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Physical activity is an important determinant of health throughout the lifespan. Meeting physical activity guidelines has been shown to help improve individuals' health outcomes as well as prevent or slow the progression of more than 20 chronic health conditions. Previous studies have shown that a large number of Arab Americans do not meet the national physical activity guidelines, and little is known about determinants of physical activity in this population. Guided by the Social Ecological Model (SEM) of McLeroy, Bibeau, Steckler, and Glanz (1988), the broad purpose of this cross-sectional descriptive correlational study was to explore the determinants of physical activity in Arab Americans. Specifically, the purpose of the study was to describe the physical activity and investigate the relationships between intrapersonal factors and interpersonal factors and physical activity and to examine to what extent do these factors influence physical activity in Arab Americans.

A total of 140 Arab Americans were recruited and provided data for the study. Age, gender, marital status, country of origin, length of the United States (U.S.), birthplace, current residence, number of family members, religious affiliation, level of education, income, employment status and type of job, body mass index, and health status were reported. Interestingly, a majority of the participants (58.6%) reported a high level of physical activity.

Spearman's rho correlation was used to assess the associations between physical activity and sample characteristics, intrapersonal factors, and interpersonal factors.

Findings revealed statistically significant associations between physical activity level and health status, religiosity, and physical activity self-efficacy. Three simultaneous multiple linear regression models with gamma regression with a log-link function were used to assess to what extent did sample characteristics, intrapersonal, and interpersonal factors influence physical activity level. Multiple regression models revealed that employment and health status were the only significant factors influencing physical activity level when accounting for other sample characteristics, intrapersonal, and interpersonal factors.

INTRAPERSONAL AND INTERPERSONAL FACTORS INFLUENCING PHYSICAL ACTIVITY IN ARAB AMERICANS: A SOCIAL-ECOLOGICAL APPROACH

by

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I dedicate this dissertation to the soul of my father who was my constant inspiration in seeking knowledge and appreciating it. May Allah [God] have mercy on his soul and grant him the highest ranks in Jannah [paradise]. Ameen.

APPROVAL PAGE

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He who does not thank people, does not thank Allah.

—Prophet Mohammad, Peace Be Upon Him

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TABLE OF CONTENTS

Page

LIST OF TABLES ix

LIST OF FIGURES x

CHAPTER

I. INTRODUCTION 1

Physical Activity Guidelines 1
Arab Americans and Physical Activity 4
Physical Activity and Chronic Conditions 5
Significance of the Problem 7
Theoretical Approach 9
Purpose of the Study 11
Chapter Summary 12

II. LITERATURE REVIEW 13

Arab Americans as a Population 14
Physical Activity Conceptual and Operational Definitions 15
Physical Activity in Arab Americans 18
An Ecological Approach to Study Physical Activity in Arab Americans 20
Using the SEM Model to Study Physical Activity in Arab Americans 22
Intrapersonal Factors 23
Interpersonal Factors 25
Organizational Factors 27
Community Factors 28
Public Policy 28
Summary 29

III. METHODOLOGY 30

Design 31
Research Setting 32
Research Sample 32
Recruitment 33

Measures 35
Physical Activity 35
Knowledge of Physical Activity Guidelines 37
Religiosity 38
Acculturation 39
Social Support 42
Enjoyment of Physical Activity 44
Physical Activity Self-Efficacy 45
Sample Characteristics 47
Data Collection Procedures 47
Data Management 48
Data Analysis 50
Human Subjects Protection 52
Chapter Summary 54

IV. RESULTS 56

Description of the Sample Characteristics and Independent and Dependent Variables 57
Physical Activity 61
Knowledge of Physical Activity Recommendation 63
Religiosity 63
Acculturation 64
Social Support 64
Physical Activity Enjoyment 64
Physical Activity Self-Efficacy 65
Question 1: What Sample Characteristics were Associated with Physical Activity Level in Arab Americans? 66
Question 2: What Intrapersonal Factors and Interpersonal Factors were Associated with Physical Activity Level in Arab Americans? 67
Question 3: To What Extent Did Sample Characteristics Influence Physical Activity Level in Arab Americans? 69
Question 4: To What Extent Did Sample Characteristics and Intrapersonal Factors Influence Physical Activity Level in Arab Americans? 69
Question 5: To What Extent Did Sample Characteristics, Intrapersonal Factors, and Interpersonal Factors Influence Physical Activity Level in Arab Americans? 70
Chapter Summary 72

V. DISCUSSION 74

Physical Activity 76
Physical Activity and Intrapersonal and Interpersonal Factors 80
Research Findings through the Lens of SEM 85
Conclusions 85
Limitations 86
Implications and Recommendations 87
Clinical Practice 87
Future Research 88

REFERENCES 90

LIST OF TABLES

Page

Table 1. Physical Activity in Arab Americans 20

Table 2. Sample Characteristics for Continuous Variables (*N* = 140) 57

Table 3. Sample Characteristics for Categorical Variables (*N* = 140) 58

Table 4. International Physical Activity Questionnaire (IPAQ)-Continuous (*N* = 140) 62

Table 5. Descriptive Statistics for Continuous Independent Variables (*N* = 140) 62

Table 6. Reliability of the Instruments Utilized in the Study 63

Table 7. Descriptive Statistics for Categorical Independent and Dependent Variables (*N* = 140) 65

Table 8. Correlation Matrix for IPAQ and Sample Characteristics 67

Table 9. Correlation Matrix for Dependent and Independent Variables 68

Table 10. Multiple Linear Regression Models for Physical Activity Level 71

LIST OF FIGURES

Page

Figure 1. The Social Ecological Model of McLeroy et al. (1988).....22

CHAPTER I

INTRODUCTION

This introductory chapter begins with an overview of the most recent physical activity guidelines. Following this, a discussion about physical activity in Arab Americans is presented. Also, the significance of meeting physical activity guidelines is highlighted in addition to an introduction into the theoretical lens that underlined this research study. Chapter II included a more detailed discussion of the theoretical model used to guide this research study, with a review of the literature. Chapter III included details about the research design and methodology, and Chapters IV and V present the results, discussions, and conclusions, as well as limitations of this study and recommendations for further study.

Physical Activity Guidelines

The most recent physical activity guidelines recommend that adults, age 18 to 64 years, engage in aerobic activities and muscle-strengthening activities. Specifically, the 2018 guidelines indicate that adults should accumulate at least 150 minutes of moderate-intensity activity (such as walking, jogging, swimming, and biking) per week or 75 minutes of vigorous-intensity physical activity (such as lifting weights, using resistance bands, and doing push-ups, or pull-ups) per week (or an equivalent combination of moderate and vigorous physical activities), plus engage in muscle-strengthening activity (such as lifting weights and using resistance bands) 2-3 days per week for additional

health benefits (The United States Department of Health and Human Services [HHS], 2018). Older adults, those 65 years or higher, should follow the same recommendations. However, according to the guidelines, if older adults are not able to meet the adult guidelines, they should be as physically active as their abilities and conditions allow (HHS, 2018). Notably, these specific recommendations for the type of activity and minutes did not change from the prior 2008 recommendations (HHS, 2008).

Meeting physical activity guidelines has been shown to help prevent or slow the progression of more than 20 chronic health conditions (National Institute for Health and Care Excellence [NIHCE], 2018). In fact, physical activity has been shown to significantly reduce the risk of conditions including type 2 diabetes (-40%), cardiovascular disease (-35%), falls, depression and dementia (-30%), joint and back pain (-25%), and colon and breast cancer (-20%) (NIHCE, 2018). Despite that, millions of individuals around the world do not meet these guidelines for physical activity. In the United States, numbers of individuals not meeting national physical activity recommendations are very alarming, suggesting a future increase in adverse health effects and health care expenditures. According to the Centers for Disease Control and Prevention [CDC] (2017a), about half of American adults (46.9%), aged 18 or older, do not meet the nation's minimum physical activity guidelines (minimally defined as meeting the physical activity guidelines for aerobic physical activity). Also, more than 80% of American adults do not meet the recommended guidelines for both aerobic and muscle-strengthening activities (President's Council on Sports, Fitness & Nutrition [PCSFN], 2017).

Thus, not meeting physical activity guidelines is a significant problem negatively impacting millions of Americans. It can contribute to several adverse health outcomes. Evidence shows that individuals who are not meeting physical activity guidelines are at increased risk of developing non-communicable diseases and their adverse events, including major chronic diseases such cardiovascular diseases, diabetes, cancer, and chronic respiratory diseases (Booth, Roberts, Thyfault, Ruegsegger, & Toedebusch, 2017; Booth, Roberts, & Laye, 2012; Bouchard, Blair, & Haskell, 2012). For example, according to the National Heart, Lung, and Blood Institute (2017), individuals not meeting the minimum physical activity guidelines are nearly twice as likely to develop heart disease and stroke as those who are physically active. Also, not meeting physical activity guidelines is significantly associated with higher rates of new and recurrent adverse events of coronary heart disease (Benjamin et al., 2018).

Similarly, not meeting physical activity guidelines is linked to the development of type 2 diabetes and can increase diabetes complications. In fact, not meeting physical activity guidelines is believed to play a role in initiating and accelerating the pathogenesis of type 2 diabetes (Benjamin et al., 2018; Bouchard et al., 2012). In other words, research shows that individuals who are not meeting physical activity guidelines are at an increased risk of developing diabetes and having more difficulties in management of this condition, which can increase the risk of diabetes complications (Bouchard et al., 2012; Hamburg et al., 2007; Wang, Greer, Porter, Kaur, & Youngstedt, 2016). Moreover, not meeting the minimum physical activity guidelines has been found to play a vital role in the development of various types of cancers. The World Health Organization (WHO,

2010) estimates that not meeting the minimum physical activity guidelines is linked to approximately 21–25% of breast and colon cancers.

Adverse health effects of not meeting the physical activity guidelines are not limited to the previously mentioned issues. In fact, not meeting minimum physical activity guidelines has been identified as an independent leading risk factor for death. In the United States, it is estimated that not meeting the minimum physical activity guidelines accounts for about 10% of premature deaths annually (HHS, 2016). Also, not meeting the minimum physical activity guidelines has been recognized as a serious public health problem negatively impacting the health-care expenditures in the United States, given that it costs the country about $117 billion each year, including direct and indirect health-related costs and other costs associated with loss of productivity (CDC, 2017c).

Arab Americans and Physical Activity

The Arab American population is one of the minority groups in the United States that has been impacted mainly by not meeting the minimum physical activity guidelines. The term “Arab American” refers to more than 3.9 million Americans who trace their ancestry/heritage back to one of the 22 Arabic-speaking countries in the Middle East and North Africa (Arab American Institute [AAI], n.d.b). Research studies have shown that a large number of Arab Americans do not meet the national recommendations for physical activity, which puts them at higher risk of developing non-communicable diseases and having more adverse effects (Hekman, Weir, Fussman, & Lyon-Callo, 2015; Qahoush, Stotts, Alawneh, & Froelicher, 2010; Sarsour, Tong, Jaber, Talbi, & Julliard, 2010; Tailakh et al., 2013). Research studies conducted on physical activity in Arab Americans

have shown that the percentage of not meeting the nation's minimum physical activity guidelines ranged from approximately 40% to 86% (Qahoush et al., 2010; Sarsour et al., 2010; Tailakh et al., 2013). In terms of meeting the recommended guidelines for both aerobic and muscle-strengthening activities, the 2013 Arab Behavioral Risk Factor Surveillance System (BRFSS) report, published by the Michigan Department of Health and Human Services, showed that only 11.4% of Arab Americans adults met these guidelines (Hekman et al., 2015). The report showed that the percentage is lower in Arab American women, with only 9.7% meeting the recommended guidelines for both aerobic and muscle-strengthening activities (Hekman et al., 2015).

Physical Activity and Chronic Conditions

Given that not meeting the nation's minimum physical activity guidelines is an independent risk factor for many major chronic conditions, it is important to emphasize the disparities in morbidity rates of major chronic conditions in the Arab American population. For example, in a cross-sectional study that included a sample of 126 Arab Americans living in California, authors reported a high prevalence of hypertension (36.5%) and pre-hypertension (39.7%) (Tailakh et al., 2013). Similarly, in another cross-sectional study including a sample of 812 Arab American women living in Michigan, authors indicated that the overall prevalence of self-reported heart disease was 7.1% and reported that Arab American women were four times more likely to have heart disease than the 729 Black American women included in the study (Jamil et al., 2008). Similarly, in a study that included a sample of 924 Arab Americans recruited from 34 different

community centers in Michigan, Aswad (2001) indicated that 7.6% of participants reported having heart disease, and 44% reported having hypertension.

Moreover, four studies explored diabetes in Arab Americans and showed that the prevalence ranged from 4.8% to 23% (Aswad, 2001; Dallo & Borrell, 2006; Jaber, Brown, Hammad, Zhu, & Herman, 2004; Jaber et al., 2003). Diabetes appears to be highly prevalent in this population, given that three of the four studies reported a prevalence that is higher than the national prevalence of diabetes in the U.S. general population (9.4%) (CDC, 2017b). Furthermore, cancer rates appear to be higher in Arab Americans when compared to other ethnic/racial groups in the United States. In a study using the Surveillance, Epidemiology, and End Results (SEER) data obtained from three different regions (California, Detroit, and New Jersey), authors compared Arab American cancer incidence to those of other ethnic/racial groups in the same regions (Bergmans et al., 2014). Authors reported that Arab American men had higher rates of lung and prostate cancer than Hispanic men and had higher rates of bladder cancer than Hispanic and Black men. Other studies showed that the risk of developing diabetes, certain types of cancers, and mental health problems was higher among Arab Americans than that of Whites and some other ethnic/racial minorities (Dallo, Schwartz, Ruterbusch, Booza, & Williams, 2012; El-Sayed & Galea, 2009; El-Sayed, Tracy, Scarborough, & Galea, 2011; Nasseri & Moulton, 2011).

Also, the mortality rate of several major chronic conditions in the United States is higher in Arab Americans than those of other racial/ethnic groups (Dallo et al., 2012; El-Sayed & Galea, 2009; El-Sayed et al., 2011; Nasseri & Moulton, 2011). For instance, it

was reported that the cardiovascular mortality rate among Arab Americans is higher than that of Whites (Dallo et al., 2012; El-Sayed et al., 2011). Using the proportional mortality ratio, it has been reported that first-generation and second-generation Arab Americans have higher odds of having heart disease and stroke than non-Hispanic Whites (Nasseri & Moulton, 2011; Nasseri, 2008). Similarly, mortality rates attributed to diabetes and cancer (overall) are higher among Arab Americans than Whites (Dallo et al., 2012; El-Sayed & Galea, 2009; El-Sayed et al., 2011). As an independent risk factor for chronic conditions, not meeting the nation's minimum physical activity guidelines can widen the disparities identified in the literature and place this minority group at a higher risk of developing more chronic conditions and complications. It could potentially increase the economic burden associated with these chronic conditions.

Physical activity is a complex health behavior. Evidence shows that physical activity is a multidimensional behavior that is determined by many factors at different levels (Buchan, Ollis, Thomas, & Baker, 2012; Canfield, 2012; Miles, 2007; Simons-Morton, McLeroy, & Wendel Simons-Morton, 2012). Physical activity is influenced by individual and social factors, and by the environmental factors and public policy. It is important to understand the factors contributing to physical activity in Arab Americans in order to have a more in-depth understating of this complex behavior (Buchan et al., 2012; Humpel, Owen, & Leslie, 2002; Sallis & Glanz, 2006).

Significance of the Problem

Previous research has shown that a large number of Arab Americans do not meet the national recommendations for physical activity. Not meeting these guidelines is a

serious problem affecting a large number of Arab Americans, which places this minority group at a higher risk of adverse health outcomes. It can place them at a high risk of developing chronic diseases such as cardiovascular diseases, diabetes, and cancers (Benjamin et al., 2018; Bouchard et al., 2012; HHS, 1998). Conditions and negative consequences associated with this problem can decrease the quality of life, especially older adult Arab Americans. They can cause significant mental health problems and emotional distress, such as anxiety and depression (Benjamin et al., 2018; Bouchard et al., 2012; HHS, 1998). Also, not meeting physical activity guidelines can place a significant economic burden on this population (Carlson, Fulton, Pratt, Yang, & Adams, 2015).

This minority group has characteristics that are unique from the general U.S. population. Arab Americans have their own language, culture, historical identity, traditional norms, family structure, gender roles, health beliefs, and religious affiliation distinguishing them from other ethnicities in the United States (Amer & Awad, 2016; Hammad, Kysia, Rabah, Hassoun, & Connelly, 1999; Nassar-McMillan, Ajrouch, & Hakim-Larson, 2014). However, whether and to what degree these factors influence physical activity among Arab Americans is unknown. Thus, it is essential to investigate potential factors contributing to physical activity among Arab Americans in order to expand and enrich the scientific knowledge about the health needs of this population. Also, studying physical activity in this target population can assist in shaping and improving the effectiveness of future health interventions for this group. Such efforts

may ultimately help promote adherence to national goals of reducing health disparities and improving the health of all Americans.

Theoretical Approach

A social-ecological approach provides a comprehensive framework to explore the main factors influencing physical activity in Arab Americans. Several ecological models have been developed over the past 3 decades. However, all of these models are built upon the ecological systems theory of child development, which was developed by Urie Bronfenbrenner (Bronfenbrenner, 1979; McLeroy, Bibeau, Steckler, & Glanz, 1988; Simons-Morton et al., 2012). Bronfenbrenner introduced the first ecological conceptual model in the 1970s and developed the theory in the 1980s (McLeroy et al., 1988). The *Ecological Systems Theory* assumes that individuals encounter different levels of environments that influence their behaviors in varying degrees (Bronfenbrenner, 1979; 1986). Bronfenbrenner believed that individuals are influenced by everything in their surrounding environment. However, Bronfenbrenner also indicated that there are four different environmental levels—the microsystem, mesosystem, exosystem, and macrosystem. The microsystem, which is the first and the most influential level, refers to relations or interactions between the individual and his/her family, friends, peers, and significant others. It includes activities and interactions that take place in the individual's immediate surroundings (Bronfenbrenner, 1979, 1986). The mesosystem (the second level) refers to the relationship or interactions between two (or more) elements or parts of the microsystem. The exosystem (the third level) refers to the environmental setting(s) that indirectly impact the individual; these are setting(s) in which the individual is not an

active participant or directly involved, but still affects him/her. Finally, the macrosystem (the fourth level) refers to society's laws, values, beliefs, and customs; notably, the macrosystem embeds the microsystem, mesosystem, and exosystem (Bronfenbrenner, 1979). In 1986, Bronfenbrenner added a fifth level of influence, the chronosystem. This level refer to any changes that take place over time in both the individual and environmental levels (Bronfenbrenner, 1986). This level can include all changes that individuals encounter over time, such as having new injuries and diseases. It is essential to mention that Bronfenbrenner indicated that the interactions between individuals and these environmental levels are dynamic, changing, and a two-directional process (e.g., they influence each other; Bronfenbrenner, 1979; 1986).

Building upon Bronfenbrenner's (1979) *Ecological Systems Theory*, McLeroy et al. (1988) developed a *Social Ecological Model* (SEM) to understand the factors influencing health behaviors (e.g., physical activity). The SEM of McLeroy et al. (1988) identifies five levels of influence, including intrapersonal, interpersonal, organizational, community, and public policy. The intrapersonal level of influence refers to the individual characteristics that directly impact behaviors such as gender, knowledge, attitudes, beliefs, and personal skills (McLeroy et al., 1988). Interpersonal level of influence refers to the individual's social network and social support systems, including family, friends, peers, and significant others. Institutional/organizational level of influence refers to the characteristics of organizations or institutions (e.g., workplace) that the individuals belong to, including the rules and regulations of these organizations or institutions (McLeroy et al., 1988). The community level of influence refers to the

characteristics of the community(s) that the individuals belong to or live in (e.g., the neighborhoods in which individuals live). Public policy level of influence refers to local, state, and national laws and policies that impact health behaviors (McLeroy et al., 1988). McLeroy et al. (1988) suggested that behaviors are determined by these five levels of influence and indicated that the human behaviors both influence and are influenced by each of the five levels of influence (reciprocal causation); the authors explained that the levels of influence impact each other. For example, an Arab American with low socioeconomic status (intrapersonal level of influence), living in a disadvantaged neighborhood (community level of influence), may not engage in physical activity because of a lack of knowledge (intrapersonal level of influence) about health benefits of physical activity. Furthermore, a lack of available resources for physical activity (public policy level of influence) may influence the level of physical activity. Also, the fact that this individual lives in a disadvantaged neighborhood and with a lower socioeconomic status may limit his or her ability to access a clean and safe physical activity resources (community and public policy levels of influence) or work in an organization that has rules in place to promote physical activity (institutional/organizational level of influence).

Purpose of the Study

As discussed, research studies have shown that a large number of Arab Americans do not meet the national recommendations for physical activity. Identifying the major determinants of physical activity in Arab Americans may help reduce the negative consequences associated with it and improve the health outcomes of this population. Guided by the SEM, the overall purpose of this study is to describe the physical activity

and investigate the major determinants of physical activity in Arab Americans. As McLeroy et al. (1988) indicated, the first level of influence (intrapersonal) has the highest impact on an individual's behavior (e.g., physical activity). Interpersonal factors cause the second-highest impact on an individual's behavior. Thus, this study focused on the first two levels of influence identified in the SEM (intrapersonal and the interpersonal levels of influence). Given the current state of the science of physical activity in Arab Americans, this study specifically examined knowledge of physical activity guidelines, enjoyment of physical activity, and physical activity self-efficacy as potential intrapersonal factors, in addition to family and social support, acculturation, and religiosity as potential interpersonal factors impacting physical activity. Although little is known about the determinants of physical activity in Arab Americans, these factors appear to impact primarily physical activity in this group.

Chapter Summary

In this chapter, physical activity guidelines and the importance of meeting these guidelines were presented. Not meeting physical activity guidelines is a significant problem contributing to several adverse health outcomes. This problem profoundly impacts the Arab-American population. It is essential to identify the determinants of physical activity among this population in order to have a better understating of this problem and to help shape the future development of culturally appropriate intervention strategies or programs to promote physical activity in this group. A sociological, ecological systems approach is useful to frame the investigation of physical activity and its main contributing factors among this population.

CHAPTER II

LITERATURE REVIEW

Evidence shows that a large number of Arab Americans do not meet physical activity guidelines, and little is known about factors contributing to physical activity in this population. Guided by the Social Ecological Model (SEM) of McLeroy et al. (1988), the purpose of the study was to describe physical activity and investigate: (1) the relationships between intra-personal sample characteristics (age, gender, marital status, country of origin, length of the U.S. residency, whether born in the United States or not, current residence, number of family members, religious affiliation, level of education, income, employment status, body mass index (BMI), and health status), intra-personal factors (knowledge of physical activity guidelines, religiosity, physical activity self-efficacy, and physical activity enjoyment) and inter-personal factors (social support and acculturation) and physical activity levels; and (2) to examine to what extent do these factors influence physical activity in Arab Americans. In this chapter, more information about physical activity and Arab Americans is provided. Conceptual and operational definitions of physical activity are discussed. An overview of the available literature on physical activity among this population is presented. Through the lens of the Social Ecological Model, a review of the literature on factors contributing to physical activity among this population is provided.

Arab Americans as a Population

The term "Arab American" refers to more than 3.9 million Americans who trace their ancestry/heritage back to one of the 22 Arabic-speaking countries in the Middle East and North Africa (AAI, n.d.b). The Arab world consists of 22 Arabic-speaking countries, namely: Algeria, Bahrain, the Comoros Islands, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Mauritania, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, United Arab Emirates, and Yemen (AAI, n.d.b). In the Arab world, the majority of people are Muslims. However, there are millions of Christian Arabs and thousands of Jewish Arabs (American-Arab Anti-Discrimination Committee [ADC], 2009). The majority of Arab Americans are Christian (63%), while 24% are Muslims (AAI, n.d.b). The U.S. Census Bureau estimated that the total number of Arab Americans is approximately 1.9 million (Asi & Beaulieu, 2013). This estimation was based on the findings from the American Community Survey ancestry question (What is your ancestry or ethnic origin?). However, the AAI reported that at least 3.9 million Americans are of Arab descent. Arab Americans have different degrees of skin color. Arab Americans live in all states, but about two-thirds of them live in 10 states, and one-third lives in California, New York, and Michigan (AAI, n.d.b). Furthermore, the number of Arab Americans is expected to increase in the next several years. In 2015, the U.S. government authorized 70,000 refugees to be resettled in the United States and announced to accept 85,000 more refugees in 2016 and 100,000 in 2017 (Gordon, Smale, & Lyman, 2015; Human Rights First, 2015). Also, as the Syrian crisis continues (as well as the other crises in Arab countries), the number of Arabs migrating to the U.S. is

expected to increase dramatically in the next several years (Gordon et al., 2015; Human Rights First, 2015).

Unfortunately, there are no national surveillance data available on the health of Arab Americans that could help to investigate the health needs of this minority group. This is mainly due to the racial/ethical classification, given that the U.S. Census Bureau and other governmental agencies classify U.S. citizens who trace their ancestry back to Arab countries as white, which does not accurately classify or represent Arab Americans (Asi & Beaulieu, 2013; El-Sayed & Galea, 2009; El-Sayed et al., 2011). Despite that, research studies conducted on Arab Americans have shown that a large number of them are not meeting physical activity guidelines (Hekman et al., 2015; Qahoush et al., 2010; Sarsour et al., 2010; Tailakh et al., 2013).

Physical Activity Conceptual and Operational Definitions

Physical activity is conceptually defined as "any bodily movement that is produced by the contraction of skeletal muscle and that substantially increases energy expenditure" (Centers for Disease Control and Prevention [CDC], 2017, para. 1). Physical activity is a broad term and includes a wide range of activities performed during sports, leisure-time, transportations, and occupations and household tasks (Bouchard et al., 2012). Thus, defining physical activity requires identifying the time spent engaging in physical activity as well as the forms of physical activity performed. Contrary to the term "*physical activity*," the term "*physical inactivity*" is commonly used in the literature. Although the definition of this term is inconsistent in the literature, the majority of researchers define it based on adherence to the national guidelines for physical activity.

In other words, individuals who do not meet the minimum recommended level of physical activity are considered physically inactive. Thus, physical inactivity is defined as an activity level that is insufficient to meet current national minimum guidelines for physical activity (Gonzalez, Fuentes, & Marquez, 2017; Lee et al., 2012; Murtagh et al., 2015).

A wide range of methods can be used to define physical activity operationally. By convention, three methods are commonly used: self-report, observational, and motion sensor measures. Self-report measures may be interviewer-administered or self-administered and may include activity logs, retrospective measures, or proxy measures (Etnier, 2008; Sylvia, Bernstein, Hubbard, Keating, & Anderson, 2014). Activity logs evaluate individuals' current levels of physical activity for a certain time. For example, *Bouchard's Physical Activity Record* (BAR) is a commonly used activity long that requires individuals to write down their activities every 15 minutes over three days (Sylvia et al., 2014). Retrospective measures usually require individuals to recall their physical activity participation (or habitual participation) from the past (e.g., days, weeks, months, or years). For example, the *International Physical Activity Questionnaire (IPAQ)* measures four types of activities (leisure-time, transportation, occupational, and household activities). The IPAQ requires individuals to recall their participation in these types of activities in the past 7 days (Forde, n.d.; International Physical Activity Questionnaire [IPAQ], 2016). The third category of self-reported measures is by proxy; a participant's proxy (e.g., parent, partner, or caregiver) completes these measures (Etnier, 2008; Sylvia et al., 2014). Proxy is often used when individuals are unable or unwilling

to self-report due to cognitive and/or communicative problems. For example, a caregiver who lives with a patient experiencing cognitive and communicative problems can complete a functional assessment to determine the level of function of the patient. The advantages of self-report measures are that these types of measures are easy to administer to large groups, they have established reliability and validity, and they are relatively inexpensive. However, a limitation of self-report measures is the potential for an inaccurate estimation of physical activity because participants may underestimate or overestimate physical activity (Etnier, 2008; Sylvia et al., 2014).

Another method to measure physical activity is through direct observation, typically obtained qualitatively by a researcher. Direct observation is often used when assessing the physical activity of individuals or groups in a specific setting or under specific conditions. An advantage of direct observation is that it provides a more objective measure of physical activity. However, limitations of direct observation are that the individual (or group) may alter their "normal" behavior (due to being observed), it requires extensive training for researchers (to score and correctly evaluate), and it is labor-intensive, and thus is usually more expensive (Etnier, 2008; Sylvia et al., 2014).

The third method to objectively measure physical activity is to use motion sensor measures (e.g., pedometers and accelerometers). Motion sensors are mechanical and electronic devices worn on the body to provide an estimate of physical activity done over some time. These types of devices have gained popularity in recent years as a result of rapid digital technology advancements. In the basic form, pedometers measure the number of steps an individual takes (Etnier, 2008; Sylvia et al., 2014). Accelerometers

are more sophisticated than pedometers and measure the rate and magnitude of body movements. Accelerometers are capable of measuring the intensity, frequency, and duration of physical activity. A wide variety of pedometers and accelerometers are available. For example, an individual may wear an accelerometer, such as Fitbit Alta Tracker®, to calculate average daily steps during physical activity. Advantages of motion sensor measures include that they are noninvasive, that they can measure physical activity over time, and that many are relatively inexpensive (Etnier, 2008; Sylvia et al., 2014). A limitation of motion sensor devices is that they are not able to accurately measure specific types of activity (e.g., swimming, biking, and skateboarding; Etnier, 2008; Sylvia et al., 2014). Also, participant adherence to following directions for using motion sensor devices is a concern, which may result in inaccurate results.

Other more invasive methods estimate energy expenditure to provide an indirect measure of physical activity. For example, energy expenditure can be measured indirectly by measuring the amount of oxygen consumed, and carbon dioxide produced or directly by measuring body heat at rest or during exercise (Etnier, 2008; Sylvia et al., 2014). For example, the Doubly Labeled Water Technique and Metabolic Chambers are two methods commonly used to estimate energy expenditure. While these methods estimate energy expenditure more accurately, they are complicated, expensive, and invasive (Etnier, 2008; Sylvia et al., 2014).

Physical Activity in Arab Americans

Evidence suggests that a large number of Arab Americans do not meet the national guidelines for physical activity (Hekman et al., 2015; Qahoush et al., 2010;

Sarsour et al., 2010; Tailakh et al., 2013). In a study investigating physical activity behaviors among a sample of 353 Arab Americans living in New York, authors reported that nearly half of the subjects (47%) indicated that they never exercised (Sarsour et al., 2010). Similarly, Qahoush et al. (2010) surveyed a sample of 180 Arab American women living in Southern California to examine health behaviors and found that even fewer (40.4%) of the participants did not meet the 2008 physical activity guidelines. In another study conducted in Southern California, Tailakh et al. (2013) included a sample of 126 Arab Americans (men and women) and found that about 86% of the subjects did not meet the minimum physical activity guidelines. These findings are congruent with the findings from the 2013 Arab Behavioral Risk Factor Surveillance System (BRFSS) report, published by the Michigan Department of Health and Human Services (Hekman et al., 2015). The report showed that 63% of Arab adults in Michigan did not meet the minimum physical activity guidelines.

Additionally, the report showed that 88.6% of Arab adults in Michigan did not meet the aerobic and muscle-strengthening physical activity guidelines. Furthermore, the report stated that the rate of not meeting the aerobic and muscle-strengthening physical activity guidelines was very high in Arab adult women; 90.3% did not meet the aerobic and muscle-strengthening physical activity guidelines (Hekman et al., 2015). These numbers clearly show that Arab Americans are less physically active than the general U.S. population, given that about 46.9% of American adults (aged 18 or older) do not meet the minimum physical activity guidelines and about 80% of American adults do not meet the aerobic and muscle-strengthening physical activity guidelines (CDC, 2017b;

President's Council on Sports, Fitness & Nutrition [PCSFN], 2017). Table 1 displays a summary of the literature discussed above.

Table 1

Physical Activity in Arab Americans

Authors	Year	Sample	Not meeting minimum PA	Not meeting full PA	Note
Qahoush et al.	2010	180 subjects; only women; mean age: 37.6 years, half (50%) with chronic condation(s) & half (50%) healthy.	40.4%	NR	
Sarsour et al.	2010	353 subjects; 57% women; age(in years)20–35 (34%), 35–50 (40%), 50–64 (15%), 65+ (6%); mean age: NR; less than half (44%) healthy, 56% with chronic condation(s)	NR	NR	47% never exercised
Tailakh et al.	2013	126 subjects; 41.3% women; mean age: 41.75 years; 36.5% with HTN, 39.7% with Pre-HTN, 23.8% with no HTN; mean BMI: 29.77 kg/m2.	86%	NR	
Hekman et al.	2015	536 subjects; 47.8% female; age (in years): 18–44 (60.7%), 45–64 (28.9%), 65+(10.3%); mean age: NR.	63%	88.6%	A report published by Michigan Department of Health and Human Services

Note. Not meeting minimum PA, percentage of subjects not meeting the minimum physical activity guidelines; Not meeting full PA, percentage of subjects not meeting both the aerobic and muscle strengthening physical activity guidelines; BMI, body mass index; HTN, hypertension; NR, not reported.

An Ecological Approach to Study Physical Activity in Arab Americans

Over the past several decades, several theoretical and conceptual approaches have been developed and utilized to explore this complex behavior. These approaches can be

classified into three approaches, the staged-based approach, the cognitive-based approach, and the ecological approach (Buchan et al., 2012). The stage-based approach can assist in developing interventions targeting Arab Americans. However, the current state of science does not support its use, given that little is known about determinants of physical activity in Arab Americans (Amer & Awad, 2016; Benjamin & Donnelly, 2013; El-Sayed & Galea, 2009; Nassar-McMillan et al., 2014). The cognitive-based approach can be used to study physical activity in Arab Americans. However, this approach does not provide a comprehensive theoretical view of various factors influencing physical activity, given that it does not take into account a number of factors (e.g., public policy and environmental factors) that have been shown to influence physical activity behavior (Buchan et al., 2012; Canfield, 2012; Miles, 2007; Simons-Morton et al., 2012). Thus, an ecological approach provides a more comprehensive theoretical framework to understand the key determinants of physical activity behavior in Arab Americans because it takes into account individual factors as well as social, community, public policy, and environmental factors (Buchan et al., 2012; McLeroy, Bibeau, Steckler, & Glanz, 1988).

Based upon the constructs of *the Ecological Systems Theory*, McLeroy et al. (1988) developed the SEM to have a better understanding of the factors influencing health behaviors. In the SEM of McLeroy et al. (1988), the authors argued that five levels of influence determine an individual's behavior (e.g., physical activity): intrapersonal factors, interpersonal factors, organizational factors, community factors, and public policy factors. Based on the model, the individual's behavior both influences and is influenced by the other levels of influence (reciprocal causation), and levels of

influence affect each other. As shown in Figure 1, the SEM of McLeroy et al. (1988) includes five concentric circles (representing the five levels of influence) that have the individual's behavior in the center.

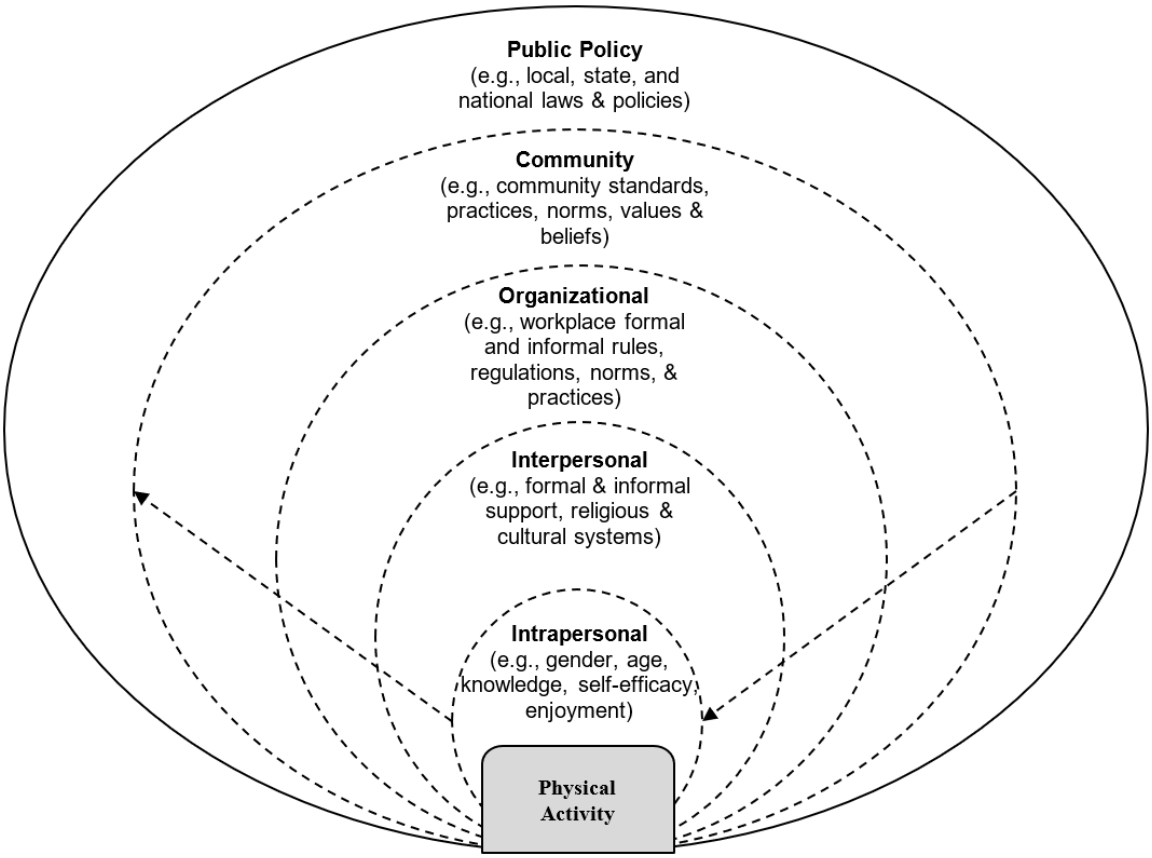

Figure 1. The Social Ecological Model of McLeroy et al. (1988). Adapted from "An Ecological Perspective on Health Promotion Programs," by K. R. McLeroy, D. Bibeau, A. Steckler, & K. Glanz (1988), *Health Education Quarterly, 15*(4), p. 335.

Using the SEM Model to Study Physical Activity in Arab Americans

It has become apparent in the past 2 decades that individual and social factors not only affect physical activity, but community, public policy, and environmental factors also influenced physical activity (Buchan et al., 2012; Humpel et al., 2002; Sallis &

Glanz, 2006). Factors identified in the literature that impact physical activity behavior among Arab Americans may be explained through the lens of the SEM, including intrapersonal, interpersonal, organizational, community, and public policy factors.

Intrapersonal Factors

Intrapersonal factors represent the individual characteristics that influence behavior (physical activity) such as gender, knowledge, attitudes, beliefs, and skills (McLeroy et al., 1988). We know little about the intrapersonal factors impacting physical activity behavior in Arab Americans. However, gender seems to be a factor influencing physical activity behavior in this population. Arab American men are more likely to be physically active as compared to Arab American women (Hekman et al., 2015; Kahan, 2015), which seems to be due to the beliefs about family responsibilities and obligations, as well as beliefs about modesty. For example, it was reported in the literature that due to modesty and cultural beliefs a large number of Arab American women, especially Muslims, do not feel comfortable exercising in the presence of men, especially if men are strangers to them (Benjamin & Donnelly, 2013; Caperchione, Kolt, & Mummery, 2009; Kahan, 2011). Also, many Arab American women do not engage in certain types of activities in public places due to the need to adhere to certain cultural expectations in terms of clothing. Moreover, influenced by cultural and social norms, some Arab American women are expected to take care of their children and household activities and give more priorities for family and social obligations than physical activity. Taking time away from such responsibilities or not adhering to these expectations can be deemed inappropriate (Caperchione et al., 2009; Hoebeke, 2008; Mansfield, 2009).

Self-efficacy, which refers to subjects' beliefs about their ability to perform physical activity, is another factor. Research shows that individuals with high self-efficacy are more likely to be physically active (Lewis, Williams, Frayeh, & Marcus, 2016; Parkinson, David, & Rundle-Thiele, 2017). In a study including a sample of 180 Arab American women living in Southern California, authors found that high self-efficacy was a significant and strong predictor of physical activity (Qahoush et al., 2010). Also, religiosity, which is defined by Delener (1990) as the degree to which beliefs in specific religious values and ideals are held and practiced by an individual, has been reported to impact physical activity behavior. A qualitiative study exploring physical activity reported that Arab Americans believe that religiosity plays a significant role in physical activity participation (Kahan, 2011).

Physical activity enjoyment, defined as how subjects perceive engaging in physical activity in terms of how it is enjoyable, is another factor. No study directly examined the influence of enjoyment of physical activity on the physical activity behaviors of Arab Americans. However, in a cross-sectional study exploring physical activity in a sample of 180 Arab Americans, it was reported that about one-third of the participants indicated that they did not enjoy exercise and thought it was tedious and painful (Qahoush et al., 2010). Research has shown that individuals with higher levels of physical activity enjoyment are more likely to be physically active than individuals with lower levels of physical activity enjoyment (Lewis et al., 2016; Ungar, Wiskemann, & Sieverding, 2016).

Evidence shows that knowledge of physical activity recommendations is associated with physical activity behavior. For example, in a study that included 2,279 college students, the authors found that knowledge of physical activity recommendations significantly predicted adherence to national recommendations of physical activity (Abula, Gröpel, Chen, & Beckmann, 2018). No study directly assessed knowledge of physical activity recommendations in Arab Americans. However, research has shown that Arab Americans have limited access to healthcare, lower literacy rates, and encounter language barriers that may limit their knowledge of the current recommendations for physical activity and the need for adhering to these recommendations (Hammad et al., 1999; Huebler, Lu, & UNESCO Institute for Statistics, 2013; Sarsour et al., 2010; Worabo et al., 2016).

Interpersonal Factors

Interpersonal factors represent the individual's social network and social support systems, including family, friends, peers, and significant others; it also includes factors that are directly impacted by an individual's social network and social support systems such as acculturation (McLeroy et al., 1988). As discussed, we know little about the interpersonal factors impacting physical activity behavior in Arab Americans. However, social support is a factor that influences physical activity behavior in this population. Social support is defined as the experience of being valued, respected, cared about, and loved by family, friends, and other social network members (Gurung, 2006). Evidence shows that encouragement and social support from family and friends are associated with the level of physical activity in which one engages (Benjamin & Donnelly, 2013; Kahan,

2011; Shuval et al., 2008). Arabs (not exclusively Arab Americans) with strong family and social support are more physically active than those with weak family and social support. In a qualitative study exploring factors that influence physical activity in a sample of 45 Arabs, authors reported that participants indicated that they believed their family and social support systems highly influenced their physical activity levels; having strong family and social support systems is believed to be a facilitator to physical activity participation (Shuval et al., 2008). Kahan (2011) reported similar findings.

Acculturation is one of the predictors for physical activity behavior in Arab Americans (Jadalla, Hattar, & Schubert, 2015; Kahan, 2011; Tailakh et al., 2016). Acculturation is defined as the process of learning that occurs when individuals from different cultural backgrounds are exposed to prolonged, continuous, first-hand contact with a new culture (Berry, 1992). Studies have shown that the degree of acculturation is associated with physical activity behavior. Arab Americans who are less acculturated are less physically active. In a descriptive cross-sectional study involving 297 adult Arab Americans living in California, Jadalla et al. (2015) reported that being more acculturated predicted better physical activity. In another cross-sectional study, Tailakh et al. (2016) reported similar findings. The authors studied a sample of 126 Arab Americans from California and indicated that more acculturated Arab Americans were found to be more likely to be physically active. Kahan (2011) reported that physical activity in the Middle East is less formalized, structured, and planned; it is relatively incidental and unplanned. Contrarily, Arab Americans believe that in the United States, there is more emphasis on engaging in formal exercise and recreational physical activity (Kahan, 2011). Also, as

Kahan (2011) discussed, Arab Americans who are unacculturated may not know about available physical activity opportunities or may not have a social network of physically active or supportive individuals. Thus, evidence suggests that the degree of acculturation influences physical activity behavior in Arab Americans.

Organizational Factors

Organizational factors refer to characteristics of organization or institutions (e.g., workplace) that the individual belongs to, including the rules and regulations of these organizations or institutions (McLeroy et al., 1988). This level of influence refers to institutional/organizational rules and obligations that affect the behavior. For instance, individuals may spend extended periods sitting in the workplace or performing schoolwork or job duties or responsibilities, which can reduce their engagement in physical activity. In a study exploring Arab American college students' perceptions of physical activity, the authors reported that students indicated that school-related tasks left little time for physical activity (Kahan, 2011).

Minority groups with low income tend to have long working hours (or have multiple jobs) and to face time constraints, which can place them at risk of being less physically active (Burgard & Lin, 2013; Shuval, Li, Gabriel, & Tchernis, 2017). Whereas, it has been reported that high-income individuals tend to have sedentary jobs (Kim & Welk, 2015; Shuval et al., 2017). Thus, it is important to consider such organizational factors when studying physical activity in Arab Americans.

Community Factors

Community factors refer to the characteristics of the community(s) to which the individual belongs (e.g., Arab American community) or in which the individual lives (e.g., the neighborhood in which an Arab American lives; McLeroy et al., 1988). Community factors is an extensive level of influence, which includes cultural norms, rules, and other characteristics of the community to which the individual belongs, as well as the resources available in the community in which they are living (e.g., parks, recreational facilities, and churches or mosques). As discussed, cultural beliefs play a significant role in shaping the activity levels of Arab Americans, as well as the types of physical activity in which they engage (Benjamin & Donnelly, 2013; Kahan, 2011; Riley, Mili, Trinh-Shevrin, & Islam, 2016; Tailakh et al., 2013; Walseth & Fasting, 2003).

Public Policy

Public policy refers to local, state, and national laws and policies that impact the behavior (e.g., physical activity; McLeroy et al., 1988). No study has examined the impact of local, state, and national laws and policies on physical activity behavior in Arab Americans. However, it is important to note that Arab Americans' classification, as White, by federal and state agencies limit the ability to study their physical activity behaviors in this population at the national or state level. Research shows that public policy can highly impact physical activity behavior. For example, *The Transportation Bill* has influenced transportation policies at the national, state, and local levels. The bill calls for funding and increasing access to safe and efficient transportation modes (Dietz, Benken, & Hunter, 2009; Eyler, Budd, Camberos, Yan, & Brownson, 2016; Frank &

Lachapelle, 2009). This includes supporting public transportation and the creation of bicycle lanes and pedestrian walkways, recreational trails, and other facilitators that promote physical activity. Such changes and regulations have helped to promote physical activity and increase the number of individuals who meet the national physical activity recommendations (Dietz et al., 2009; Eyler et al., 2016; Frank & Lachapelle, 2009).

Summary

This review of literature reflects current knowledge on physical activity in Arab Americans. Several gaps in the literature are noted. However, current evidence suggests that Arab Americans do not meet physical activity guidelines. As reported in the literature, findings on potential contributing factors are inconsistent. Further research is warranted to ascertain the factors that influence physical activity in Arab Americans. Based on the SEM model, factors from intrapersonal and interpersonal levels appear to influence physical activity in Arab Americans highly and should be examined, given that the first and second levels of influence in the SEM have the highest impact on physical activity (McLeroy et al., 1988). To adequately assess physical activity and potential factors contributing to physical activity in this population, it is important to determine whether knowledge of physical activity guidelines, self-efficacy, physical activity enjoyment, social support, and religious and cultural beliefs are associated with the level of physical activity. Additionally, it is important to investigate to what extent these factors influence physical activity in this population.

CHAPTER III

METHODOLOGY

Evidence shows that a large number of Arab Americans do not meet physical activity guidelines, and we know little about factors contributing to physical activity in this population. Guided by the Social Ecological Model (SEM) of McLeroy et al. (1988), the purpose of the study was to describe physical activity and investigate: (1) the relationships between intra-personal sample characteristics (age, gender, marital status, country of origin, length of the U.S. residency, whether born in the U.S. or not, current residence, number of family members, religious affiliation, level of education, income, employment status, body mass index (BMI), and health status), intra-personal factors (knowledge of physical activity guidelines, religiosity, physical activity self-efficacy, and physical activity enjoyment) and inter-personal factors (social support and acculturation) and physical activity levels; and (2) to examine to what extent do these factors influence physical activity in Arab Americans. This chapter includes a description of the research methodology used, including the rationale for the selected research approach, an overview of the research design, research setting, research sample, recruitment strategies, measures, data collection procedures, data management, data analysis, and human subjects protection. This study addressed the following research questions:

1. What sample characteristics were associated with physical activity in Arab Americans?

2. What intrapersonal factors (knowledge of physical activity guidelines, religiosity, physical activity self-efficacy, and physical activity enjoyment) and interpersonal factors (social support and acculturation) were associated with physical activity in Arab Americans?
3. To what extent did sample characteristics (age, gender, marital status, religion, whether born in the United States or not, length of stay in the United States, education, employment, BMI, and health status) influence physical activity in Arab Americans?
4. To what extent did sample characteristics and intrapersonal factors (knowledge of the physical activity recommendation, religiosity, physical activity enjoyment, and physical activity self-efficacy) influence physical activity in Arab Americans?
5. To what extent did sample characteristics, intrapersonal factors, and interpersonal factors (acculturation and social support) influence physical activity in Arab Americans?

Design

A cross-sectional descriptive correlational design was used. This design was selected because it was congruent with the purpose of this study. This design was appropriate to use because the relationships among two or more variables were being explored (Gliner, Morgan, & Leech, 2017). Also, this design provided the rationale for preliminary causal inferences (Waltz, Strickland, & Lenz, 2017).

Research Setting

The study setting took place in three counties in North Carolina, namely, Mecklenburg, Guilford, and Wake counties. These counties were selected because they had the largest Arab American populations in North Carolina (AAI, n.d.a). Several stakeholders (imams and pastors) and sites in the community (Arabic grocery stores and restaurants, mosques [masjids], and churches) located in these three counties made assisted with recruitment and access.

Research Sample

The targeted population was Arab Americans. The available sample was Arab Americans living in a southeastern state. The inclusion criteria were: adults age 18 years or older, self-identified Arab Americans, and able to read, understand, and provide informed consent in English. The exclusion criteria were: self-reported pregnancy and self-reported conditions that preclude physical activity (e.g., use of a wheelchair).

A non-probability convenience sampling method was used to recruit potential subjects. In this study, the proposed sample size was 110. Based on G*Power calculations, a sample size of 110 had been determined to provide a statistical power of ≥80%, assuming a type I error rate of 0.05, a medium effect size (f 2) of 0.15, and 5% missing data (G*Power version 3.1.9.3). A total of 140 participants met the inclusion/exclusion criteria and were included in the study. Participants were given the option to complete a paper survey or an online survey. For the online survey, a total of 143 participants read the information sheet and answered the eligibility questions. Nineteen of them did not meet the eligibility criteria. Among the remaining 124

participants, 44 participants did not provide sufficient usable data and were excluded from the study. Forty-one participants were missing more than 90% of the total survey, and *n*=3 participants were missing more than 70% of the total survey.

The final dataset for the online survey included 80 participants. For the paper survey, a total of 72 envelopes were returned; of those, *n*=12 participants were excluded. Seven participants did not meet the eligibility criteria; *n*=3 participants returned surveys not filled in; *n*=2 participants provided identical inconsistent data (answers and handwriting; e.g., reported age 18 years and length of stay in the United States 24 years) and incomplete answers. In total, 140 participants (online survey= 80; paper survey= 60) met the inclusion/exclusion criteria and were included in the study.

Recruitment

To recruit a heterogeneous sample (e.g., Muslims and Christian), one Arabic grocery store, Arabic restaurant, masjid, and church were targeted in each of the three cities in the identified counties (a total of four locations per city). The specific locations were selected after consulting with community insiders, stakeholders, and leaders in the three cities. Two recruitment methods were utilized. First, subjects were recruited in-person (face-to-face). The principal investigator (PI) visited each of the four-targeted locations in the three cities and set up a folding table and chair in each of these sites for several sessions over 3 months. Flyers and study forms were available at the table for the potential subjects to review at their leisure. The PI did not directly approach potential subjects or invite them to come to the table; instead, the PI waited for the potential subjects to initiate a discussion with the PI. Potential subjects who showed interest in the

study were informed about the study's purpose, time commitment, potential risks and benefits, and, if interested, they were screened for eligibility. Eligible subjects who volunteered to participate were instructed on how to complete the study questionnaire onsite. Alternatively, subjects were given the option to complete the questionnaire and mail it back in a pre-addressed stamped envelope. Notably, the majority of the participants who completed the paper survey were recruited from places of worship.

A second recruitment method included subjects contacting the PI through information provided on the study flyers posted and distributed in the targeted sites. English and Arabic language flyers advertising the study were posted in visibly prominent places by the PI and distributed by community insiders at the selected sites. The flyers for the online survey included information about the study and instructions on how to participate in the study, as well as the PI's contact information.

These two methods were selected in order to overcome recruitment challenges identified in the literature. Given that recruiting a heterogeneous sample of Arab Americans has been found to be a very challenging task, researchers studying Arab Americans have highly recommended using both active (e.g., face-to-face) and passive (e.g., flyers) recruitment methods (Aroian, Katz, & Kulwicki, 2006; Haddad & Corcoran, 2013; Jaber, 2003; Kahan & Al-tamimi, 2009; Shara et al., 2017; Timraz et al., 2017). Utilizing a combination of both active and passive recruitment methods have yielded more positive outcomes in past studies involving Arab Americans (Kahan & Al-tamimi, 2009).

Measures

Data were self-reported and collected on a total of seven constructs, with corresponding instruments measuring six independent variables and one dependent variable. A sample characteristic form was used to gather information about each of the potential subjects. The following paragraphs discuss the study instruments as well as the sample characteristic form.

Physical Activity

Physical activity was defined as "any bodily movement that is produced by the contraction of skeletal muscle and that substantially increases energy expenditure" (CDC, 2017a, para. 1). The long form of the *International Physical Activity Questionnaire* (IPAQ) was used to measure physical activity. The scale was developed in 1998 by an international group of physical assessment experts to measure health-related physical activity (Craig et al., 2003). It consists of 27 items measuring four domains for physical activity (work-related, transportation, housework/gardening, and leisure-time) (Forde, n.d.; IPAQ, 2016). It requires individuals to recall their participation in these types of activities in the last seven days. Results can be reported in categories (low, moderate, or high) or as a continuous variable (MET minutes per week). As proposed in the IPAQ scoring protocol, individuals are classified as highly physically active if they engage in vigorous-intensity activity at least 3 days and accumulating at least 1500 MET-minutes per week or 7 or more days of any combination of walking, moderate-intensity, or vigorous-intensity activities, achieving a minimum of at least 3000 metabolic equivalent (MET)-minutes per week (IPAQ, 2016). Individuals are classified as moderately

physically active if they engage in 3 or more days of vigorous activity of at least 20 minutes per day or 5 or more days of moderate-intensity activity or walking of at least 30 minutes per day or 5 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum of at least 600 (MET)-minutes per week. Those not meeting any of the criteria for either "moderate" or "high" levels of physical activity are classified in the "low" physical activity level category (IPAQ, 2016).

The scale reliability and validity were investigated in 12 countries with different ethical and racial groups (Craig et al., 2003). For validity, Craig et al. (2003) assessed concurrent validity by comparing long and short forms; the pooled correlation coefficient between long and short forms was 0.67 (95% CI= 0.64–0.70). They also assessed the criterion validity by comparing it with a *Computer Science Applications* (CSA) accelerometer; the pooled correlation coefficient was 0.33 (95% CI =0.26–0.39). For reliability, Craig et al. (2003) reported test-retest reliability coefficients ranging from 0.67 to 0.91, with a pooled correlation coefficient of 0.82. Notably, the IPAQ has been used widely in the last decades and has been found to a reliable and valid scale (Alomari et al., 2011; Silsbury, Goldsmith, & Rushton, 2015). For example, Silsbury et al. (2015) reported that the scale showed good repeatability over one week (correlation coefficients ranging from 0.63 to 0.79). Also, the IPAQ has been used in a study exploring physical activity in a sample of 180 Arab American women (Qahoush et al., 2010), with a reported test-retest reliability of 0.80 for the IPAQ.

In the current study, the IPAQ internal consistency reliability, as measured by Standardized Cronbach's alpha, was 0.80. The standardized Cronbach's alpha was used

because the encoding of time variables differed between items (e.g., values of "days/week" questions ranged from 0 to 7, while the values of "minute/day" questions ranged from 0 to 960). The standardized Cronbach's alpha was calculated for the items concerning physical activity, not including the items corresponding to the time spent sitting, given that items corresponding to the time spent sitting are neither included in the calculation of the total physical activity score (MET-minutes/week) nor the four domains' subscores.

Knowledge of Physical Activity Guidelines

Knowledge of physical activity guidelines was operationally defined as the ability of subjects to identify the current national guidelines for physical activity correctly. Although there is no single instrument currently available in the literature to measure this variable, previous studies have used two questions as a proxy to assess knowledge of physical activity guidelines (Abula et al., 2018; Cameron, Craig, Bull, & Bauman, 2007; Knox, Esliger, Biddle, & Sherar, 2013; Knox, Musson, & Adams, 2015; O'Dwyer, Rafferty, O'Shea, Gissane, & Wilson, 2014).

The first question is: "how many days per week do you think a person your age should do physical activity?" The second question is: "on each of the *n* (whatever the subject stated in question two) days, how many minutes should the person engage in the moderate-to-vigorous intensity activity?" Based on the scoring instructions, subjects in this study who provided answers that were inconsistent with the current physical activity guidelines were scored as "not knowledgeable," and those who provided answers that were consistent with the current physical activity guidelines were scored as

"knowledgeable" (Abula et al., 2018; Cameron et al., 2007; Knox et al., 2013; Knox et al., 2015; O'Dwyer et al., 2014).

Religiosity

Religiosity is defined as the degree to which beliefs in specific religious values and ideals are held and practiced by an individual (Delener, 1990). The *Centrality of Religiosity Scale* (CRS) was used in the current study to measure religiosity. The CRS was developed by Huber in 2003 to assess the importance or salience of religious meanings in one's personal life (Huber & Huber, 2012). The CRS was originally developed to measure religiosity in the context of the monotheistic/Abrahamic religions (Islam, Christianity, and Judaism). However, the CRS has been used in more than 100 religious studies in 25 countries (with, in total, more than 100,000 participants). Furthermore, the CRS has been translated and adapted in numerous languages and countries (19 languages, 21 countries) (Huber & Huber, 2012). Using Likert-type scale items, CRS measures five core dimensions of religiosity, which are public practice, religious experience, ideology, private practice, and intellectual practice. Additionally, the CRS is available in three versions: five items, 10 items, and 15 items.

In the current study, the 5-item version of CRS was used in order to reduce the response burden, given that it has good reliability and validity (Huber & Huber, 2012). Scoring and recording procedures for the CRS published by Huber and Huber (2012) were used for the current study. To calculate the CRS score, the obtained total score is divided by the number of the items, resulting in a total score ranging from 1.0 to 5.0. Then, participants were based on the total score as "non-religious" (total score from 1.0

to 2.0), religious (total score from 2.1 to 3.9), and "highly religious" (total score from 4.0 to 5.0). The validity of the 5-item version of CRS has been confirmed empirically. For reliability, Huber and Huber (2012) indicated that, overall, the Cronbach's Alpha for the five-item version of CRS was 0.85, across different samples from 21 countries.

The 5-item version of CRS has not been previously used with Arab Americans. However, the 15-item version of CRS has been used in two studies exploring religiosity in Arab Americans (Hatton & Nielsen, 2016; Wekhian, 2015). Hatton and Nielsen (2016) utilized the CRS with a sample of 280 undergraduate Arab-American students (female=53.9%; mean age= 19.9 years) to assess the relationship between religiosity and watching violent extremist videos from war regions in the Middle East. Wekhian (2015) utilized the CRS with a sample of 257 adult Arab-American Muslims (female=48.6%; mean age was not reported) to assess the relationship between religiosity and conflict management. Estimates of validity and reliability were not reported in both studies. In the current study, the internal consistency reliability for the 5-item CRS was 0.60, as measured by Cronbach's alpha.

Acculturation

Acculturation is defined as the process of learning that occurs when individuals from different cultural backgrounds are exposed to prolonged, continuous, first-hand contact with a new culture (Berry, 1992). The *Vancouver Index of Acculturation* (VIA) was used to measure acculturation. The VIA was developed by Ryder, Alden, and Paulhus (2000) to assess the extent to which individuals participate in and identify with the non-dominant (culture of origin) and dominant cultures. The VIA measures several

domains of acculturation (including values, social relationships, and adherence to traditions). The VIA consists of 20 items measuring two subscales (non-dominant culture and dominant culture), with 10 items allocated to the non-dominant culture and 10 items allocated to the dominant culture (Ryder et al., 2000). The VIA uses a 9-point Likert-type scale, ranging from 1 (*strongly disagree*) to 9 (*strongly agree*). Examples of items include "I enjoy social activities with typical American people" and "it is important for me to maintain or develop the practices of my heritage culture." On each subscale for the VIA, scores are summed and then averaged (range from 1 to 10), with higher subscale scores representing higher levels of identification with the culture represented (Ryder et al., 2000). The VIA has been used to measure acculturation in different populations and found to have good validity and reliability (Huynh, Howell, & Benet-Martínez, 2009; Ryder et al., 2000). To assess its psychometric properties, the developers of VIA included samples of 414 Chinese, non-Chinese East Asian, and non-native English-speaking adults (71% female; ages ranged from 17 to 37 years) (Ryder et al., 2000). For validity assessment, the developers concurrent assessed validity by comparing the two subscales with (a) length of time lived in the Western English-speaking country, (b) length of time educated in a Western English-speaking country, (c) the *Suinn-Lew Asian Self-Identity Acculturation* Scale (SL-ASIA) mean score, and (d) a single item measuring Western identification (Ryder et al., 2000). The authors indicated that the length of time lived in and educated in the West was found to be significantly associated with the dominant culture subscale ($r = 0.47$ and 0.41, respectively, $p < 0.001$). Similarly, the dominant and non-dominant culture subscales were associated with SL-ASIA mean score

(r = -0.30 and 0.54, respectively, $p < 0.001$), as well as with the single-item measuring Western identification (r = -0.34 and 0.44, respectively, $p < 0.001$). For reliability, the authors reported that Cronbach's alpha coefficients for both subscales ranged from 0.85 to 0.92, across the three different samples (Ryder et al., 2000). In a meta-analysis study investigating the reliability of VIA (as well as two other acculturation scales, with dominant and non-dominant culture subscales), Huynh et al. (2009) reported that, on average, the VIA yielded Cronbach's alpha coefficients above 0.80 for both non-dominant and dominant scales across different ethnic/racial populations, with more than 3,500 participants.

The VIA has been used previously to measure acculturation in Arab Americans. In a study exploring acculturation and mental health, Amer (2005) utilized VIA to measure acculturation in a sample of 609 Arab Americans (mean age= 29.3 years; female= 60%). As measured by Cronbach's coefficient alpha, Amer (2005) reported a reliability of 0.88 for the non-dominant culture (Arab culture) subscale and a reliability of 0.82 for the dominant culture (American culture) subscale.

In the current study, the VIA was modified by separating the two subscales. It has been reported that some Arab Americans found it confusing first to read one heritage culture item, followed by a mainstream culture item (Goforth, 2011). Thus, items corresponding to the heritage culture and items corresponding to the mainstream culture were separated into two different pages (a page for items corresponding to the heritage culture and a page for items corresponding to the mainstream culture). In the current

study, the internal consistency reliability for both subscales, as measured by Cronbach's alpha, was 0.89.

Social Support

For this study, social support was defined as the experience of being valued, respected, cared about, and loved by family, friends, and other social network members (Gurung, 2006). The *Multidimensional Scale of Perceived Social Support* (MSPSS) was used to measure social support. The MSPSS scale consists of a total of 12 items that measure perceptions of support from three sources: family, friends, and significant others (each one is measured with four items). Each source of support represents a subscale, with four items allocated for each subscale. The MSPSS uses a 7-point Likert scale (ranging from 1=*very strongly disagree* to 7=*very strongly agree*; Zimet, Dahlem, Zimet, & Farley, 1988; Zimet, Powell, Farley, Werkman, & Berkoff, 1990). Items allocated for each subscale are summed and then divided by 4 to calculate subscale scores (Zimet et al., 1988; Zimet et al., 1990). All items are summed and then divided by 12 to calculate the MSPSS total score. A total scale score ranging from 1 to 2.9 represents low support, 3 to 5 represents moderate support, and 5.1 to 7 represents high support (Zimet et al., 1988; Zimet et al., 1990). The MSPSS has been used across a wide variety of race and ethnic groups and has shown good validity and reliability (Aroian, Templin, & Ramaswamy, 2010; Kazarian & Merhi, 2012; Wang, Wan, Huang, Huang, & Kong, 2017; Zimet et al., 1990).

The MSPSS has been previously used with Arab Americans and been culturally adapted. Aroian et al. (2010) included a sample of 539 Arab American women (mean

age=40.20 years) to adapt the MSPSS and test its psychometric properties culturally. For validity, the authors assessed criterion-related validity (concurrent validity) by comparing the scale with the *Profile of Mood States* (POMS), the Seeking Social Support, Problem Solving, Blaming Self, and Avoidance subscales from the *Revised Ways of Coping Checklist* (RWCCL), and a single item from the *Daily Hassles Scale* (DHS) measuring problems with one's spouse (Aroian et al., 2010). Generally, they found that the MSPSS subscales were significantly associated with POMS total score, RWCCL subscales, and DHS items. For example, they found that MSPSS family and friend subscales significantly associated with POMS (r= -0.28 and r= 028, respectively), RWCCL Seeking Social Support subscale (r= 0.18 and r= 0.16, respectively), and DHS item (r= -0.66 and r= -0.46, respectively; Aroian et al., 2010). The authors did not report the correlation coefficients for the entire MSPSS; correlation coefficients for the MSPSS subscales were reported. However, they further assessed the validity of the scale by conducting Confirmatory Factor Analysis (CFA) to confirm the factor structure in order to establish the construct validity. The authors showed that the overall fit of the CFA model was good (χ^2 =148.97, CFI = 0.96, Root Mean Square Error of Approximation [RMSEA] = 0.06, and p <0 .01; Aroian et al., 2010). For reliability, internal consistency estimates were 0.89, 0.89, and 0.73 for family, friends, and other closed ones, respectively. The internal consistency for the entire MSPSS was 0.74, as measured by Cronbach's coefficient alpha (Aroian et al., 2010). In the current study, the internal consistency reliability for the 12-item MSPSS, as measured by Cronbach's alpha, was 0.91.

Enjoyment of Physical Activity

Enjoyment of physical activity was operationally defined as how subjects perceive engaging in physical activity in terms of how it is enjoyable (Raedeke, 2007). The 8-item version of the *Physical Activity Enjoyment Scale* (PACES) adapted by Raedeke (2007) was used to measure enjoyment of physical activity. The adapted PACES is based on the original scale (18-item scale) developed by Kendzierski and DeCarlo in 1991. Dr. Kendzierski (personal communication, February 6, 2019) recommended Raedeke's 8-item version of the PACES. The 8-item version of PACES asks subjects to rate "how you feel at the moment about the physical activity you have been doing in the past month," using a 7-point bipolar scale. Item examples include "I enjoyed it . . . I hated it," "I found it pleasurable . . . I found it unpleasurable," and "I was very absorbed in the activity . . . I was not at all absorbed in the activity." Four of the eight items are reverse-coded. Items scores are summed and then averaged, resulting in a final score ranging from 1 to 7, with higher scores indicating higher levels of enjoyment and lower scores indicating lower levels of enjoyment.

In terms of its psychometric properties, Raedeke (2007) indicated that the 8-item version of PACES highly correlated with the original scale (r = 0.94). Also, Raedeke (2007) reported a reliability of 0.86, as measured by alpha coefficient. Raedeke's 8-item version of the scale has not been widely used. However, in a recent study, Wilkerson (2017) utilized Raedeke's 8-item version of the PACES in an experimental study (n=42; male=36, female=6) aiming at improving physical activity levels. Wilkerson (2017) utilized Raedeke's 8-item version of PACES at three different points of time and reported

that the scale is a reliable measure of enjoyment across all time points (Cronbach's alpha coefficient ranged from 0.93 to 0.97). Also, Raedeke's 8-item version has not been previously used with Arab Americans. In the current study, the 8-item PACES scale's internal consistency reliability, as measured by Cronbach's alpha, was 0.90.

Physical Activity Self-Efficacy

Self-efficacy was defined as subjects' beliefs about their ability to perform physical activity (Bandura, 1997). The Physical Activity Assessment Inventory (PAAI) scale was used to measure subjects' self-efficacy. This scale was developed based on Bandura's Self-Efficacy Theory to broadly assess physical activity, including structured and unstructured physical activity (Haas & Northam, 2010). Haas and Northam (2010) developed this instrument because they found that most of the established instruments measuring self-efficacy in terms of the activity focused on exercise, which is a sub-category of physical activity. However, the PAAI is a 13-item numeric scale that assesses how confident individuals are in performing their usual physical activity (e.g., activities at work, home, or leisure time) in a variety of circumstances (e.g., when feeling tired and during bad weather; Haas & Northam, 2010). Item responses range from "0" (cannot do at all) to "100" (certainly can do). Item scores are summed, resulting in a score ranging from 0 to 1300, with higher scores indicating higher levels of self-efficacy and lower scores indicating lower levels of self-efficacy (Haas & Northam, 2010). The PAAI showed good validity and reliability. To assess its psychometric properties, Haas and Northam (2010) conducted two separate studies, involving a total sample of 347 adult women. The first study included 219 women from different racial/ethnic groups

(mean age= 50.33 years; 76% healthy and 24% with chronic conditions, including joint problems, respiratory disorders, heart problems, stroke, and obesity). For validity, Haas and Northam (2010) assessed construct validity by comparing the PAAI with a single-item scale measuring physical activity and the 5-item *Self-Efficacy for Exercise Scale* (SES). The authors indicated that the PAAI showed significant associations with the single-item scale measuring physical activity ($r = 0.33$, $p < .01$) and the SES ($r = 0.54$, $p < .01$) (Haas & Northam, 2010). Also, the authors reported that the PAAI was able to discriminate between healthy women and women with chronic conditions. For reliability, Haas and Northam (2010) reported a reliability of 0.95, as measured by Cronbach's coefficient alpha. The second study included 128 women from different racial/ethnic groups (mean age= 60.12 years; 57% with breast cancer and 52.9% with no history of breast cancer). For validity, the authors assessed construct validity by comparing the PAAI with the *Human Activity Profile* (HAP), which is a self-report instrument used to assess physical activity by calculating energy expenditure based on estimated metabolic equivalents (METs; Haas & Northam, 2010). The authors indicated that there was a significant and identical association between self-efficacy and physical activity across the two groups ($r = 0.44$, $p <0.001$). Also, again, the PAAI was able to discriminate between the two groups. For reliability, as measured by Cronbach's coefficient alpha, Haas and Northam (2010) reported a reliability of 0.96 in the group with cancer and 0.94 in the group without breast cancer.

Notably, the PAAI has not been previously used with Arab Americans. In the current study, the internal consistency reliability for the PAAI, as measured by Cronbach's alpha, was 0.93.

Sample Characteristics

The following sample characteristics were collected: age, gender, marital status, country of origin, length of U.S. residency, whether born in the United States or not, current residence, number of family members, religious affiliation, level of education, income, employment status and type of job, BMI, and health status. These sample characteristics were selected because the literature has shown that they impact physical activity (Benjamin & Donnelly, 2013; Langøien et al., 2017; Puciato, 2019). A separate form was developed to collect these data.

Data Collection Procedures

Subjects voluntarily completed a self-administered questionnaire. The self-administered questionnaire was distributed to the potential subjects in three different ways. First, the questionnaire was distributed in-person (face-to-face), and the PI was available in-person for answering subjects' questions while completing the questionnaire. This recruitment strategy was used based on recommendations made by other researchers researching Arab Americans (Aroian et al., 2006; Haddad & Corcoran, 2013; Kahan & Al-tamimi, 2009; Shara et al., 2017; Timraz et al., 2017). Also, based on the literature, some Arab American women do not feel comfortable being approached or invited to participate in studies by a researcher of the opposite sex (Kahan & Al-tamimi, 2009; Shara et al., 2017; Timraz et al., 2017). Therefore, during the recruitment phase, when a

potential female subject was approached, there was another woman from the community present to accompany the PI. Second, in order to improve recruitment efficiency and flexibility, potential subjects were offered an alternative option to complete the questionnaire at home and mail to the PI in a sealed, stamped, pre-addressed envelope provided with the study materials. For confidentiality purposes, the completed questionnaires were mailed to a School of Nursing mailing address. Subjects were informed that they should use the given envelope and that there was no need to include their names or addresses or other identifiable information in the completed questionnaires. Third, subjects had the option to complete the questionnaire online through Qualtrics® survey software, which is a secure online survey tool. The Quick Response (QR) code, which was available to be scanned as needed by a smartphone, and the Uniform Resource Locator (URL) link were provided in flyers to direct potential participants to the online survey. Offering such alternative techniques has shown to be highly effective in recruiting this population (Aroian et al., 2006; Haddad & Corcoran, 2013; Kahan & Al-tamimi, 2009; Shara et al., 2017; Timraz et al., 2017). It should be noted that in order to ensure the internal validity of the research results, all subjects were encouraged to seek clarification from the PI when questions or issues arise while completing the questionnaire (whether completing the questionnaire in the presence of the PI, at home, or online).

Data Management

Each collected questionnaire (in-person, mailed, or online) was assigned a unique identification number (ID No.; for example, 001, 002, and 003) for data management and

analysis. Data were coded numerically for each variable. A codebook was created, identifying the variable names for each question in the questionnaire and values assigned for each possible response (e.g., for gender, male=1 and female=0). Data collected in-person or via mail were manually entered by the PI into a Statistical Package for the Social Sciences (SPSS) spreadsheet, version 24.0, using the codebook. A double data entry method was used. Data collected online were downloaded and exported directly from Qualtrics® survey software into the SPSS spreadsheet, which is a feature available through Qualtrics®. No identifiable information was included. Data accuracy was checked for both methods of entry by a second researcher through random number case checks. Errors were less than 1%. Online survey data were checked for missing data and omitted responses.

Missing data for both paper and online surveys for participants included in the study were examined for presence, trends, and level. Sample characteristic variables were missing between 2.9% and 9.3% of the cases, with the majority missing less than 5% of the cases. Physical activity, knowledge of physical activity guidelines, religiosity, social support, and acculturation variables were missing in less than 5% of the cases. The most significant contributors to missing data were enjoyment and self-efficacy variables, where data for 12.6% and 20% of the cases, respectively, were missing. It should be noted that enjoyment and self-efficacy questionnaires were asked at the end of the survey. However, further consideration of missing data was handled using multiple imputation with 20 imputations for analyses. The imputed data were only used in multiple linear regression models. Alternate models with complete-case data were tested to determine

the impact of handling missing data. The results of the analyses with imputed data were consistent with the results of the complete case analyses, with the exception of one variable in one of the regression models (discussed in study findings). The presence and incidence of missing data for each variable were reported in the study findings.

Data Analysis

First, to describe physical activity, sample characteristics, and intrapersonal and interpersonal behaviors of the participants, measures of central tendency for continuous data (mean and median), variability (range and standard deviation), and frequencies and percentages were calculated. Descriptive statistics are given as mean, median, standard deviation, and minimum and maximum values for continuous variables and number with percent for categorical variables.

The following data analysis methods were used to answer the following questions:

1. What sample characteristics are associated with physical activity in Arab Americans?
2. What intrapersonal factors (knowledge of physical activity guidelines, religiosity, physical activity self-efficacy, and physical activity enjoyment) and interpersonal factors (social support and acculturation) are associated with physical activity in Arab Americans?

To measure the strength and direction of associations between sample characteristics, intrapersonal factors, and interpersonal factors and physical activity level, Spearman's rho correlation, a nonparametric alternative, was used, given that the basic

assumptions for Pearson's *r* were not adequately met. Spearman's rho correlation was selected, as it is more appropriate for non-normally distributed variables (Polit, 2010 & Huck, 2012). The results of the correlation analysis are reported in these study findings.

1. To what extent do sample characteristics (age, gender, marital status, religion, whether born in the United States or not, length of stay in the United States, education, employment, BMI, and health status) influence physical activity in Arab Americans?
2. To what extent do sample characteristics and intrapersonal factors (knowledge of the physical activity recommendation, religiosity, physical activity enjoyment, and physical activity self-efficacy) influence physical activity in Arab Americans?
3. To what extent do sample characteristics, intrapersonal factors, and interpersonal factors (acculturation and social support) influence physical activity in Arab Americans?

Three simultaneous multiple linear regression models were initially proposed to answer these three research questions. Using Studentized Deleted Residuals (SDRs), multiple linear regression assumptions were checked for potential violations. Because the assumption of normality was not satisfied, several data transformation procedures (e.g., logarithm, square root, reciprocal) were performed. Despite that, the normality assumption was not satisfied. Gamma regression with a log link function, an alternative parametric regression modeling, was utilized, given that physical activity level measures (metabolic equivalents [METs]-minutes per week) were positively skewed. Gamma

regression has been previously used to model skewed physical activity outcomes, and in particular, METs estimated from the IPAQ (Hu et al., 2015; Lee, Xiang, & Hirayama, 2010). Consistent with the previous studies and given that gamma regression with a log link function requires non-zero values, values of zero were recoded as 0.1 for the modeling (zeroes were not prevalent, only five cases; Hu et al., 2015; Lee et al., 2010). The results of the regression analysis are reported in these study findings. In the analysis, a two-sided p-value < 0.05 was considered statistically significant. All analyses were performed using SPSS v24.0 (IBM Corp., Armonk, NY).

Human Subjects Protection

An Institutional Review Board (IRB) approval from the University of North Carolina at Greensboro (UNCG) was obtained before the beginning of the study. A study information sheet was used instead of signed informed consent, as a signed consent would serve as a source of identifying information. The questionnaire did not contain identifying information.

The anonymity and confidentiality of the subjects and data were assured. For the questionnaires completed in-person or mailed in, subjects' responses did not contain any personally identifiable information. A study information sheet was attached to the questionnaire (on the first page) so that subjects were fully informed of the nature of the study, the risks and potential benefits of study participation, and their rights as research subjects before completing the questionnaire. By completing the questionnaire, subjects indicated that they were voluntarily participating in the study and understood what included in the information sheet. For the questionnaires completed online, the contents

of the information sheet were inserted as the first question in the Qualtrics introduction page for the study. By proceeding to the next page, subjects indicated that they were voluntarily participating in the study and understood what included in the information sheet. The IP address collection feature was turned off.

For data security, paper mailed copies of the questionnaire (each coded with a unique sequential ID No.) were stored in a locked file cabinet in the faculty advisor's locked office at the School of Nursing. The PI entered data obtained from the hard copies of the questionnaire into a SPSS spreadsheet. The SPSS spreadsheets were stored in a password- and firewall-protected personal laptop and backed up to "BOX," which is a secure, password-protected file-sharing resource at UNCG. Data collected from online questionnaires (each coded with a unique sequential ID No.) was electronically transferred from Qualtrics® survey software to an SPSS spreadsheet and downloaded to a password and firewall-protected personal computer and then backed up to "BOX." The use of "BOX" allowed for data backup and a secure method for the PI and dissertation committee members to collaborate for data management and analysis. Data were de-identified and considered 1-lock data, according to UNCG's Information Technology Services. Thus, data could be synced to a password- and firewall-protected laptop. The PI and dissertation committee members had access to the data through "BOX."

As a thank you for participation, an incentive (20 Walmart e-Gift cards, each $25) was raffled to subjects who elected to submit their first name and email address for the drawing. For subjects utilizing paper and mailed copies of the questionnaire, a raffle entry form was attached to the questionnaire (on the last page). The raffle form was

detached by the PI (upon receiving the questionnaire) and placed in a separate design envelope. The envelope was stored in a locked file cabinet in the faculty advisor's locked office at the UNCG School of Nursing. For subjects utilizing the online questionnaire, a raffle invitation appeared on the thank you page (upon completion of the questionnaire), with instructions on how to submit their first name and email address. A separate link was provided for the subjects to submit their information. Regardless of the questionnaire completion methods, provided information for raffle drawing (first name and email address) was not connected to any questionnaire responses. Upon completion of the data collection phase, the PI entered the provided information for the raffle drawing into an Excel spreadsheet. The spreadsheet was stored in a password- and firewall-protected personal laptop and backed up to "BOX." A total of 77 participants selected to enter the raffle drawing. The PI selected 20 winners randomly and emailed them the e-Gift cards.

Chapter Summary

Little is known about intrapersonal and intrapersonal factors impacting physical activity among Arab Americans. Descriptive correlational design was used for this study to describe and explore the patterns of physical activity in Arab Americans and the relationships between intrapersonal and intrapersonal factors and physical activity and examined if these factors influence physical activity in this population. A convenience sampling technique was used to recruit potential research subjects from three counties in North Carolina. Data measures included seven instruments to measures constructs. The instruments were IPAQ, knowledge of physical activity guideline questionnaire, CRS,

VIA, MSPSS, PACES, and PAAI. Data collection was conducted in person and through an online survey. Data analyses included descriptive statistics, correlation coefficient tests, and regression modeling. Reliability estimates were computed for the construct measures.

CHAPTER IV

RESULTS

Evidence shows that a large number of Arab Americans do not meet physical activity guidelines, and we know little about factors contributing to physical activity in this population. Guided by the Social Ecological Model (SEM) of McLeroy et al. (1988), the purpose of the study was to describe physical activity and (a) to investigate the relationships between intra-personal sample characteristics (age, gender, marital status, country of origin, length of the U.S. residency, whether born in the United States or not, current residence, number of family members, religious affiliation, level of education, income, employment status, body mass index (BMI), and health status), intra-personal factors (knowledge of physical activity guidelines, religiosity, physical activity self-efficacy, and physical activity enjoyment) and inter-personal factors (social support and acculturation) and physical activity levels; and (b) to examine the extent to which these factors influence physical activity in Arab Americans. In this chapter, sample characteristics, intra-personal factors, inter-personal factors, and physical activity levels are described among Arab American participants. The extent to which these factors influence physical activity is reported. The statistical analyses of the data are presented. First, the sample is described in detail. Then, basic psychometrics of instruments utilized in the study are presented in Table 6, followed by correlation and regression results as related to each research question.

Description of the Sample Characteristics and Independent and Dependent Variables

A total of 140 participants were included in the study. Eighty participants (57%) were male, and *n*=55 (39%) were female; *n*=5 participants (3.6%) did not report their gender. The participants' ages ranged from 18 to 80 years, with a mean of 40.64 years (*SD* ±14.60) (see Table 2). Most participants were born outside of the United States (77.9%). Participants' countries of origin were varied with persons from Egypt (17.9%), Palestine (16.4%), Jordan (13.6%), Sudan (10.7%), Morocco (7.1%), and Syria (7.1%). The remaining (20.8%) were small proportions from other countries; nine participants did not report their country of origin (see Table 3). Participants' average length of stay in the United States was 17.26 years (*SD* ± 9.76). One hundred sixteen participants reported that their current state of residency was North Carolina. The majority of participants were Muslims (87%), while a small percentage of participants (8.6%) were Christians; *n*=5 participants (3.6%) did not report their religion.

Table 2

Sample Characteristics for Continuous Variables (*N* = 140)

Characteristic	**Mean ± SD [Median, (Min, Max)] Missing= *n* (%)**
Age (years)	40.64 ± 14.60 [41, (18, 80)]
Missing	6 (4.3%)
Length of stay in the United States (years)	17.26 ± 9.76 [18, (1, 44)
Missing	5 (3.4%)
Family members	3.69 ± 2.02 [4.0, (0, 8)]
Missing	9 (6.4%)
Body mass index (kg/m^2)	27.36 ± 4.98 [26.87, (16, 40)]
Missing	13 (9.3%)

Table 3

Sample Characteristics for Categorical Variables (N = 140)

Characteristic	***n* (%)**
Gender	
Male	80 (57.1%)
Female	55 (39.3%)
Missing	5 (3.6%)
Born in the U.S.	
Yes	26 (18.6%)
No	109 (77.9%)
Missing	5 (3.6%)
Country of origin	
Egypt	25 (17.9%)
Palestine	23 (16.4%)
Jordan	19 (13.6%)
Sudan	15 (10.7%)
Morocco	10 (7.1%)
Syria	10 (7.1%)
Other	29 (20.8%)
Missing	9 (6.4%)
Residence	
North Carolina	116 (82.9%)
Other	16 (11.4%)
Missing	8 (5.7%)
Religious affiliation	
Muslim	123 (87.9%)
Christian	12 (8.6%)
Missing	5 (3.6%)
Marital status	
Married	89 (63.6%)
Single	34 (24.3%)
Other	12 (8.6%)
Missing	5 (3.6%)
Education	
No high school or GED	7 (5.0%)
High school or GED	20 (14.3%)
College/university degree	68 (48.6%)
Graduate degree	39 (27.9%)
Missing	6 (4.3%)

Table 3

Cont.

Characteristic	*n* (%)
Employment	
Employed	95 (67.8%)
Not employed	40 (28.6%)
Missing	5 (3.6%)
Type of work	
Office work	10 (19.5%)
Professional work	37 (38.9%)
Skilled work	40 (42.1%)
Missing	8 (8.4%)
Annual total household income	
Less than $15,000	19 (13.6%)
$15,000 to $29,999	21 (15.0%)
$30,000 to $44,999	23 (16.4%)
$45,000 to $59,999	16 (11.4%)
$60,000 to $74,999	15 (10.7%)
$75,000 to $89,999	11 (7.9%)
Over $90,000	26 (18.6%)
Missing	9 (6.4%)
Body mass index category	
Underweight (<18.5 kg/m^2)	2 (1.4%)
Normal (18.5–24.9 kg/m^2)	38 (27.1%)
Overweight (25–29.9 kg/m^2)	56 (40.0%)
Obese (≥30 kg/m^2)	31 (22.1%)
Missing	13 (9.3%)
Health status	
Not having chronic disease(s) or condition(s)	103 (73.6%)
Having chronic disease(s) or condition(s)	33 (23.6%)
Missing	4 (2.9%)
Type of chronic disease(s) or condition(s)	
Hypertension	16 (11.4%)
Diabetes mellitus	12 (8.6%)
Heart disease(s)	3 (2.1%)
High cholesterol levels	8 (5.7%)
Arthritis and rheumatic diseases	9 (6.4%)
Other	15 (10.7%)
Missing	13 (9.3%)

**Note*. GED = General Educational Development.

Eighty-nine participants (63%) were married, and *n*=34 (24%) were single. The remaining 12 (8.6%) were widowed, divorced, or separated; five participants (3.6%) did not report their marital status (see Table 3). Participants' average number of family members was 3.69 (SD ± 2.02). Seven participants did not complete high school/General Educational Development (GED), *n*=20 completed high school/GED, 68 had some college/university degree, and *n*=39 had a graduate degree. Thirteen percent of participants reported an annual total household income of $15,000 or less, 15% reported income between $15,000 and $29,999, 16% reported income between $30,000 and $44,999, and 11% reported income between $45,000 and $59,999. Notably, more than half (51.9%) of the participants in this sample reported income greater than $45,000 annually. Furthermore, a little over two-thirds of the participants (67.8%) were employed. Concerning the type of work, the highest numbers of participants were skilled workers (with laborer jobs being the most frequently reported types of jobs), followed by professional workers and office workers, respectively.

The average BMI was 27.36 kg/m^2 (*SD* ± 4.98). Two participants were underweight (BMI < 18.5), *n*=28 participants were normal weight (BMI 18.5–24.9), *n*=56 persons were overweight (BMI 25–29.9), and *n*=31 persons were obese (BMI ≥ 30); *n*=13 participants did not report their weight and height.

In terms of health status, nearly three-fourths reported having no chronic disease(s) or condition(s), while *n*=33 participants reported being diagnosed with chronic disease(s) or condition(s). Of those who reported chronic disease(s) or condition(s), *n*=16 participants had hypertension, *n*=12 participants had diabetes mellitus, *n*=3 participants

had heart disease(s), *n*=8 participants had high cholesterol levels, and *n*=9 participants had arthritis and rheumatic diseases. The remaining conditions reported varied. They included cancer, lung disease(s), kidney disease(s), liver disease(s), osteoporosis, depression and anxiety, autoimmune disease(s), hypotension, diverticulitis, and chronic muscle pain in smaller proportions.

Physical Activity

The level of physical activity was assessed using the *International Physical Activity Questionnaire-Long Form* (IPAQ-LF). Physical activity scores were obtained according to the IPAQ scoring protocol (IPAQ, 2016). As shown in Table 4, the median total physical activity score (in metabolic equivalent [MET]-minute/week) for study participants across all four domains of IPAQ was 5749.5. Concerning domains, the highest median total METs-minutes-per-week was for the domestic and garden domain, followed by the work domain, leisure-time domain, and transportation domain, respectively. Concerning specific types of activity, the highest median total METs-minutes-per-week was for moderate-intensity physical activity, followed by walking and vigorous-intensive physical activity, respectively.

Total kilocalories expended per week in physical activity were calculated (MET-min x [weight in kilograms/60 kilograms]); the median total kilocalories expended per week was 7283.2. Median sitting time for participants was 317.1 minutes per week. Furthermore, the levels of physical activity based on the IPAQ scores were classified as low, moderate, and high, as proposed in the IPAQ scoring protocol. Interestingly, more than half of the participants (58.6%) reported a high level of physical activity, while

22.9% reported a moderate level of physical activity, and 14.3% reported a low level of physical activity. Results of reliability estimates for IPAQ, as well as other instruments utilized in the study, are presented in Table 6.

Table 4

International Physical Activity Questionnaire (IPAQ)-Continuous (*N* = 140)

Variable	***M* ± *SD* [Interquartile Range] Missing= *n* (%)**
International Physical Activity Questionnaire (IPAQ)- Continuous	
Total physical activity MET-minutes/week	5749.5 [1510.5 - 14824]
Total Walking MET-minutes/week	990.0 [173.3 - 3168.0]
Total Moderate MET-minutes/week total	2556.0 [495.0 - 6780.0]
Total Vigorous MET-minutes/week	0.0 [0.0 - 3840.0]
Total MET-minutes/week at work	208.5 [0.0 - 8651.3]
Total MET-minutes/week for transportation	99.0 [0.0 - 616.5]
Total MET-minutes/week from domestic and garden	930.0 [82.5 - 3630.0]
Total MET-minutes/week in leisure-time	198.0 [0.0 - 1197.0]
Total kilocalories/week	7283.2 [1949.6 - 19163.7]
Average Sitting Total Minutes/day	317.1 [214.3 - 482.1]
Missing	6 (4.3%)

Note. MET= metabolic equivalent.

Table 5

Descriptive Statistics for Continuous Independent Variables (*N* = 140)

Variable	***M* ± *SD* [Median] Missing= *n* (%)**
Vancouver Index of Acculturation (VIA)	
Arab culture subscale	6.8 ± 1.5 [7.1]
Missing	4 (2.9%)
American culture subscale	5.7 ± 1.6 [7.1]
Missing	7 (5.0%)
Multidimensional Scale of Perceived Social Support (MSPSS)	5.8 ± 1.1 [6.0]
Missing	3 (2.1%)
Physical Activity Enjoyment Scale (PACES)	39.8 ± 11.2 [39.0]
Missing	19 (13.6%)
Physical Activity Assessment Inventory (PAAI)	631.3 ± 279.0 [617.0]
Missing	28 (20.0%)

Table 6

Reliability of the Instruments Utilized in the Study

Instrument	Number of Items	Cronbach's Alpha Coefficient
International Physical Activity Questionnaire	22	0.80[a]
Centrality of Religiosity Scale	5	0.60
Vancouver Index of Acculturation		
Arab culture subscale	10	0.89
American culture subscale	10	0.89
Multidimensional Scale of Perceived Social Support	12	0.91
Physical Activity Enjoyment Scale	8	0.90
Physical Activity Assessment Inventory	13	0.93

Note. [a] Standardized Cronbach's alpha.

Knowledge of Physical Activity Recommendation

Knowledge of the physical activity recommendation was assessed using two questions identified in the literature. Results showed that *n*=50 participants (35.7%) were knowledgeable about the national physical activity recommendations, while *n*=87 participants (62.1%) were not knowledgeable about the national physical activity recommendations (see Table 7).

Religiosity

Religiosity was assessed using the 5-item version of the *Centrality of Religiosity Scale* (CRS). As presented in Table 7, the majority of the participants were classified as "Highly religious" (*n*=114; 81%), and the remaining were classified as "Religious" (*n*=24; 17.1%); none of the participants were classified as "Not religious" based on their scores.

Acculturation

Acculturation was assessed using the *Vancouver Index of Acculturation* (VIA). The scale consists of two subscales (Arab culture subscale and Americans culture subscale). On each subscale, the possible total scores range from 1 to 10. Higher scores represent higher levels of identification with the culture represented, and lower subscale scores represent lower levels of identification with the culture represented. The mean score for the VIA-Arab culture subscale was 6.8 (*SD* ± 1.5) and the VIA-American culture subscale was 5.7 (*SD* ± 1.6). See Table 5.

Social Support

Social support was assessed using the *Multidimensional Scale of Perceived Social Support* (MSPSS), with higher scores indicating high levels of support and lower scores indicating a lower level of support. As displayed in Table 5, the participants' mean score was 5.8 (*SD* ± 1.1). Furthermore, the participants were classified as having low, moderate, or high perceived social support if they had scores of between 1-2.9, 3-5, and 5.1-7, respectively. A majority of the participants reported high-perceived social support (77.1%), followed by moderate-perceived social support (19.3%) and a smaller proportion of participants reporting low-perceived social support (1.4%). See Table 7.

Physical Activity Enjoyment

Physical activity enjoyment was assessed using Raedeke's (2007) version of the *Physical Activity Enjoyment Scale* (PACES), which consists of eight items that measure how much an individual enjoys physical activity. The overall possible score ranges from 8 to 56, with higher PACES scores reflecting higher levels of physical

activity enjoyment and lower PACES scores reflecting lower levels of physical activity enjoyment. As presented in Table 5, participants exhibited higher levels of physical activity enjoyment with a mean PACES score of 39.8 (*SD* ± 11.2).

Physical Activity Self-Efficacy

Physical activity self-efficacy was assessed using the *Physical Activity Assessment Inventory* (PAAI). The PAAI is a 13-item numeric scale (0 to 100) that measures how confident individuals are in performing their usual physical activity in a wide range of circumstances or conditions. The overall possible score ranges from 0 to 1300, which higher PAAI scores reflecting higher levels of physical activity self-efficacy. As shown in Table 5, participants exhibited moderate levels of physical activity self-efficacy with a mean PAAI score of 631.3 (*SD* ± 279.0).

Table 7

Descriptive Statistics for Categorical Independent and Dependent Variables (*N* = 140)

Variable	***n* (%)**
International Physical Activity Questionnaire category	
Low	20 (14.3%)
Moderate	32 (22.9%)
High	82 (58.6%)
Missing	6 (4.3%)
Knowledge of the physical activity recommendation	
Not knowledgeable	87 (62.1%)
Knowledgeable	50 (35.7%)
Missing	3 (2.1%)
Centrality of Religiosity Scale category	
Not religious	0 (0%)
Religious	24 (17.1%)
Highly religious	114 (81.4%)
Missing	2 (1.4)

Table 7

Cont.

Variable	*n* (%)
Multidimensional Scale of Perceived Social Support Category	
Low support	2 (1.4%)
Moderate support	27 (19.3%)
High support	108 (77.1%)
Missing	3 (2.1%)

Question 1: What Sample Characteristics were Associated with Physical Activity Level in Arab Americans?

To answer this research question, Spearman's rho correlation was used to assess the associations between sample characteristics (age, gender [male=1, female=0], marital status [married=1, unmarried=0], religion [Muslim=1,Christian=0], Born in the United States (Born in the United States=1, not born in the United States=0], length of stay in the United States, education [having some college education or higher=1, having high school/GED or less education=0], BMI, and health status [having chronic condition versus= 1, not having chronic condition=0]) and physical activity level (total physical activity MET-minutes per week). The only variable that significantly associated with the physical activity level was health status. There was a positive association between physical activity level and having a chronic condition(s) ($r_s = 0.21$; $p = 0.019$). The results are presented in Table 8.

Table 8

Correlation Matrix for IPAQ and Sample Characteristics

Variables	1	2	3	4	5	6	7	8	9	10	11
1. IPAQ	-										
2. Age	0.09	-									
3. Gender[a]	-0.04	0.27**	-								
4. MarSta[b]	0.03	0.35**	0.17	-							
5. Religion[c]	-0.04	-0.02	0.11	0.11	-						
6. U.S. Born[d]	-0.06	-0.53**	-0.13	-0.32**	0.09	-					
7. U.S. LOS	-0.02	-0.26**	0.12	0.02	0.01	0.19*	-				
8. Educated[e]	0.01	0.21*	-0.04	0.16	0.04	-0.13	0.19*	-			
9. Employed[f]	0.14	0.13	0.29**	0.29**	0.08	-0.09	0.04	-0.04	-		
10. BMI	-0.07	0.28**	0.14	0.20*	0.03	-0.01	0.17	-0.01	0.09	-	
11. Healstat[g]	0.21*	0.32**	0.01	0.10	0.13	-0.19*	0.04	0.06	0.14	0.22*	-

Note. *N*'s range from 121 to 135 due to occasional missing data. IPAQ = International Physical Activity Questionnaire. MarSta = Marital status. U.S. LOS= length of stay in the United States. U.S. Born = born in the United States. BMI = Body Mass Index. Healsta = Health status. * $p < 0.05$, ** $p < 0.01$.
[a] Gender= male=1, female=0. [b] Marital Status = married=1, unmarried=0. [c] Religion=Muslim=1, Christian=0. [d] U.S. Born= born in the United States=1, not born in the United States=0. [e] Educated = having some college education or higher=1, having high school/General Educational Development or less education=0. [f] Employed= employed=1, unemployed = 0. [g] Healstat= having a chronic condition = 1, vs. not having chronic condition = 0.

Question 2: What Intrapersonal Factors and Interpersonal Factors were Associated with Physical Activity Level in Arab Americans?

To answer this research question, Spearman's rho correlation was used to assess the associations between knowledge of the physical activity recommendation (having knowledge=1, not having knowledge=1), religiosity (highly religious=1, religious=0), acculturation, social support, physical activity enjoyment, physical activity self-efficacy and physical activity. It should be noted that religious was the reference group, given that none of the participants were classified as "Not religious" based on their scores. However, among these variables, religiosity and physical activity self-efficacy were significantly associated with physical activity level. Spearman's Rho correlation

indicated that there was a positive association between physical activity level and physical activity self-efficacy (r_s = 0.28; p= 0.003), with higher physical activity levels associated with higher physical activity self-efficacy. Also, a positive linear association between religiosity (highly religious versus religious) and physical activity level (r_s = 0.19; p= 0.029) was found, with highly religious related to a higher physical activity level. No signification associations were found between the knowledge of the physical activity recommendation, religiosity, acculturation, social support, physical activity enjoyment and physical activity. The results are presented in Table 9.

Table 9

Correlation Matrix for Dependent and Independent Variables

Variables	1	2	3	4	5	6	7	8
1. IPAQ	-							
2. PA Knowledge[a]	0.14	-						
3. Religiosity[b]	0.19*	0.06	-					
4. VIA-Ar	0.07	-0.03	0.11*	-				
5. VIA-Am	0.06	-0.04	-0.02	0.11	-			
6. MSPSS	0.12	0.05	0.17*	0.46**	0.13	-		
7. PACES	-0.09	0.02	0.11	-0.09	0.07	0.01	-	
8. PAAI	0.28**	0.08	0.24*	0.00	-0.07	0.17	0.11	-

Note. *n*'s range from 106 to 135 due to occasional missing data. IPAQ = International Physical Activity Questionnaire. PA Knowledge = Knowledge of physical activity recommendations. VIA-Ar = Vancouver Index of Acculturation-Arab culture. VIA-Ar = Vancouver Index of Acculturation-American culture. MSPSS = Multidimensional Scale of Perceived Social Support. PACES = Physical Activity Enjoyment Scale. PAAI = Physical Activity Assessment Inventory. * $p < 0.05$, ** $p < 0.01$.
[a] PA knowledge = knowledgeable of physical activity recommendation=1, not knowledgeable of physical activity recommendation=0. [b] Religiosity= highly religious=1, religious=0.

Question 3: To What Extent Did Sample Characteristics Influence Physical Activity Level in Arab Americans?

To answer this research question, Gamma regression with a log link function was used for calculations. Multiple imputation (20 imputations) was applied to handle missing data. Sample characteristics (age, gender, marital status, religion, born in the United States, length of stay in the United States, education, employment, BMI, and health status) were included to explore to what extent these variables physical activity levels. As shown in Table 8, only employment and health status were found to be significant predictors of physical activity level (MET-minutes per week). The predicted mean MET-minutes per week of physical activity was 87% higher for employed respondents compared to unemployed respondents, adjusting for all other independent variables in the model (Exp (b) = 1.870, 95% CI = 1.063, 3.287, p = 0.030). The predicted mean MET-minutes per week of physical activity was 88.1% higher for those reported having chronic condition (s) compared to those reported not having chronic condition(s), adjusting for all other independent variables in the model (Exp (b) = 1.881, 95% CI = 1.058, 3.343, p = 0.031). Similar conclusions were drawn from the complete case (n=119) with no imputations and imputed data.

Question 4: To What Extent Did Sample Characteristics and Intrapersonal Factors Influence Physical Activity Level in Arab Americans?

To answer this research question, gamma regression with a log link function was used. Multiple imputation (20 imputations) was applied to handle missing data. Sample characteristics and other intrapersonal factors (knowledge of the physical activity recommendation, religiosity, physical activity enjoyment, and physical activity self-

efficacy) were included. As presented in Table 8, only health status remained significant in the regression analysis. The predicted mean MET-minutes per week of physical activity was 96.2% higher for those reported having a chronic condition (s) as compared to those reported not having chronic condition (s), adjusting for all other independent variables in the model (Exp (*b*) = 1.962, 95% CI = 1.053, 3.655, *p* = 0.034).

Question 5: To What Extent Did Sample Characteristics, Intrapersonal Factors, and Interpersonal Factors Influence Physical Activity Level in Arab Americans?

To answer this research question, Gamma regression with a log link function was used. Multiple imputation (20 imputations) was applied to handle missing data. Sample characteristics, intrapersonal factors, and interpersonal factors (acculturation and social support) were included. As shown in Table 10, employment and health status remained predictive factors for physical activity level. The predicted mean MET-minutes per week of physical activity was 77.4% for employed respondents compared to unemployed respondents, adjusting for all other independent variables in the model (Exp (*b*) = 1.774, 95% CI = 1.017, 3.096, *p* = 0.043). The predicted mean MET-minutes per week of physical activity was 91.4% higher for those with chronic condition(s) compared to those without chronic condition(s), adjusting for all other independent variables in the model (Exp (*b*) = 1.914, 95% CI = 1.009, 3.626, *p* = 0.047). Similar findings for these two predictors were obtained for the complete case (*n*=81) and imputed data.

Table 10

Multiple Linear Regression Models for Physical Activity Level

Variables	Model (1) (*n*=140) Exp(*b*) 95% CI for Exp(b) *p*-value*	Model (2) (*n*=140) Exp(*b*) 95% CI for Exp(b) *p*-value*	Model (3) (*n*=140) Exp(*b*) 95% CI for Exp(b) *p*-value*
Age	1.009 (0.986, 1.034) 0.431	1.007 (0.984, 1.030) 0.555	1.007 (0.984, 1.030) 0.533
Gender [a]	0.995 (0.607, 1.631) 0.984	1.011 (0.610, 1.677) 0.964	0.970 (0.582, 1.619) 0.907
Marital Status [b]	0.724 (0.394, 1.328) 0.297	0.754 (0.395, 1.439) 0.392	0.731 (0.382, 1.399) 0.344
Religion [c]	0.952 (0.403, 2.250) 0.912	1.045 (0.431, 2.532) 0.922	1.318 (0.522, 3.323) 0.559
Born in the U.S. [d]	0.960 (0.411, 2.241) 0.925	0.970 (0.399, 2.361) 0.947	0.996 (0.407, 2.438) 0.993
Length of stay in the U.S. (years)	0.997 (0.969, 1.025) 0.815	0.993 (0.964, 1.024) 0.668	0.989 (0.959, 1.020) 0.469
Educated [e]	1.006 (0.560, 1.806) 0.984	1.064 (0.586, 1.933) 0.838	1.096 (0.598, 2.008) 0.767
Employed [f]	1.870 (1.063, 3.287) 0.030	1.706 (0.964, 3.019) 0.067	1.774 (1.017, 3.096) 0.043
Body mass index (kg/m^2)	0.973 (0.931, 1.019) 0.257	0.962 (0.915, 1.012) 0.134	0.968 (0.918, 1.019) 0.215
Health status [g]	1.881 (1.058, 3.343) 0.031	1.962 (1.053, 3.655) 0.034	1.914 (1.009, 3.626) 0.047
Knowledge of the physical activity recommendation		0.660 (0.402, 1.081) 0.099	0.653 (0.397, 1.076) 0.094
Religiosity [h]		1.275 (0.652, 2.492) 0.477	1.322 (0.678, 2.573) 0.412

Table 10

Cont.

Variables	Model (1) (*n*=140) Exp(*b*) 95% CI for Exp(b) *p*-value*	Model (2) (*n*=140) Exp(*b*) 95% CI for Exp(b) *p*-value*	Model (3) (*n*=140) Exp(*b*) 95% CI for Exp(b) *p*-value*
Physical Activity Enjoyment Scale (PACES)		0.986 (0.962, 1.011) 0.288	0.983 (0.958, 1.008) 0.177
Physical Activity Assessment Inventory (PAAI)		1.001 (1.000, 1.002) 0.161	1.001 (1.000, 1.002) 0.216
Vancouver Index of Acculturation (VIA)-Arab culture			0.923 (0.783, 1.088) 0.341
Vancouver Index of Acculturation (VIA)-American culture			1.092 (0.928, 1.285) 0.289
Multidimensional Scale of Perceived Social Support (MSPSS)			1.150 (0.899, 1.473) 0.266

Note. [a] Gender = male vs. female; [b] Marital Status = married vs. unmarried; [c] Religion = Muslim vs. Christian; [d] Born in the U.S. = born in the United States vs. not born in the United States; [e] Educated = having some college education or higher vs. having high school/General Educational Development or less education; [f] Employed = employed vs. unemployed; [g] Health status = with chronic condition vs. without chronic condition; [h] Religiosity= highly religious vs. religious.

Chapter Summary

A total of 140 Arab Americans were recruited and provided data for the study. Patterns of physical activity among Arab Americans were investigated. Interestingly, a majority of the participants reported a high level of physical activity. Spearman's rho correlation was used to explore the association between the sample characteristics, intrapersonal, and interpersonal factors and physical activity level. Results show that

health status, religiosity, and physical activity self-efficacy were significantly associated with physical activity level. Three simultaneous multiple linear regression models with gamma regression with a log-link function were used to assess to what extent did sample characteristics, intrapersonal, and interpersonal factors influence physical activity level. The regression results showed that employment and health status were significant predictors for physical activity when accounting for other independent variables in most models.

CHAPTER V

DISCUSSION

Guided by the Social Ecological Model (SEM) of McLeroy et al. (1988), the purpose of the study was to describe physical activity and investigate (a) the relationships between intra-personal sample characteristics (age, gender, marital status, country of origin, length of the U.S. residency, whether born in the United States or not, current residence, number of family members, religious affiliation, level of education, income, employment status, body mass index (BMI), and health status), intra-personal factors (knowledge of physical activity guidelines, religiosity, physical activity self-efficacy, and physical activity enjoyment) and inter-personal factors (social support and acculturation) and physical activity levels; and (b) to examine to what extent these factors influence physical activity in Arab Americans. In this chapter, the interpretation of the results is discussed, as well as the limitations of the study. Finally, the implications and recommendations for nursing practice and research are presented.

The sample of Arab Americans in the current study was mainly young and middle-aged adults, comparable to the samples of Arab Americans described in prior research studies exploring physical activity among this population (Qahoush et al., 2010; Sarsour et al., 2010; Tailakh et al., 2013). The mean age for the current study was 40.64 years, as compared to 37.6 years and 41.75 years in Qahoush et al. (2010) and Tailakh et al. (2013) studies, respectively. Sarsour et al. (2010) indicated that that the sample was

mainly young and middle-aged Arab American adults but did not report the mean age for the total sample.

The majority of the participants in the current study were married, male, Muslims, and born outside of the U.S. These sample findings were similar to previous studies (Qahoush et al., 2010; Sarsour et al., 2010; Tailakh et al., 2013). The majority of the participants in the current study were healthy, well educated, and working population. Qahoush et al. (2010) reported similar sample characteristics. Except for the findings from Qahoush et al. (2010), previous research studies exploring physical activity among the Arab American population did not report participants' BMI. The mean BMI in the current study was comparable to the mean BMI reported by Qahoush et al. (2010). It should be noted that in the Arab world, some individuals view overweight and obese individuals, especially women, as being healthy (Kafaji, 2011). The majority of the study sample was highly religious, which may be because the participants included in this study were mainly recruited from mosques or churches. Samples of Arab Americans included in previous research about physical activity were mainly recruited from places of worship (El-Sayed & Galea, 2009; Qahoush et al., 2010; Sarsour et al., 2010).

The findings of this study indicated that the majority of the participants were not knowledgeable about the national physical activity recommendations. Similar findings have been reported in the literature. (Abula et al., 2018; Cameron et al., 2007; Knox et al., 2013; Knox et al., 2015; O'Dwyer et al., 2014). Knowledgeability of national physical activity guidelines among Arab Americans has not been previously reported in the literature.

The participants in this current study reported moderate levels of acculturation toward both the Arab culture and the American culture. Tailakh et al. (2016) reported similar findings. They further indicated that lower levels of acculturation were mainly observed in female, less educated, and unemployed participants, while higher levels of acculturation were observed in male, educated, and employed participants. This study did not involve examining differences in physical activity in terms of gender, education level, or employment status, but these variables were included as predictors in the analyses. None of these showed significant influence on physical activity.

The findings of the current study showed that participants exhibited moderate levels of physical activity self-efficacy. Physical activity self-efficacy among Arab Americans has not been previously reported in the literature. However, Qahoush et al. (2010) studied exercise self-efficacy and reported that their study participants exhibited a low level of exercise self-efficacy. It should be noted that exercise is a subtype of physical activity. Also, participants reported high-perceived social support and high levels of physical activity enjoyment. Enjoyment and social support, as they relate to physical activity, have not been investigated yet in Arab Americans.

Physical Activity

Over half of the subjects in the current study reported high levels of physical activity. These findings are consistent with a previous study conducted by Qahoush et al. (2010). Notably, Qahoush et al. (2010) combined medium and low levels of physical activity groups to indicate that the combined group was considered physically inactive. The reported physical activity levels in this current study were higher than those reported

in previous publications (Hekman et al., 2015; Sarsour et al., 2010; Tailakh et al., 2013). However, based on the IPAQ scoring protocol and the 2018 national physical activity guidelines, findings of this current study suggest that more than half of the participants met the minimum physical activity guidelines (HHS, 2018; IPAQ, 2016). It should be noted that the reported median total physical activity (in METs-minutes per week) across all domains of leisure-time, work, transportation, and household tasks was higher than that reported in the 12-country study of IPAQ and other previous studies (Altamirano, Peterson, Miller, & Gardner, 2018; Cloix et al., 2015; Craig et al., 2003; Zogg et al., 2014). However, higher median total physical activity was reported in other populations (Hu et al. 2015; Rutten & Abu-Omar 2004; Rutten et. al., 2004). Domestic and gardening activities and work-related activities were the major contributors to total physical activity reported in the current study (followed by leisure-time activities and transportation, respectively). Similar findings were reported by Cloixa et. al. (2014) and Milanović et al. (2014). With respect to specific types of activity, the main contributor to the reported total physical activity was moderate-intensity physical activity. Similar findings were reported by Altamirano et al. (2018) and Zogg et al., (2014).

It should be noted that the IPAQ scoring criteria used for classifying participants into the moderate category does not clearly distinguish between those meeting the minimum physical activity guidelines versus those not meeting the minimum physical activity guidelines. For example, according to the IPAQ scoring protocol individuals reporting 20 minutes of vigorous-intensity activity on 3 days per week (60 minutes per week) fall into the moderate category, which technically does not meet the minimum

physical activity guidelines (U.S. Department of Health and Human Services [HHS], 2018; IPAQ, 2016). Similarly, the IPAQ does not capture those meeting both aerobic and muscle-strengthening activity guidelines (HHS, 2018; IPAQ; 2016).

Several factors should be taken into consideration when interpreting the previously mentioned findings of the current study. First, unlike the participants in the previous research studies exploring physical activity among the Arab American population, the majority of the participants included in the study were young healthy, well educated, and working. The links between physical activity and employment, education, and health status have not been investigated in Arab Americans. However, research has shown that healthy, well educated, financially stable, working individuals are more likely to be physically active, including minorities (Benjamin & Donnelly, 2013; Office of Disease Prevention and Health Promotion, n.d.; Sawchuk et al., 2011; Scholes & Bann, 2018; Shaw & Spokane, 2008; Van Domelen et al., 2011). Thus, it is plausible that these sample characteristics may have contributed to higher levels of physical activity. Furthermore, given that the majority of the participants in the current study were Muslim and highly religious, it should be noted that Muslims are instructed and encouraged to maintain a high level of physical activity, according to Islam's teachings (Kahan, 2018; Walseth & Fasting, 2003; Zaman, 1997). Thus, it is plausible that these two characteristics may have contributed to higher levels of physical activity. In addition, compared with other questionnaires, especially those focusing on leisure-time physical activity, the IPAQ provides a more comprehensive measure of physical activity practices, giving that it captures more activities from various aspects of life, including as

work-related, transport, housework/gardening, leisure activity, and sitting time, and provides information about the frequency and duration, and intensity of physical activity practices (Milanović et al., 2014; Swain & American College of Sports Medicine, 2014; Sylvia, Bernstein, Hubbard, Keating, & Anderson, 2014). Thus, it is plausible that this may have contributed to higher levels of physical activity reported in the current study.

Also, the geographical location and time of recruitment in this study were not similar to those in previous studies. In the current study, the recruitment and data collection phase took place in North Carolina during spring and summer months, which are typically associated with a warm climate (April, May, and June of 2019). Arab American participants included in the previous research studies were mainly from Michigan, New York, Texas, and California (Hekman et al., 2015; Qahoush et al., 2010; Sarsour et al., 2010; Tailakh et al., 2013). Except for Qahoush et al.'s (2010) study (conducted in Texas between 2/28/2006 and 4/6/2006), the remaining studies did not report the time of recruitment. Literature has shown that the changes in season and weather conditions significantly impact physical activity levels (Bethancourt, Rosenberg, Beatty, & Arterburn, 2014; Sawchuk et al., 2011; Tucker & Gilliland, 2007). Therefore, it is plausible that the levels of physical activity reported in the current study may not be directly comparable to previous studies if the climate influenced the amount of outdoor activity. For the studies that collected data in colder regions of the country during the winter months, given that IPAQ required participants to recall their participation in certain types of activities in the past 7 days, the participants could have reported lower levels of physical activity.

Physical Activity and Intrapersonal and Interpersonal Factors

As discussed earlier in Chapter II, intrapersonal factors represent the individual characteristics that influence the behavior (physical activity) such as gender, knowledge, beliefs, and skills (McLeroy et al., 1988). Interpersonal factors represent the individual's social network and social support systems, including family, friends, peers, and significant others; it also includes factors that are directly impacted by an individual's social network and social support systems such as acculturation (McLeroy et al., 1988).

The first research question involved examining the bivariate associations between physical activity levels and sample characteristics (age, gender, marital status, religion, whether born in the United States or not, length of stay in the United States, education, employment, BMI, and health status). The results from this study showed that *only* health status was significantly associated with physical activity levels in a bivariate manner. In other words, having a chronic condition(s) was positively associated with physical activity level. No study has previously evaluated the relationship between having a chronic condition(s) and physical activity in Arab Americans. However, Qahoush et al. (2010) asked participants to rate their health status in general (possible answers were excellent, very good, good, fair, and poor). The authors reported that health status was significantly associated with physical activity levels. It should be noted here that the majority of the reported chronic conditions in the current study were cardiovascular risk factors (hypertension, diabetes mellitus, and dyslipidemia). Thus, it is plausible that persons who reported having chronic conditions have been counseled on

lifestyle changes, including the need to increase their physical activity (Kalda, Pechter, Suija, Kordemets, & Maaroos, 2012).

As discussed, the majority of the sample in the current study were not born outside of the United States. However, results revealed that whether or not subjects were born in the United States was not related to physical activity level. This finding is inconsistent with findings from Qahoush et al. (2010), which indicated those not being born in the United States having lower levels of physical activity. The relationships between physical activity and the remaining sample characteristics investigated in the current study have not yet been investigated in samples of Arab Americans.

The second research question involved examining the bivariate associations between physical activity and other intrapersonal (knowledge of physical activity guidelines, religiosity, physical activity self-efficacy, and physical activity enjoyment) and interpersonal (social support and acculturation) factors. Of these factors, only two intrapersonal factors (physical activity self-efficacy and religiosity) were found to be significantly associated with physical activity in a bivariate manner. None of the interpersonal factors was associated with physical activity. The findings of the current study showed that being highly religious is linked to higher physical activity levels. The relationship between physical activity and religiosity has not been yet investigated in samples of Arab Americans. However, qualitative findings from a study by Khan (2011) indicated that Arab Americans believed that religiosity plays a role in physical activity participation.

Similarly, the previous research studies exploring physical activity in Arab Americans have not yet investigated the associations between physical activity and physical activity self-efficacy. However, Qahoush et al. (2010) examined the relationship between exercise self-efficacy and found similar results. It should be noted that exercise is a subtype of physical activity; the current study physical activity self-efficacy was assessed. The findings of the current study showed that higher physical activity levels were associated with greater physical activity self-efficacy. This finding is consistent with the findings of other research studies (Lewis et al., 2016; Parkinson et al., 2017; Tavares, Plotnikoff, & Loucaides, 2009). Research has consistently shown that individuals with high levels of self-efficacy are more likely to be physically active (Lewis et al., 2016; Parkinson et al., 2017; Tavares et al., 2009).

The remaining three research questions involved examining the extent to which sample characteristics, intrapersonal, and interpersonal factors influence physical activity. Specifically, the third research questions involved examining the influence of age, gender, marital status, religion, whether born in the United States or not, length of stay in the United States, education, employment, BMI, and health status on physical activity. Results showed that employment and health status influenced the physical activity levels of Arab Americans. Employed participants in the current study had higher levels of physical activity compared to unemployed participants, and participants diagnosed with chronic condition(s) had higher levels of physical activity. It should be noted that about half (42.1%) of the employed participants were skilled workers, with laborer jobs being the most frequently reported type of job. The influence of employment (or occupation)

has not yet been explored in this population. However, similar results have been reported in studies exploring physical activity in other ethnic/racial groups (Van Domelen et al., 2011; Puciato, Rozpara, Mynarski, Łoś, & Królikowska, 2013; Williams, Yore, & Whitt-Glover, 2018). A plausible explanation identified in the literature for why employed participants reported higher levels of physical activity is that workers may be more organized and have more stable schedules, and thus generally more physically active than the unemployed (Nawrocka, Garbaciak, Cholewa, & Mynarski, 2018). Also, research shows that blue-collar workers are more physically active (Vandelanotte et al., 2015; Puciato et al., 2013; Duncan, Badland, & Mummery, 2010). Furthermore, it should also be noted that one of IPAQ four domains used in this study asks participants about work-related physical activity.

Similar to employment, the influence of health status has not yet been investigated in Arab Americans. However, Kalda et al. (2012) reported similar findings. Kalda et al. found that some individuals with chronic diseases have higher levels of physical activity than those without chronic diseases. As highlighted, the majority of the reported chronic conditions were cardiovascular risk factors. Thus, a plausible explanation of this finding is that individuals with chronic conditions received more counseling from their clinicians related to lifestyle modifications, including increasing physical activity, given that the American College of Cardiology and American Heart Association clinical practice guidelines for cardiovascular diseases include physical activity as one of the key healthy lifestyles contributing to cardiovascular disease prevention and treatment (Arnett et al., 2019). Another plausible explanation for the

findings of the current study might be that the participants with chronic diseases included in this study were already active individuals or have access to resources and services that facilitate participation in physical activity. Since the current study did not examine the causality of the relationship, other factors may be involved that were not considered in this study.

The fourth research question involved examining the influence of sample characteristics along with knowledge of the physical activity recommendation, religiosity, physical activity enjoyment, and physical activity self-efficacy on physical activity. Although physical activity, self-efficacy, and religiosity were significantly associated with physical activity, results showed that they did not significantly influence physical activity levels when accounting for other sample characteristics and intrapersonal factors. Interestingly, only health status influenced physical activity levels. Again, participants with a chronic condition(s) were more physically active than those without a chronic condition(s) when accounting for other factors.

The fifth research question involved examining the influence of sample characteristics, intrapersonal factors, acculturation, and social support on physical activity. When interpersonal factors (acculturation and social support) were taken into consideration, the findings further indicated that employment and health status influenced physical activity levels of Arab Americas. Again, employed participants and those diagnosed with chronic conditions had higher levels of physical activity.

Research Findings through the Lens of SEM

As highlighted, health status, religiosity, and physical activity self-efficiency were associated with physical activity, and health status and employment were found to influence the physical activity of Arab Americans significantly. Through the lens of the Social Ecological Model, these factors are intrapersonal factors. None of the interpersonal variables included in the study were associated with or influenced physical activity. These findings provide evidence that supports the usefulness of SEM in identifying the main determinants of physical activity, given that McLeroy et al. (1988) indicated that the first level of influence (intrapersonal) has the highest impact on an individual's behavior. Similar findings have been reported in previous research studies exploring physical activity in other ethnic/racial groups (de Vet, de Ridder, & de Wit, 2011; Shields, 2015; Zysset et al., 2018). It should be noted that this study primarily involved examining intrapersonal factors. Findings may guide future studies utilizing SEM to explore physical activity.

Conclusions

This study examined physical activity and its contributing intrapersonal and interpersonal factors in Arab Americans, guided by a social-ecological approach. The findings suggested that more than half of Arab Americans sampled were meeting the minimum physical activity guidelines as measured by the IPAQ. The sample was relatively healthy, well educated, and employed. Intrapersonal factors (health status, religiosity, and physical activity self-efficiency) were most related to physical activity. Also, when taking into consideration other sample characteristics, intrapersonal and

interpersonal factors, health status and employment were the only factors found to be significantly influencing physical activity levels in Arab Americans. Interestingly, none of the interpersonal factors was found to be associated with physical activity or had an influence on physical activity.

This study represents an initial attempt to explore physical activity as well as intrapersonal and interpersonal factors contributing to physical activity in order to establish a knowledge base about physical activity in Arab Americans. The strengths of the research lie in its attempt to explore a gap in the literature that has not yet been explored in a relatively understudied population. Also, the study examined the utilized instruments for internal consistency reliability, which can help to inform future studies, especially studies investigating Arab Americans, thus adding to the body of knowledge in terms of reliability of these instruments.

Limitations

Limitations exist in the current study that restrict the generalizability of the findings. First, this study utilized a cross-sectional design which, by its nature, limited the ability to determine causality and make generalizations. Also, based on the sampling method used in this study (a non-probability convenience sampling), Arab Americans who were interested in physical activity may have chosen to participate in the study more than those not interested in physical activity. The sample is one of convenience, and the location is North Carolina, which may not represent Arab Americans living in other geographic locations or areas of the United States. Furthermore, participants included in this study were mainly recruited from mosques or churches. Recruiting participants from

a variety of settings with more heterogeneous characteristics may provide different perspectives and findings. Finally, the data collection methods (e.g., self-report) also could limit the findings of the study, given that self-reported data carries a threat to validity.

Implications and Recommendations

Clinical Practice

The findings of this study showed that health status and physical activity self-efficiency are linked to physical activity, and health status and employment were found to be significantly influencing physical activity in the Arab Americans sampled. These findings have practical implications for nurses and other healthcare providers to recognize the importance of enhancing self-efficacy and considering the health status and employment status when providing resources or developing targets for intervention that promote physical activity in Arab Americans. Nurses and other healthcare providers should also acknowledge the importance of supporting physical activity in both employed and unemployed patients and individuals with chronic diseases and without chronic diseases. This could be accomplished by encouraging all Arab Americans to participate in physical activity and explaining the health benefits of participation in physical activity.

Furthermore, the findings showed that religiosity is linked to physical activity in the Arab Americans sampled. Such finding has practical implications for nurses and other healthcare providers to acknowledge the importance of assessing possible religious beliefs or practices that may act as barriers to or facilitators of physical activity and referring and guiding Arab Americans to resources that are consistent with their religious

beliefs or practices, which can help to promote physical activity in this population. Additionally, nurses should advocate for the development of religiously sensitive programs, strategies, and interventions to promote physical activity in Arab Americans.

Future Research

This study utilized a self-administered questionnaire that subjectively measured physical activity patterns in Arab Americans over a short time (the past 7 days). Future studies should consider also using objective measures (such as pedometers or accelerometers) along with subjective measures. Utilizing such a dual approach has been shown to provide more specific and accurate estimates of physical activity levels, which can help to inform future research and ultimately lead to the development of evidence-based interventions that can promote physical activity in Arab Americans (Tudor-Locke & Lutes, 2009). Given the complexity of physical activity as a behavior, future research might consider employing a longitudinal design to explore the long-term patterns of physical activity in Arab Americans. Also, future research might consider conducting in-depth individual interviews to explore this behavior from qualitative perspectives further.

Furthermore, as discussed, this study included participants form specific sites and geographical locations. Thus, researchers exploring physical activity in Arab Americans might consider conducting larger multi-site and multi-state studies in the United States. Moreover, this study utilized instruments that have not been previously validated and/or culturally adapted in the Arab-American population. Given that the instruments utilized in this study exhibited excellent reliability, researchers should consider utilizing them in order to add to the body of knowledge on evaluation instruments in the Arab-American

population. Finally, future research is indeed needed to investigate further physical activity and its contributing factors in Arab Americans in order to have a better understanding of this behavior and ultimately developing more culturally appropriate interventions and programs to promote physical activity in this minority population.

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