



Is Exercise Extra? A Mixed Methods Examination of Cultural Barriers and Enablers

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Abstract

Objective:

This study seeks to produce culturally-attuned recommendations for disease management in individuals with type 2 diabetes in M'Bour, Senegal.

Methods:

The PEN-3 Cultural Model (PEN-3) framed this mixed methods study to capture a) the qualitative barriers and enablers to participating in physical activity through narrative interviews; as well as b) the quantitative extent to which participants engaged in physical activity through the International Physical Activity Questionnaire (IPAQ). Content analysis identified emergent themes from interviews and descriptive statistics summarized IPAQ responses.

Results:

Among 41 individuals formally diagnosed with diabetes, the mean age was 58 (SD=11.8). Results elicited from PEN-3 included several barriers and enablers to physical activity. Barriers included prohibitive costs of gym membership and exercise equipment; limb pain; and feeling ill. Participants reported walking as their main source of exercise, with an average frequency of 4 days per week (SD=2.8). Although patients reported a lack of others with whom to exercise, familial support aided in maintaining exercise behaviors such as walking.

Conclusions:

Given participants' need for exercise companions, group-based activities may be useful. Patients with diabetes may also benefit from complimentary home-based exercises that are gentle and pain alleviating.

Key Words Diabetes, Physical Activity, Sub-Saharan Africa, Exercise

BACKGROUND

Type 2 diabetes mellitus (DM) continues to grow as a major concern in developing countries, especially Sub-Saharan Africa (SSA). Recent estimates from the International Diabetes Foundation report over 15 million people are currently living with the disease in SSA²². DM has been projected to increase to over 41.4 million by 2035 in SSA²⁸. Although West African countries have been reported to display a 4% prevalence of DM on average¹, Senegal experiences 10% of the disease in its urban settings^{20, 28, 33}. The public health burden of increasing DM in Senegal disproportionately affects older individuals and women^{28, 31}. Difficulties of managing DM in the SSA region and Senegal particularly include medication shortages, under resourced healthcare, geographical challenges³⁶. Rationale for this includes sedentary

occupations paired with urbanization². Furthermore, economic and educational barriers to disease management and treatment, including lack of insurance; medication availability and prohibitive costs; misinformation; and, lifestyle modifications such as physical activity, are of utmost importance^{8, 9, 10}.

Although several studies have previously examined diet as a lifestyle modification for disease management in Senegal, limited studies consider physical activity's utility for diabetes control, despite scientific evidence of exercise's benefit^{13, 20, 25 28}. Of the limited studies on exercise in Senegal, results indicate high rates of physical inactivity, particularly among women, as well as absence of supporting health policy^{1,25}. Helpful policies may include the implementation of health programming as well as promoting exercise across the life-course, from childhood educational institutions to adult workplaces^{11, 25, 26}. Additionally, policies may target the expansion of established entities for engagement in physical activity to communities through efforts such as the creation of recreation centers, providing cost-sensitive space for exercise with sociocultural components²⁵. Health and health behavior are inextricably linked with cultural identity such that identity shapes and informs wellbeing^{28, 29, 31}. For instance, cultural gender roles may dictate engagement in physical activity^{28, 29}. Culture, the communal continuum of practices such as languages, spoken and unspoken, guided by shared values and beliefs, is especially important in the SSA and Senegalese contexts^{3, 4, 5, 28, 29}. Individual health behaviors such as exercise operate in tandem with family, community and social structures that define group membership may shape how one's awareness of health, appraisal of health, and approaches of health management^{3, 4, 5, 23}. For instance, social structures feed and filter health awareness and action throughout the family and community. Misinformation may lead to determinantal health and health behavior such as fear and poor choices while accurate awareness may provide social support for lifestyle modification and medication adherence^{28, 29, 36}. However, there is limited literature considering how culture may shape health behaviors such as adherence to physical activity guidelines for diabetic patients in this population.

PURPOSE

This study examines cultural enablers and barriers to physical activity for diabetes management in the urban setting of M'Bour, Senegal.

THEORETICAL FRAMEWORK

The PEN-3 Model^{3,4,5} was employed as a cultural thinking tool to aid interpretation of physical activity-related health behaviors among participants in this study. The PEN-3 Model was originally developed to examine the cultural meanings of health behaviors in ethnic populations and subsequently to frame these behaviors within contextual relationships such as family and community. The PEN-3 Model consists of three interrelated domains: relationships and expectations, cultural empowerment, and cultural identity. For each domain, behaviors are analyzed as to whether they are positive, existential, or negative; additionally, perceptions, enablers, or nurturers of behaviors are evaluated as well as how person, extended family, and neighborhood relate to health behaviors. Relationships and expectations and cultural empowerment inform potential intervention components. The last domain, cultural identity, determines points of entry for potential interventions. (see Figure 1).

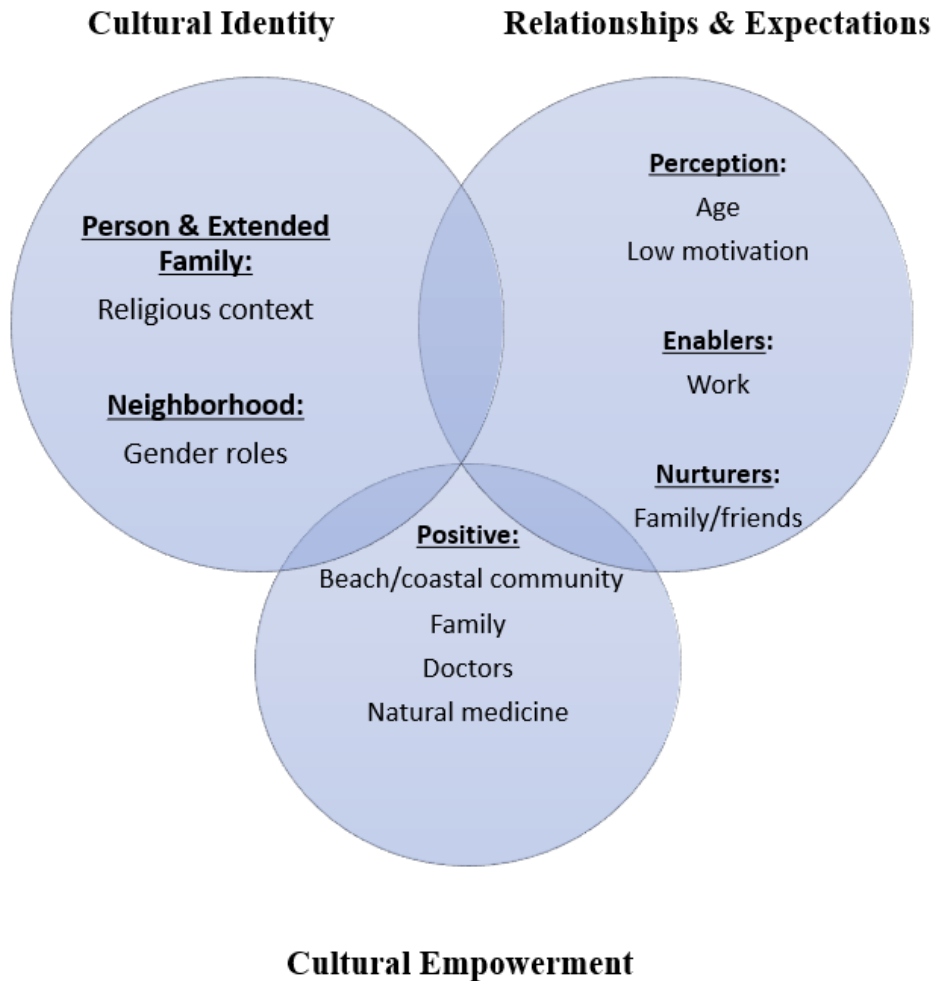


Figure 1. PEN-3 Cultural Model

METHODS

I. Study Setting

M'Bour is a coastal city in Senegal with a population of approximately 195,000. It is located 80 kilometers south of Dakar, the capital of Senegal. Study participants were recruited in 2014 from the local diabetes association affiliated with a not-for-profit organization, Weer Africa, and the hospital of M'Bour. M'Bour was chosen given long standing relationships (by the primary authors institution) with the community, the local hospital and providers. Additional participants were identified through word of mouth. The purpose of the diabetes association is to provide support and diabetes education for persons living with diabetes in the M'Bour area. All study participants self-reported living with type 2 diabetes and described their diabetes self-care regimen as part of the interview introduction, to confirm they were indeed living with diabetes. Participants who were not diabetic, not able to consent or who could not complete the survey or interview were excluded.

Verbal consent was obtained in Wolof, the local language, by a trained research associate from the community. Study participants were compensated with 2500 West African CFA Francs, or the equivalent of 5 USD. The participants were given autonomy to select the location of the interview. The majority of interviews were conducted at the participants home or at the home of a friend. The entire study was conducted over a four-week period.

II. Study Design

The research team partnered with a local community research associate who was part of the diabetes association and also living with diabetes to recruit, conduct interviews, and facilitate completion of the questionnaire. All interviews were audio-recorded, verbally translated real-time from Wolof to English, and transcribed in English writing verbatim by the trained and locally based research associate. Interviews were 30-45 minutes long and continued until data reached theoretical saturation^{15,16,17}. All questionnaires were completed following the interviews.

We collected demographic information with variables such as age, gender, occupation, and year of diabetes diagnosis. A mixed methods approach^{15,16,17} was employed to capture a) the qualitative barriers and enablers to participating in physical activity, and b) the quantitative extent participants engaged in physical activity. Given the role of culture in health behaviors in Senegal, we used a semi-structured interview approach for the qualitative portion where participants were empowered to share their personal accounts in a culturally grounded fashion akin to storytelling^{6,34}. Then, the quantitative portion provided a standardized measure of energy expenditure. Mixed methods allowed for more dynamic understanding of energy expenditure through identifying potential intervention targets from the qualitative aspect and characterizing physical activity habits in terms of quantity and vigor. Key elements of mixed methods research include intersection and triangulation of data^{15,16,17}. This study investigates physical activity from both quantitative and qualitative assessments. Both methods of data collection and analysis provide significant information individually, and even more insight in tandem. Triangulation demonstrated the frequency of exercise from IPAQ-matched frequency of exercise reported in qualitative interviews and analyzed by the PEN-3 Model.

III. Qualitative

The qualitative interview guide was developed by the research team with feedback from local stakeholders, including members of medical staff at the local Hospital de M'Bour. Interviews began with general events that were likely to be told in narrative form. Participants were also asked general questions about coping with diabetes to establish narrative form. Once narrative form was engaged, the focus shifted to stories on perception and definitions of-, experiences with-, belief about barriers to-, and promoters of exercise in relation to diabetes management.

Interview questions included: "What is the most important thing about managing diabetes? Do you think sports are important? Do you currently participate in sports? What kind of exercise do you do? Do you have any pain when you exercise? What are your barriers to exercising? Do you have anyone to exercise with? Did you have to stop exercising due to your health? What kind of support do you need to help you exercise?" Note that the word "sport" was used interchangeably with exercise, as it is a common term used to refer to exercise or physical activity in Senegal.

IV. Quantitative

Additionally, we administered the International Physical Activity Questionnaire (IPAQ)¹⁴, which included questions regarding participants' level and frequency of self-reported vigorous, moderate, walking, and sedentary behaviors in the last 7 days. The IPAQ has been used and proven valid in Low- and-Middle-Income Countries (LMIC)¹⁴. This tool specified the type of physical activity present in the study sample in terms of rate and robustness. The data from the IPAQ were acquired in order to glean insight into the energy expenditure profile of the sample, ultimately generating recommendations for optimal physical activity engagement.

V. Analytical Approach

Qualitative content analyses started with open coding and proceeded with identifying emergent themes related to barriers and enablers of exercise. We conferred with members of medical staff at the Hospital de M'Bour and the members of the diabetes association who did not participate in the interviews to confirm relevance and interpretation of the narrative interviews, codes, and emergent themes from the qualitative analysis through iterative meetings following each day of interviews to guide data analysis^{15,16,17}. After the content analysis was completed emergent themes were organized based on the PEN-3 Model. The 3 main PEN-3 categories include: (1) cultural identity; (2) relationships and expectations; and (3) cultural empowerment. Participant interviews were analyzed and grouped accordingly with person and extended family, and neighborhood aspects of cultural identity; perceptions, enablers, and a nurturers of relationships and expectations; and, positive aspects of cultural empowerment. Two members of the research personnel coded all transcripts separately after developing the codebook guided by the PEN-3 Model. The coded transcripts were then compared and produced 89% agreement. Quantitative data

analyses included summary statistics such as frequencies, means, ranges, and standard deviations. Results are expanded in detail below.

RESULTS

I. Participant Characteristics

As reported in Table 1, participants (N=41) included 23 females and 18 males with an average 58 years of age (SD=11.8, range 40-82 years). The majority of the sample (N=35) were unemployed, with nearly a quarter of the sample (N=12) unable to secure employment as a result of disability or debilitating pain. Occupations of the employed participants ranged from formal sector such as a security guard to informal positions such as merchants. A third of the female specific sample reported occupational status as a homemaker (N=7). Nearly half of the sample (N=16) was retired. Although all participants were formally diagnosed with diabetes, the range of years living with diabetes at time of interview spanned from 1 to 41. Notably, the majority of the sample (N=33) reported diagnosis from 4 to 10 years ago.

TABLE 1: Demographics for n=41 Participants

Variable	Percentage (n)
<i>Age, years, m (SD)</i>	58 (11.8)
<i>Gender</i>	
Male	44 (18)
Female	56 (23)
<i>Occupation Status</i>	
Unable to work/ Unemployed	29 (12)
Employed	15 (6)
Retired	39 (16)
Homemaker	17 (7)

II. Results of PEN-3 Analysis

Cultural Identity: Person, Extended Family, and Neighborhood

Cultural identity explores the influences of person, extended family, and neighborhood on physical activity and DM management. For instance, as a predominantly Muslim practicing society, Senegalese society at large values rituals such as daily prayer. This aspect relates to the person and extended family domain and creates space for exercise:

“After the morning prayer, I walk from home to the beach [about] 30 minutes” (43-year-old female).

Additionally, traditional neighborhood operations of homemaking may provide opportunities for women to engage in light to moderate physical activity.

“I exercise by going to the market, cooking, and cleaning.” (48-year-old female)

“I exercise everyday, walking to the market, cooking, [and] cleaning.” (55-year-old female).

Relationships and Expectations: Perceptions, Enablers, and Nurtures

This portion of the model elucidates participants’ perceptions, enablers, and nurturers for physical activity as related to DM management. Perceptions encompass one’s experience and feelings that deter or enable physical activity as a mode of diabetes management. Notably, when first asked *‘what is the most important thing for DM management?’* at the start of the narrative interview, few participants (N=5) included exercise among their perceived important consideration. When mentioned, exercise would be cited alongside

other factors. Instead, most responses highlighted diet and medication adherence. However, *all* participants reported sports were important later on in the semi-structured interview.

Some participants reported other barriers to physical activity such as their perception of their health:

“After I finish walking for five minutes, I experience body tremors all over.” (63-year-old female)

“If I try to do more [exercise] than I do now, I will have breathing problems.” (48-year-old female)

Additionally, participants mentioned lack of motivation and challenges with age, such that:

“I know sitting is not good. I am lazy. I sit and keep thinking what am I going to eat for dinner, lunch, etc... Exercise never takes priority.” (68-year-old female).

“I need a treadmill to help me exercise.” (77-year-old male)

“I have no barriers to exercise, just age.” (58-year-old female)

“I used to [exercise], but lately I have so many activities to take care of... I am old so to do all the activities (e.g. radio talk show, baptisms) I am doing and to do exercise is merely impossible.” (57-year-old male)

Participants reported finances as a barrier to disease control related to enablers. For instance, participants described financial insufficiency directly inhibiting their ability to secure a gym membership. Additionally, participants cited limited time due to work obligations. For example, participants mentioned:

“I used to go to the gym up to three months ago, but I can no longer afford it so I walk and keep myself busy instead.” (53-year-old male)

“I used to walk to the beach every day for exercise when I found out I had diabetes, but now I work, and I can’t.” (55-year-old male)

Nurturers’, such as peers, family, or community, influence may support or hinder physical activity for diabetes management. For instance, only a few participants (N=5) shared they had another person to engage in physical activity with them.

“My neighbor offered me to come exercise and I declined. I need a change of attitude.” (50-year-old female)

“I exercise by myself. Sometimes my daughter goes to the market with me.” (55-year-old female).

“I do not have anyone to exercise with, but when I walk to the beach, I can find people exercising and I join them.” (65-year-old male)

“Yes, I exercise with a friend.” (55-year-old male)

Furthermore, several participants indicated a need to exercise alongside others, including reasons related to the poor diabetes management.

“Sometimes I exercise when I have someone to help me walk back and forth [because I am blind].” (55-year-old blind male)

“I walk with my granddaughter. I cannot walk around by myself because of my condition.” (58-year-old female).

Cultural Empowerment: Positive, Negative, and Existential

Cultural empowerment analyses consist of organizing findings as positive, negative, or existential. Positive and negative tenets encourage and obstruct successful DM management, respectively. Existential principles may be practiced, yet they do not impact disease management.

The presence of a beach, paired with communal values, provides positive influence for exercise. Particularly, family members may aid in maintaining health behaviors.

“Two times a week, I walk to the beach and back. One kilometer and a half [which is] one hour and 15 minutes and I also clean the house.” (66-year-old female)

“[I walk] with friends or slowly with little kids... little running after children here and there.” (63-year-old female).

Some participants may be reliant upon medical doctors for more guidance on management. Doctors may be able to influence a more comprehensive approach to management, with culturally sensitive recommendations for manners to engage in physical activity. One participant noted:

“If the doctor told me what kind of exercise, I would do it, but no one has ever told me to do this or that, so I never did. The doctor never told me anything about exercise, I just think that it is a good idea.” (52-year-old female)

Meanwhile, other participants rely on more traditional forms of medicine:

“Currently, I eat aloe vera [for medication].” (63-year-old female)

“I was not prescribed any medication just advised to change my diet. I take three seeds from the [moringa tree] in the morning – it’s like medication.” (54-year-old male)

Results of the International Physical Activity Questionnaire (IPAQ)

Participants reported walking as their main source of exercise, with an average frequency of 4 days per week (SD=2.8; range 0-7 days). The amount of time (in minutes) spent walking varied widely (SD=85.2 minutes; range 0-8 hours) with an average of about an hour (61 minutes). Participation in moderate or vigorous exercise was reported by less than a quarter of the sample (N=8). Of those who reported engaging in moderate exercise, participants spent an average of 26 minutes (SD=62.2, range 10 minutes-5 hours) exercising for a total of 1 to 3 days a week. A few (N=4) participants reported vigorous physical activity once a week for 4 to 11 minutes. Notably, participants displayed on average 7.5 hours of sitting daily (SD=4.6; range 7-12 hours). Results are summarized in Table 2.

TABLE 2. Weekly Physical Behavior for n=41 Participants

Weekly Physical Behavior	Participant Average Reports
Sedentary	7.5 hours (SD=4.6)
Walking Activity	61 minutes (SD=85.2)
Moderate Activity (N=8)	26 minutes (SD=62.2)
Vigorous Activity (N=4)	7.5 minutes (SD=3.1)

Triangulation of Qualitative and Quantitative Results

Several qualitative quotes supported the quantitative IPAQ results. For instance, a few participants reported adequate engagement in physical activity measured by IPAQ assessment and personal narratives in qualitative interviews. Further, participants also acknowledged the importance of physical activity for diabetes management:

“[I exercise] everyday... there isn’t a day that I do not exercise.” (63-year-old male; daily vigorous exercise for 40 minutes)

“I exercise a good amount and know that it is good for my health.” (55-year-old male; daily moderate exercise for 60 minutes)

However, many participants shared insight into their barriers for physical activity. Their narratives described comprehension of exercise’s importance while illustrating their challenges in partaking such that:

“I know [exercise is] good but I am unable to do any. [I am] only able to walk in the bedroom.” (73-year-old female; no reported physical activity)

“Yes. [Exercise is] very important, but it is difficult due to muscle weakness. [I] use a cane [and I am] very weak.” (82-year-old female; no reported physical activity)

“When I wake up in the morning, I walk for 15-20 minutes and it feels really good, [but] my occupation [as a security guard] is prohibitive. I am not able to walk long distances. I work the whole day so to go out and walk is too much for my body. At work, I sit down and keep watch. Sometimes I get up, look around, and come back to sit.” (64-year-old male; daily walking for 30 minutes)

“Good food will help because the way I am eating is not enough to support exercise. I am hungry often [and] dizzy when attempting to simply get up.” (63-year-old female; no reported physical activity)

Overall, findings were triangulated by the quantitative and qualitative results. Although participants were able to articulate the importance of physical activity, the majority of the sample did not meet recommendations for sufficient physical activity. In fact, the majority of the sample displayed substantial sedentary behavior. Furthermore, study participants shared several barriers to DM management consistent with current literature. Additionally, participants share insight into such barriers which advance gaps in knowledge for prevention and control of DM.

DISCUSSION

SSA is experiencing a rise in non-communicable diseases such as DM^{20, 31, 33}. Study results shed insight into opportunities to address the rising prevalence of DM in SSA. In Senegal, the distribution of the disease falls higher on women and aging adults²⁸. This study employed a mixed methods approach to explore physical activity habits as well as potential cultural enablers and barriers to physical activity in individuals with DM in M'Bour, Senegal.

This study included mixed methods for data triangulation. Results from both quantitative IPAQ and qualitative PEN-3 analysis highlighted participants' lack of full engagement in physical activity, an important barrier for DM management. Knowledge, an influencer of perception, serves as a key factor for diabetes management^{2, 23}. Lack of information or misinformation has been cited as a major concern with people living with DM in SSA and Senegal in particular³⁶. Accordingly, Senegalese communities may benefit from interventions for social and educational support, with cultural considerations for increasing exercise, to effectively manage DM^{7, 31}.

Findings from the IPAQ with the study sample indicated high amounts of sedentary behavior and substandard rates of physical activity. Participants' reported quality of exercise mainly included light activity such as walking. Results elicited from PEN-3 Model guided analysis of quantitative data included several barriers and enablers to physical activity. Barriers included prohibitive costs of gym membership and exercise equipment. Also, limb pain and feeling ill were commonly mentioned barriers to exercise attributed to age. However, these reports may be linked to poor disease management^{2, 7, 20, 28, 33, 36}. Lack of motivation and lack of time were also identified as barriers. However, aligned with social structures and their influence on health and health behavior, it is imperative to consider people living with diabetes across their family and community contexts for comprehensive and sustainable approaches to health improvement^{7, 31}. Although patients reported a lack of others with whom to exercise, familial and community support aided in maintaining exercise behaviors such as walking.

Findings from our study should be contextualized with its limitations. Our participants were recruited locally recruited through convenience sampling. Therefore, results may not be widely generalizable across the entire country of Senegal. Additionally, a limitation is that the authors did not extend the consultation of the medics and members of the diabetes association to review the qualitative data beyond the medically engaged to the wider community. However, findings suggest people living with diabetes in Senegal and other SSA countries may benefit from government supported education programs on comprehensive disease management with more emphasis on exercise. Additionally, doctors may consider integrating management of DM with traditional medicine given the cultural salience of medicinal plants as well as their economical effectiveness^{12, 18, 20}.

Further, cultural sensitivity is critical. Indeed, interventions must consider West African values of family functioning and community. Cultural values and practices may facilitate engagement for health promotion such as homemaking activities of food shopping and preparation as well as cleaning with respect to contextual and cultural gender roles, particularly for women who are at heightened risk for disease. Furthermore, connectivity through religious practices provide ripe opportunities for cultivating community which may serve as a social group for exercise. Given participants' need for exercise companions, group-based exercise activities may prove to be beneficial. Interventions may leverage the subtropical climate of SSA and geographic location of M'Bour, Senegal on the coast, creating simple, stimulating social settings for energy expenditure such as beachside workout clubs. Additionally, results from this study indicate the potential benefit from complimentary home-based exercises that are gentle and may alleviate pain. Conclusions from this study emphasize the importance of implementing culturally grounded approaches to shape health and health behavior in SSA.

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