do you do this activity with? ( <i>most common answers</i> )
1.	Running	104	Enjoyment/Leisure/ Fun/ Love doing it/ Recreational/ Hobby	Alone
2.	Walking	88	Health/ being healthy/ for health benefits	Spouse
3.	Yoga	54	Stress relief/ relaxing	Family
4	Sports	54	To be fit/Fitness	Friends
5	Cycling	40	To lose weight/ weight maintenance	Kids
6	Weights	27	Endurance	Coworkers
7	Dance/Zumba	19	Strength	Roommate
8	Gym	17	Regulate breathing	Sister/Brother
9	Elliptical	15	Being outdoors/fresh air/ enjoy nature	Neighbor
10	Pilates	14	Toning/ get in shape/ flexibility	Personal trainer
	Others: <ul style="list-style-type: none"> <li>• Hiking</li> <li>• Jogging</li> <li>• Swimming</li> <li>• Treadmill</li> <li>• Push-ups</li> <li>• Rowing</li> <li>• Boxing</li> <li>• Fitness class</li> <li>• Yardwork</li> </ul>		Others: <ul style="list-style-type: none"> <li>• Burn calories</li> <li>• Get energy</li> <li>• Feels good</li> <li>• Motivation</li> <li>• Self-care</li> <li>• Increase metabolism</li> <li>• Digestion</li> <li>• Cardio/increased heart rate</li> <li>• Religious (yoga)</li> </ul>	

#	Activity that you would like to engage in but are not able to	Frequency
1.	Swimming	68
2.	Yoga	63
3.	Cycling/Biking	63
4	Running	51
5	Sports (does not include tennis)	48
6	Weight training/ weight lifting/ strengthening	33
7	Dance/Zumba	29
8	Tennis/Squash	29
9	Walking	22
10	Boxing/kickboxing	19
	Others:	
	• Hiking	16
	• Pilates	13
	• Gym/workout	12
	• Rock-climbing	10
	• Spinning class	9
	• Cardio	8
	• Jogging	6
	• Treadmill/ Ellip	5
	• Boot camp ex.	4
	• Crossfit	3
	• Personal trainer	
	• Aerobic	
	• Horseback riding	
	• kayaking	

What prevents you from engaging in these activities?	Frequency
Lack of time	114
Lack of Training/Need proper guidance/ Lack of experience/ Intimidated/not sure where to start/ need help planning/ uncomfortable/self conscious/ need to learn how to swim/bike	36
Lack of motivation	35
Cost	31
Lack of Facilities/ Lack of availability	30
Kids / House/ Marriage responsibilities	22
Lack of partner/ Lack of company	20
Lack of access to female only facilities/ mixed gender at yoga/ same sex coach/ women's only gym/ lack of access to girls only swimming pools	17
Injury/ knee pain/ back pain	16
Weather	16
Others:	
• Laziness	15
• Lack of Accessibility	14
• Lack of energy/tired	13
• Long work hours	11
• Lack of fitness/stamina	
• Logistics	
• Don't own a bike	
• Stress	
• Neighborhood dogs	

#	Please provide a brief statement of what in your community could be done or changed that would be most helpful in increasing the physical activity levels in your community	Frequency
1.	<ul style="list-style-type: none"> <li>• Provide awareness about physical activity / awareness programs/ awareness among women, create excitement around exercise to encourage</li> <li>• Education on the importance of exercise</li> <li>• Provide guidelines about exercise</li> </ul>	44
2.	<ul style="list-style-type: none"> <li>• Provide programs in the community centers where people feel comfortable</li> <li>• Community sponsored events</li> <li>• Organizing activities, competition, marathons, races, cycling, zumba classes</li> <li>• Exercise programs at religious centers (mosque, churches)</li> <li>• Communal workouts at the mosque/faith based centers</li> <li>• Arrange group activities with Muslims</li> <li>• Provide basic introductory classes to get members of community to be familiar with exercise.</li> </ul>	38
3.	<ul style="list-style-type: none"> <li>• Free training sessions</li> <li>• Free classes/ free gyms, swimming pools</li> <li>• Lower cost of gym/tennis courts/make gyms affordable</li> </ul>	32
4.	<ul style="list-style-type: none"> <li>• Parks/ Sidewalks/ Walking and biking trails</li> <li>• More public spaces</li> </ul>	27
5.	<ul style="list-style-type: none"> <li>• Gender specific facilities/trainers</li> <li>• Female only recreational centers/gyms/facilities</li> <li>• Swimming pools for women</li> <li>• Gender segregated yoga classes and aerobics</li> </ul>	24
6.	<ul style="list-style-type: none"> <li>• Gym facilities, Swimming pool</li> <li>• Build or assign a play area for sports for community</li> <li>• Bike rentals</li> <li>• Recreational centers at the community centers</li> </ul>	24
7.	<ul style="list-style-type: none"> <li>• Create social groups for walking/ biking/ hiking</li> <li>• Starting leagues for men and women in sports and hobbies</li> <li>• Provide incentives for people to join these groups</li> </ul>	19
8.	<ul style="list-style-type: none"> <li>• Adult leagues for organized sports</li> <li>• Beginner level classes for adults</li> <li>• Programs geared towards adults (30-40 yrs)</li> <li>• Classes for wider age groups</li> </ul>	10
9.	<ul style="list-style-type: none"> <li>• Flexible hours/ 24hr gym</li> <li>• Pools that are open all year round</li> <li>• Classes at convenient times after work</li> <li>• Availability of activities over the weekend</li> </ul>	6
10.	<ul style="list-style-type: none"> <li>• Physical activity options where there is a daycare or playground for children to engage</li> </ul>	6

	<ul style="list-style-type: none"> <li>• Free daycares at gyms</li> </ul>	
11	<ul style="list-style-type: none"> <li>• Community based planning required</li> <li>• Community outreach</li> </ul>	5
12	<ul style="list-style-type: none"> <li>• Bollywood dance classes/ more yoga classes</li> </ul>	4
13.	<ul style="list-style-type: none"> <li>• More activities for winter</li> <li>• Indoor options during heat and pollen</li> </ul>	3



## REFERENCES

- Al-Hazzaa, H. M. (2007). Health-enhancing physical activity among Saudi adults using the International Physical Activity Questionnaire (IPAQ). *Public health nutrition*, 10(01), 59-64.
- American Heart Association. (2015, January). *Physical activity improves quality of life*. Retrieved from [http://www.heart.org/HEARTORG/HealthyLiving/PhysicalActivity/StartWalking/Physical-activity-improves-quality-of-life\\_UCM\\_307977\\_Article.jsp#.V3nGDeYrKR](http://www.heart.org/HEARTORG/HealthyLiving/PhysicalActivity/StartWalking/Physical-activity-improves-quality-of-life_UCM_307977_Article.jsp#.V3nGDeYrKR)
- Babakus, W. S., & Thompson, J. L. (2012). Physical activity among South Asian women: a systematic, mixed-methods review. *Int J Behav Nutr Phys Act*, 9, 150.
- Bélanger-Gravel, A., & Godin, G. (2010). Key beliefs for targeted interventions to increase physical activity in children: analyzing data from an extended version of the theory of planned behaviour. *International journal of pediatrics*, 2010.
- Bethlehem, J. (2010). Selection bias in web surveys. *International Statistical Review*, 78(2), 161-188.
- Bhatnagar, P., Shaw, A., & Foster, C. (2015). Generational differences in the physical activity of UK South Asians: a systematic review. *The International Journal of Behavioral Nutrition and Physical Activity*, 12, 96. <http://doi.org/10.1186/s12966-015-0255-8>
- Bhutta, C. B. (2012). Not by the book: Facebook as a sampling frame. *Sociological Methods & Research*, 41, 57-88.
- Buchan, D. S., Ollis, S., Thomas, N. E., & Baker, J. S. (2012). Physical Activity Behaviour: An Overview of Current and Emergent Theoretical Practices. *Journal of Obesity*, 2012, 1-11. <http://doi.org/10.1155/2012/546459>
- Carroll, R., Ali, N., & Azam, N. (2002). *Promoting physical activity in South Asian Muslim women through "exercise on prescription"*. Core Research.
- Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J., & Neville, A. J. (2014, September). The use of triangulation in qualitative research. In *Oncology nursing forum* (Vol. 41, No. 5).

- Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Reports*, 100(2), 126–131.
- Celis-Morales, C. A., Ghouri, N., Bailey, M. E. S., Sattar, N., & Gill, J. M. R. (2013). Should Physical Activity Recommendations Be Ethnicity-Specific? Evidence from a Cross-Sectional Study of South Asian and European Men. *PLoS ONE*, 8(12), e82568. <http://doi.org/10.1371/journal.pone.0082568>
- Centers for Disease Control and Prevention. (2015). The Benefits of Physical Activity Retrieved from <http://www.cdc.gov/physicalactivity/basics/pa-health/>
- Chaudhary, N., Vyas, A., & Parrish, E. B. (2010). Community based organizations addressing South Asian American health. *Journal of Community Health*, 35(4), 384-91. doi:<http://dx.doi.org/10.1007/s10900-010-9256-3>
- Choudhry, U. K., Jandu, S., Mahal, J., Singh, R., Sohi-Pabla, H., & Mutta, B. (2002). Health promotion and participatory action research with South Asian women. *Journal of Nursing Scholarship*, 34(1), 75-81.
- Chen, T., & Hsu, C. (2002). Asian Americans. *Encyclopedia of Public Health*. Retrieved from Encyclopedia.com: <http://www.encyclopedia.com/doc/1G2-3404000068.html>
- Chen Jr, M. S., & Hawks, B. L. (1995). A debunking of the myth of healthy Asian Americans and Pacific Islanders. *American Journal of Health Promotion*, 9(4), 261-268.
- Craig, C. L., Marshall, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E. and Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & Science in Sports & Exercise*, 35: 1381–1395.
- Daniel, M., & Wilbur, J. (2011). Physical activity among South Asian Indian immigrants: an integrative review. *Public Health Nursing*, 28(5), 389-401.
- Daniel, M., Wilbur, J., Fogg, L. F., & Miller, A. M. (2013). Correlates of lifestyle: physical activity among South Asian Indian immigrants. *Journal of community health nursing*, 30(4), 185-200.

- Dave, S. S., Craft, L. L., Mehta, P., Naval, S., Kumar, S., & Kandula, N. R. (2015). Life Stage Influences on US South Asian Women's Physical Activity. *American Journal of Health Promotion*, 29(3), e100-e108.
- De Bourdeaudhuij, I., Sallis, J. F., & Saelens, B. E. (2003). Environmental correlates of physical activity in a sample of Belgian adults. *American journal of health promotion*, 18(1), 83-92.
- Demidenko E. (2008) Sample size and optimal design for logistic regression with binary interaction. *Statistics in Medicine*, 27:36-46
- Dishman, R. K., Motl, R. W., Saunders, R., Felton, G., Ward, D. S., Dowda, M., & Pate, R. R. (2004). Self-efficacy partially mediates the effect of a school-based physical-activity intervention among adolescent girls. *Preventive medicine*, 38(5), 628-636.
- Dodani, S. (2008). Excess coronary artery disease risk in South Asian immigrants: Can dysfunctional high-density lipoprotein explain increased risk? *Vascular Health and Risk Management*, 4(5), 953–961.
- Evans, J. R., & Mathur, A. (2005). The value of online surveys. *Internet research*, 15(2), 195-219.
- Eyler, A. A., Baker, E., Cromer, L., King, A. C., Brownson, R. C., & Donatelle, R. J. (1998). Physical activity and minority women: a qualitative study. *Health Education & Behavior*, 25(5), 640-652.
- Eyler, A. E., Wilcox, S., Matson-Koffman, D., Evenson, K. R., Sanderson, B., Thompson, J., ... Rohm-Young, D. (2002). Correlates of Physical Activity among Women from Diverse Racial/Ethnic Groups. *Journal of Women's Health & Gender-Based Medicine*, 11(3), 239–253.  
<http://doi.org/10.1089/152460902753668448>
- Evenson, K. R., Eyler, A. A., Wilcox, S., Thompson, J. L., & Burke, J. E. (2012). US Determinants of Exercise in Women Phone Survey. *Measurement Instrument Database for the Social Science*. Retrieved from [www.midss.ie](http://www.midss.ie)
- Fischbacher, C. M., Hunt, S., & Alexander, L. (2004). How physically active are South Asians in the United Kingdom? A literature review. *Journal of Public Health*, 26(3), 250-258.

- Fleury, J., & Lee, S. M. (2006). The social ecological model and physical activity in African American women. *American Journal of Community Psychology*, 37(1-2), 129-40. doi:<http://dx.doi.org/10.1007/s10464-005-9002-7>
- Fuchs, M. (2008). Mobile Web Survey: A preliminary discussion of methodological implications. *Envisioning the survey interview of the future*, 77-94.
- Gideon, L. (2012). *Handbook of survey methodology for the social sciences*. New York, NY: Springer.
- Giles-Corti, B., & Donovan, R. J. (2002). The relative influence of individual, social and physical environment determinants of physical activity. *Social science & medicine*, 54(12), 1793-1812.
- Greenhalgh, T., Helman, C., & Chowdhury, A. M. M. (1998). Health beliefs and folk models of diabetes in British Bangladeshis: a qualitative study. *Bmj*, 316(7136), 978-983.
- Gregg, E. W., Pereira, M. A., & Caspersen, C. J. (2000). Physical activity, falls, and fractures among older adults: a review of the epidemiologic evidence. *Journal of the American Geriatrics Society*, 48(8), 883-893.
- Grimm, P. 2010. Social Desirability Bias. *Wiley International Encyclopedia of Marketing*. 2.
- Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ) – Short and Long Forms. November 2005. Retrieved from <https://sites.google.com/site/theipaq/scoring-protocol>
- Gupta, M., Singh, N., & Verma, S. (2006). South Asians and cardiovascular risk what clinicians should know. *Circulation*, 113(25), e924-e929.
- Hagstromer, M., Ainsworth, B. E., Oja, P., & Sjostrom, M. (2010). Comparison of a subjective and an objective measure of physical activity in a population sample. *Journal of physical activity & health*, 7(4), 541.
- Hayes, L., White, M., Unwin, N., Bhopal, R., Fischbacher, C., Harland, J., & Alberti, K. G. M. M. (2002). Patterns of physical activity and relationship with risk markers for cardiovascular disease and diabetes in Indian, Pakistani, Bangladeshi and European adults in a UK population. *Journal of Public Health*, 24(3), 170-178.

- Horne, M., & Tierney, S. (2012). What are the barriers and facilitators to exercise and physical activity uptake and adherence among South Asian older adults: A systematic review of qualitative studies. *Preventive medicine*, 55(4), 276-284.
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, 15(9), 1277-1288.
- Huston, S. L., Evenson, K. R., Bors, P., & Gizlice, Z. (2003). Neighborhood environment, access to places for activity, and leisure-time physical activity in a diverse North Carolina population. *American Journal of Health Promotion*, 18(1), 58-69.
- Inman, A. G., & Tewari, N. (2003). The power of context: Counseling South Asians within a family context. In G. Roysircar, D. S. Sandhu, & V. E. Bibbins, Sr. (Eds.), *Counseling within a family context: A guidebook of practices* (pp. 97–107). Alexandria, VA: American Counseling Association.
- International Physical Activity Questionnaire (IPAQ). (2011). Retrieved from [www.ipaq.ki.se](http://www.ipaq.ki.se)
- Ivey, S. L., Khatta, M., Vedanthan, R., (2002). A Brown Paper; The Health of South Asians in the United States-Cardiovascular Disease.
- Jepson, R., Harris, F. M., Bowes, A., Robertson, R., Avan, G., & Sheikh, A. (2012). Physical activity in South Asians: an in-depth qualitative study to explore motivations and facilitators. *PLoS One*, 7(10), e45333.
- Juarbe, T., Turok, X. P., & Pérez-Stable, E. J. (2002). Perceived benefits and barriers to physical activity among older Latina women. *Western journal of nursing research*, 24(8), 868-886.
- Kandula, N. R., & Lauderdale, D. S. (2005). Leisure time, non-leisure time, and occupational physical activity in Asian Americans. *Annals of epidemiology*, 15(4), 257-265.
- Karter, A. J., Schillinger, D., Adams, A. S., Moffet, H. H., Liu, J., Adler, N. E., & Kanaya, A. M. (2013). Elevated Rates of Diabetes in Pacific Islanders and Asian Subgroups The Diabetes Study of Northern California (DISTANCE). *Diabetes care*, 36(3), 574-579.

- King, A. C., Stokols, D., Talen, E., Brassington, G. S., & Killingsworth, R. (2002). Theoretical approaches to the promotion of physical activity: forging a transdisciplinary paradigm. *American journal of preventive medicine*, 23(2), 15-25.
- Kim, B. S., Atkinson, D. R., & Yang, P. H. (1999). The Asian Values Scale: Development, factor analysis, validation, and reliability. *Journal of counseling Psychology*, 46(3), 342.
- Klatsky, A. L., Tekawa, I., Armstrong, M. A., & Sidney, S. (1994). The risk of hospitalization for ischemic heart disease among Asian Americans in northern California. *American journal of public health*, 84(10), 1672-1675.
- Lauderdale, D. S., & Rathouz, P. J. (2000). Body mass index in a US national sample of Asian Americans: effects of nativity, years since immigration and socioeconomic status. *International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity*, 24(9), 1188-1194.
- Lawton, J., Ahmad, N., Hanna, L., Douglas, M., & Hallowell, N. (2006). 'I can't do any serious exercise': barriers to physical activity amongst people of Pakistani and Indian origin with Type 2 diabetes. *Health Education Research*, 21(1), 43-54.
- Lee, I. M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., Katzmarzyk, P. T., & Lancet Physical Activity Series Working Group. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *The lancet*, 380(9838), 219-229.
- Macera, C. A., Ham, S. A., Yore, M. M., Jones, D. A., Ainsworth, B. E., Kimsey, C. D., & Kohl, H. (2005). Prevalence of physical activity in the United States: behavioral risk factor surveillance system, 2001. *Prev Chronic Dis*, 2(2), A17.
- Mahapatra, N. (2012). South asian women in the U.S. and their experience of domestic violence. *Journal of Family Violence*, 27(5), 381-390.  
doi:<http://dx.doi.org/10.1007/s10896-012-9434-4>
- Maker, A. H., Mittal, M., & Rastogi, M. (2005). South Asians in the United States: Developing a systemic and empirically based mental health assessment model. In M. Rastogi & E. Wieling (Eds.), *Voices of color: First person accounts of ethnic minority therapists* (pp. 233-254). Thousand Oaks, CA: Sage.
- McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Education & Behavior*, 15(4), 351-377.

- McNeill, L. H., Wyrwich, K. W., Brownson, R. C., Clark, E. M., & Kreuter, M. W. (2006). Individual, social environmental, and physical environmental influences on physical activity among black and white adults: a structural equation analysis. *Annals of Behavioral Medicine*, 31(1), 36-44.
- Mokkarala, S., O'Brien, E. K., & Siegel, J. T. (2016). The relationship between shame and perceived biological origins of mental illness among South Asian and white American young adults. *Psychology, Health & Medicine*, 21(4), 448-459. doi:10.1080/13548506.2015.1090615
- Owen, N., Leslie, E., Salmon, J., & Fotheringham, M. J. (2000). Environmental determinants of physical activity and sedentary behavior. *Exercise and sport sciences reviews*, 28(4), 153-158.
- Pan, S. Y., Cameron, C., DesMeules, M., Morrison, H., Craig, C. L., & Jiang, X. (2009). Individual, social, environmental, and physical environmental correlates with physical activity among Canadians: a cross-sectional study. *BMC Public Health*, 9(1), 21.
- Palaniappan, L., Anthony, M.-N., Mahesh, C., Elliott, M., Killeen, A., Giacherio, D., & Rubenfire, M. (2002). Cardiovascular risk factors in ethnic minority women aged  $\leq 30$  years. *The American Journal Of Cardiology*, 89(5), 524-529. doi:10.1016/S0002-9149(01)02291-3
- Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current opinion in psychiatry*, 18(2), 189-193.
- Pew Research Center. (2012). Religions and public life project: Religious composition by country. Retrieved from <http://www.pewforum.org/2012/12/18/table-religious-composition-by-country-in-numbers/>
- "Power/Sample Size Calculation" (n.d.). Retrieved from <http://www.dartmouth.edu/~eugened/power-samplesize.php>
- Qualtrics. (2015). Retrieved from <http://it.umd.edu/Qualtrics>
- Ranasinghe, C. D., Ranasinghe, P., Jayawardena, R., & Misra, A. (2013). Physical activity patterns among South-Asian adults: a systematic review. *The International Journal of Behavioral Nutrition and Physical Activity*, 10, 116. <http://doi.org/10.1186/1479-5868-10-116>
- Razali, N. M., & Wah, Y. B. (2011). Power comparisons of shapiro-wilk, kolmogorov-smirnov, lilliefors and anderson-darling tests. *Journal of statistical modeling and analytics*, 2(1), 21-33.

- Rippe, J. M. (Ed.). (2011). *Encyclopedia of lifestyle medicine and health*. Sage Publications.
- Sadler, G. R., Ryuji, L., Nguyen, T., Oh, G., Paik, G., & Kustin, B. (2003). Heterogeneity within the Asian American community. *International Journal for Equity in Health*, 2, 12. doi:10.1186/1475-9276-2-12
- Sallis, J. F., Cervero, R. B., Ascher, W., Henderson, K. A., Kraft, M. K., & Kerr, J. (2006). An Ecological Approach to Creating More Physically Active Communities. *Annual Review of Public Health*, 27(1), 297–322. <http://doi.org/10.1146/annurev.publhealth.27.021405.102100>
- Sallis, J. F., & Owen, N. (1999). *Physical activity & behavioral medicine*. Thousand Oaks, CA: Sage Publications.
- Sallis, J. F., Owen, N., & Fisher, E. B. (2008). Ecological models of health behavior. *Health behavior and health education: Theory, research, and practice*, 4, 465-486.
- Sallis, J. F., & Saelens, B. E. (2000). Assessment of physical activity by self-report: status, limitations, and future directions. *Research quarterly for exercise and sport*, 71(sup2), 1-14.
- Samuels, D. J., & Zucco, C. (2013). Using Facebook as a subject recruitment tool for survey-experimental research. Available at SSRN:<http://ssrn.com.proxy-um.researchport.umd.edu/abstract=2101458> or <http://dx.doi.org/10.2139/ssrn.2101458>
- Shah, A. D., Vittinghoff, E., Kandula, N. R., Srivastava, S., & Kanaya, A. M. (2015). Correlates of prediabetes and type II diabetes in US South Asians: findings from the Mediators of Atherosclerosis in South Asians Living in America (MASALA) study. *Annals of Epidemiology*, 25(2), 77–83. <http://doi.org/10.1016/j.annepidem.2014.10.013>
- Shapiro, S. S., & Wilk, M. B. (1965). An analysis of variance test for normality (complete samples). *Biometrika*, 52(3/4), 591-611.
- South Asian Americans Leading Together, The Asian American Federation (2012, July). *A Demographic Snapshot Of South Asians In The United States July 2012 Update* [Fact sheet] Retrieved from <http://saalt.org/wp-content/uploads/2012/09/Demographic-Snapshot-Asian-American-Foundation-2012.pdf>
- South Asian Americans Leading Together (SAALT). (2007). *Demographic Characteristics Of South Asians In The United States: Emphasis On Poverty, Gender, Language Ability, And Immigration Status* [Fact sheet] Retrieved from



- <http://saalt.org/wp-content/uploads/2012/09/Demographic-Characteristics-of-SA-in-US-20001.pdf>
- Sreeramareddy, C.T., Kutty, N.A.M, Jabbar, M.A.R., & Boo, N.Y. (2012). Physical activity and associated factors among young adults in Malaysia: An online exploratory survey. *Bioscience trends*, 6(3), 103-109.
- Thomas, S. B., Quinn, S. C., Butler, J., Fryer, C. S., & Garza, M. A. (2011). Toward a fourth generation of disparities research to achieve health equity. *Annual review of public health*, 32, 399.
- Unger, J. B., Reynolds, K., Shakib, S., Spruijt-Metz, D., Sun, P., & Johnson, C. A. (2004). Acculturation, physical activity, and fast-food consumption among Asian-American and Hispanic adolescents. *Journal of community health*, 29(6), 467-481.
- United States Department of Health and Human Services. (April 2011). *HHS Action Plan to Reduce Racial and Ethnic Health Disparities: A Nation Free of Disparities in Health and Health Care*. Washington, D.C. Retrieved from [http://minorityhealth.hhs.gov/npa/files/Plans/HHS/HHS\\_Plan\\_complete.pdf](http://minorityhealth.hhs.gov/npa/files/Plans/HHS/HHS_Plan_complete.pdf)
- United States Department of Health and Human Services. (2008). *Physical Activity Guidelines Advisory Committee Report, 2008*. Washington, DC. Retrieved August 5, 2015 from: <http://health.gov/paguidelines/>
- Vyas, A., Chaudhary, N., Ramiah, K., & Landry, M. (2013). Addressing a Growing Community's Health Needs: Project SAHNA (South Asian Health Needs Assessment). *Journal of Immigrant & Minority Health*, 15(3), 577–583. <http://doi.org/10.1007/s10903-012-9655-x>
- Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian medical association journal*, 174(6), 801-809.
- Welk, G. (2002). *Physical activity assessments for health-related research*. Champaign, IL: Human Kinetics.
- Williams, E. D., Stamatakis, E., Chandola, T., & Hamer, M. (2011). Physical activity behaviour and coronary heart disease mortality among South Asian people in the UK: an observational longitudinal study. *Heart*, 97(8), 655-659.
- World Health Organization, (2015). Physical Activity. Retrieved November 23, 2015 from [http://www.who.int/topics/physical\\_activity/en/](http://www.who.int/topics/physical_activity/en/)

- World Health Organization, (n.d.). Global Strategy on Diet, Physical Activity and Health: What is Moderate-intensity and Vigorous-intensity Physical Activity? Retrieved from [http://www.who.int/dietphysicalactivity/physical\\_activity\\_intensity/en/](http://www.who.int/dietphysicalactivity/physical_activity_intensity/en/)
- World Health Organization (2010). *Global recommendations on physical activity for health*. Retrieved August 7, 2015 from <http://www.who.int/dietphysicalactivity/publications/9789241599979/en/>
- Yang, D., Bernstein, L., & Wu, A. H. (2003). Physical activity and breast cancer risk among Asian-American women in Los Angeles. *Cancer*, 97(10), 2565-2575.
- Ye, J., Rust, G., Baltrus, P., & Daniels, E. (2009). Cardiovascular risk factors among Asian Americans: results from a National Health Survey. *Annals of epidemiology*, 19(10), 718-723.
- Zaman, M. J. S., & Jemni, M. (2011). South Asians, physical exercise and heart disease. *Heart*, 97(8), 607-609.