

Qualitative Analysis of Psycho-Social Factors of Potential Influence on Physical Activity and Dietary Practice of Patients with Diabetes and Cardiovascular Disease in Saudi Arabia

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Abstract

Objective: To explore a selection of psycho-social variables with potential influence on exercise and dietary behaviors in patients with cardiovascular disease and diabetes in Saudi Arabia and to elicit salient directions and themes for further examination on a larger scale. **Method:** This was a phenomenological qualitative study informed by the Self-Determination Theory and the COM-B Model. It involved fully structured, open-ended interviews administered to 8 inpatients at a governmental hospital in Riyadh between October and December 2020. Data was examined using a hybrid of deductive and inductive content analysis. **Results:** Patients with a higher degree of basic psychological need satisfaction lived healthier lives and displayed more positive emotional responses. We detected differences between physical activity and nutritional behavior in terms of the associated perception of autonomy and competence, as well as motivational quality. The family emerged as major social support source for both behaviors. Environmental opportunities provided for exercise and diet support were commonly perceived as insufficient. **Conclusions:** We suspect the level of perceived psychological need support to be linked to the patients' behavioral and psychological outcomes. We also expect local inequalities in the available behavior change support across different health behaviors and the need to adequately foster patient autonomy in clinical interventions in Saudi Arabia.

Keywords: Saudi Arabia, non-communicable diseases, psycho-social behavior determinants, Self-Determination Theory, COM-B Model, health-related behavior change, chronic care management.

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INTRODUCTION

The high prevalence of lifestyle-related risk factors, such as inactivity and poor dietary habits, is leading to a constantly increasing incidence of non-communicable diseases (NCD) in the Kingdom of Saudi Arabia (KSA), with further growth anticipated in the coming years [1, International Diabetes Federation, IDF [2, 3]. In 2017, five of the top 10 causes of premature death in the Kingdom were attributed to NCD [1], which, according to the WHO accounted for 73% of all deaths in the same year [4]. It is estimated that the total number of cardiovascular disease (CVD) cases will increase from 201,340 in 2016 to 479,500 by 2035 [5]. Estimations for the KSA country prevalence of diabetes (DM) incorporate a rise from 19% in 2017 to almost 24% by 2045 [2]. These lifestyle diseases, together with their adverse effects on the individuals' quality of life (QoL), constitute an immense burden on the health care system and certainly contribute to

premature death and disability among the Saudi population [3, 4].

In the context of secondary and tertiary prevention of CVD and DM, physical activity (PA) and healthy diet (HD) habits have shown a consistent positive impact on the progression of various diseases [6, 7] and a substantial, though often overlooked, potential to increase the efficacy of chronic treatment approaches [8-10]. Unfortunately, evidence typically demonstrates insufficient compliance with behavioral treatment protocols in clinical settings, or suboptimal availability or non-existence of health promotion practices and services in primary care facilities or hospitals in KSA [11, 12]. With a view to continuous improvement of patient-centered chronic care in the Kingdom, we see a need to enhance the available services, practices and behavior-based health interventions in terms of affordability, accessibility and

efficacy. Current behavioral approaches mostly concentrate on enhancing health awareness and information transfer (i.e. health education) [11, 12], but neglect other critical factors determining health behavior in chronic patients [13]. In the best-case scenario, taking into account a multitude of factors that may affect changes in patient behavior; a biopsychosocial approach should be incorporated into clinical programs with behavior-based treatment goals [14, 15]. This demanding task can only be mastered if the practitioners in charge have thorough understanding of the behavioral regulations within the respective patient groups. Since to date local research into the health behavior determinants of chronic patients is very limited, this phenomenological study aims to take a first step in this regard. Informed by the Self-Determination Theory (SDT) [16, 17] and complemented by the COM-B Model [18], it seeks to understand what factors have the potential to affect the health behavior of CVD and DM patients in the cultural context of Saudi Arabia. In addition, it aims to pave the way for more theory-informed studies of both interpretative and positivistic paradigms, by identifying relevant factors and by eliciting salient directions and themes worthy of further examination.

Research questions

This study encompassed the following research questions

General research question

- Drawing upon the SDT and the COM-B model: What are the psycho-social characteristics of potential influence on health behaviors in Saudi patients with CVD and DM?

Specific research questions

- Do CVD and DM patients perceive basic need satisfaction (autonomy, competence, relatedness) in their exercise and diet conduct?
- Which are recurrent issues/factors of potential importance in the patients' behavioral regulations to be addressed in a large-scale study? (i.e. salient points of interest for further investigation)
- How do patients perceive/experience the provided physical and social opportunity to behave healthily (e.g. existing exercise and diet program offers, social support)
- What are the opinions and preferences for health programs best fitted to their needs?
- Do patients share ethnographic similarities in
 - life aspirations
 - motivations
 - preferences in social support
- Which meaning do patients assign to standing terms such as "healthy lifestyle" or "healthy diet"?

MATERIALS AND METHODS

Research Design

This study had an exploratory phenomenological qualitative design, using fully structured extensive interviews to investigate a selection of theory-based psycho-social constructs in patients submitted to the inpatient department of a governmental hospital in Riyadh, Saudi Arabia. The study was approved by the Research and Ethical Review Committee of the Universidad Internacional Iberoamericana in Campeche, Mexico on March 22nd, 2019 and the Prince Mohammed bin Abdulaziz Hospital in Riyadh on May 14th, 2019.

Theoretical Framework

The Self-Determination Theory [16, 17] and the COM-B Model [18] served as a guiding theoretical framework to this study. Developed by Ryan and Deci in the late 1970s and 1980s [16], the SDT is a theory of personality and motivation that offers explanations for how and why people change their behavior. Ryan and Deci consider motivation to be the primary catalyst for behavioral change and posit that intrinsic motivation and life goals, as opposed to extrinsic ones, contribute to long-lasting behavior change [17, 19]. Furthermore, the STD proposes that the quality of human motivation is linked to the satisfaction of three basic psychological needs inherent and universal to every person and critical in the process of successful behavior change. These needs are postulated as "perceived autonomy", which is the feeling of control over ones' own actions, without being externally forced or influenced; "perceived competence", understood as one's perceived capability to produce a desired outcome in a certain situation and "perceived relatedness", reflecting one's sense of being respected, understood, and cared for by (important) others [17, 20]. A strong body of STD-based research in the health domain has confirmed the theories' value and applicability in clinical interventions [21-23]. Treatment approaches targeting the satisfaction of the basic psychological needs in the health context have revealed greater adherence to exercise protocols, long-term weight loss [21, 24] and positive mental, as well as physical health outcomes [25]. STD-based intervention studies have further proven their efficacy in significantly modifying health habits and improving different health indices in different reviews and recent meta-analyses [25, 26].

We believe that an understanding of the patient profile with respect to the STD's core constructs will improve the capability of clinicians to effectively enhance the patients' motivation for the required behavioral improvements. In addition, enhanced insight into psycho-social behavioral determinants would enable intervention developers to tailor programs to the standards of a biopsychosocial treatment approach.

In support of intervention creators, another widely acknowledged framework was woven into the theoretical foundation of this study as an implementation-driven complement to the SDT. The COM-B Model comprises a theory-like and systemic model describing the essential interacting system components of human behavior. It resides at the heart of the Behavior Change Wheel Model (BCW), developed by Michie, Atkins and West in [18] as a science-backed guide for behavior-based intervention development. COM-B is an acronym for the essential interacting system components of human conduct: "Ability", "Opportunity", "Motivation" and "Behavior". The model postulates that at least one of the COM components has to be modified in order to achieve beneficial system setting that allows for sustained behavior change ("B").

In contrast to the SDT, the COM-B (within the BCW) offers a structured guide for practitioners to translate principles into practice, while promoting the integration of other established theories into the creation process [18].

Sampling and participant characteristics

Participants were recruited from the inpatient department by means of purposeful sampling between October and December 2020. Participant inclusion criteria defined as follows: men and women who are (a) 18 years of age and older, (b) registered at the inpatient department at the hospital, (c) being admitted for treatment of either CVD or DM [1], (d) self-identified as Arabic speaker, (e) willing to commit to several interview sessions if required, and (f) provided a written consent. In total 8 patients (4 male, 4 female) were recruited for the study, including 4 CVD and 4 DM patients. The majority of patients were between 60-69 years of age (n = 5), while 3 were between 35-59 years of age.

Data collection & process

Fully structured interviews were conducted in one-to-one mode by 4 research team members on site. When eligible, patients were approached by the interviewer and asked for participation. In order to enhance the comfort perception of the participant, efforts were made to ensure that the patient and interviewer were of the same gender and region of origin. Prospective participants were provided with all details concerning the study, assured their anonymity, the right of withdrawal at any time and the confidentiality of all their data collected.

A written informed consent was obtained by all participants prior to enrollment, including the agreement to be audio-recorded in the interview. All

interviews were conducted in Arabic, audio recorded, and responses were documented in brief field notes. Additionally, all interviewers were trained and advised to track a selection of non-verbal cues throughout the interview. Interviews were conducted in one, up to maximal two sessions per day, with a duration of 45-60 minutes.

Data collection instrument

An open-ended questionnaire was specifically designed for this study and included items investigating core constructs of both theoretical foundations (SDT and COM-B).

Six core constructs of interest of the SDT and 5 constructs of the COMB-B model were used as a basis to question construction [Appendix 1]. Available in Arabic and English language, the instrument included a selection of demographic (age, gender, diagnosis), anthropometric (weight/height), and 25 open-ended thematic questions [Appendix B]. It comprised three thematic sections: general domain (2 questions), exercise and physical activity domain (12 questions) and diet/nutrition domain (11 questions). Prior to data collection, the questionnaire was tested by a selection of knowledgeable individuals (research associate, physician, nurses, nursing director) for criteria like "easy to use", "easy to read", "easy to understand", "unambiguousness of the wording" and grammar. Based on the input of the pilot testers, the questionnaire was modified where necessary.

DATA ANALYSIS

A hybrid of a deductive and inductive content analysis approach was used in this study, comprising theory-driven deductive and classic inductive analysis components [27, 28]. Both analysis components incorporated elements of the framework analysis method for data management [29]. Accordingly, procedures for data analysis included transcription of the audio records, translation of the transcripts, familiarization with all interviews by repetitive reading, application of the pre-defined analytical framework (deductive coding) followed by new coding (inductive coding), charting the data into a framework matrix and interpreting the data [29]. Since sample size was small, analysis was performed manually rather than using qualitative analysis software.

Transcription and translation

Digital interview audio-records were transcribed verbatim and numbered to ensure anonymity of participants' responses. Once the original transcripts were formulated, the transcriber compared them to the original recordings and hand-written notes to ensure correct transcription. Detected non-verbal cues were included in the final transcript of each question. Final Arabic transcript versions were translated into English language by a bilingual, native

¹ Both, DM type 1 and DM type 2 were eligible for participation.

professional with profound expertise in both, linguistics and the medical field.

Coding

For the deductive analysis part, core constructs of the SDT and COM-B were converted into a pre-defined analytical framework [30], constituting 20 theory-based categories distributed across three domains (general, exercise and diet) [Figure 1]. Each category was covered by 1-2 interview questions. In the first coding cycle, all interviews were screened, and condensed meaning units were created in each category.

Data that did not fall within the predefined categories was analyzed to decide if they reflected a new category or an established subcategory. In the second coding cycle, the meaning units were inductively and descriptively coded according to recurrently emerging themes. All generated themes were then discussed by the team in order to define them more clearly and to achieve a consensus. Where differing interpretations occurred, transcripts were reviewed until consensus was reached. Determined inductive codes and themes were then added to the analytical framework for subsequent interpretation.

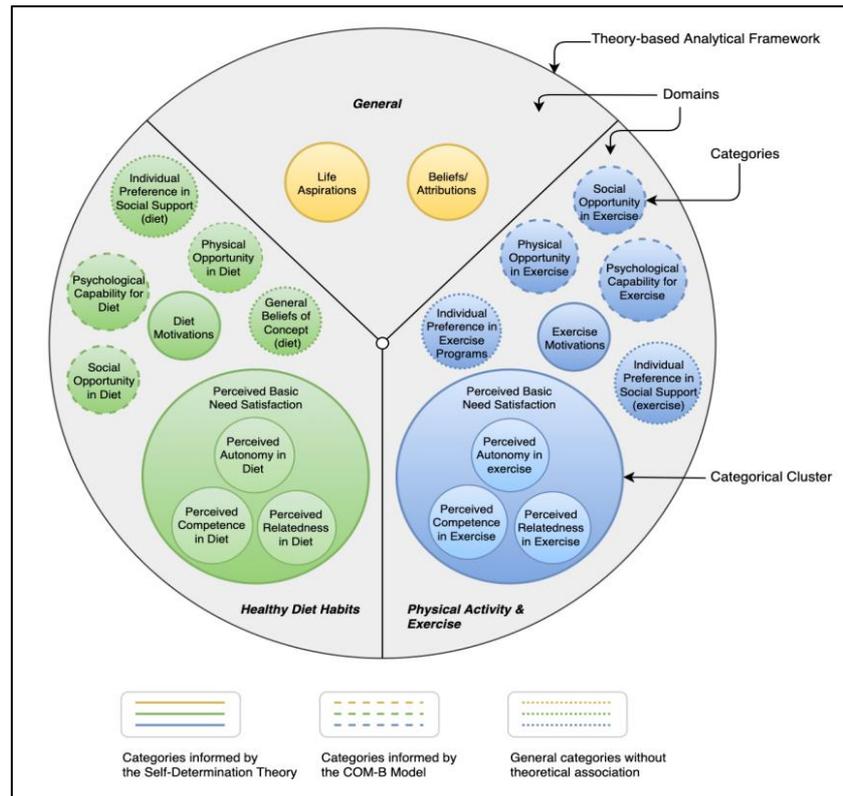


Fig-1: Pre-defined Analytical Framework

Note. Shown is the structural arrangement of the theory-based analytical framework used in this study. Based on the Self-Determination Theory and the COM-B behavioral change model, three superordinate domains and 20 categories were examined. Both, the diet and exercise domain included a categorical cluster in which conceptually associated categories were merged.

RESULTS

The presentation of the findings is shaped by the structure of the theoretical analysis framework.

General

Personal beliefs in the meaning of “healthy lifestyle”

The beliefs and attributions that people hold are recognized to affect health-related behaviors [31, 32]. Since ethnic communities have different belief and attribution systems in health, disease and health-related

conduct [33], we found it important to understand, which meaning patients attributed to certain expressions that are often used in the context of health promotion. Two predominant themes emerged in this category from the data: patients either related the standing term “healthy lifestyle” to the absence of illness/disease or health problems, or they associated the term with the execution or avoidance of specific behaviors such as exercise, diet, smoking or sleep:

“The phrase means that a person must be careful to stay away from anything harmful to health such as smoking, staying up late, unhealthy food and others.” (m [2], DM)
 “Many things occur to me. It means a healthy life without health problems.” (m, DM)

² m = male, f = female

Life aspirations

Life aspirations or life goals direct individuals in their plans and actions and affect their performance and mental well-being [34]. Participant responses fell under four major themes in this category: most frequently, patients aspired to achieve freedom of disease or disease-related complications. Some patients expressed their wish to return to a previous “healthy status” or “healthy/normal version of themselves”. Responses in this theme were often emotionally loaded (e.g. sadness, frustration). Another concern was the patients’ disease-related autonomy and their aspired independence from others, as well as the capability to successfully self-manage their condition.

“Since I am a heart patient, my goals are to maintain my health as much as possible so that I can live free from complications from my disease as much as possible.” (f, CVD)

“My goal is to be free of disease and to be able to walk again. They tell me I am diabetic and have kidney failure. I hope to go back to be as healthy as I was before.” (f, DM)

Finally, some patients explicitly wished good health for the important ones around them (children and family).

Physical Activity and exercise Self-reported exercise habits

Patients appeared to fall into two groups: patients going for walks and those not engaging in any type of PA. Reported duration of the regularly “walking” individuals encompassed 30-60 minutes. Other types of PA were reported only by two patients who indicated that they would stretch to instructions, participate in physiotherapy or perform some light exercises.

“I walk daily in the evening after Maghrib prayer. Sometimes for an hour and a half and sometimes only half an hour - depending on my health conditions. Walking is important for everyone, not just the patient.” (m, DM)

“I do not practice any kind of sport. I just walk to the mosque to pray.” (m, DM)

Although some patients thought walking was vital to all, including the sick, others seemed to see their state of health and associated rapid fatigue as an obstacle to PA.

Exercise motivations & behavioral regulations

According to the SDT, motivational quality is associated with the degree to which regulatory processes of a certain behavior have been internalized and integrated into the self [17]. Both processes are facilitated by a sense of autonomy and self-determination for a specific behavior and hampered by perceptions of external control and undesired force.

Furthermore, an internal perceived locus of control or rather intrinsic motivation is commonly accompanied by a feeling of innate enjoyment and interest for a specific activity [19, 17].

Three motivational patterns for exercise arose from the responses. Some patients reported that they were motivated to exercise by encouragement and support from family members. For others, their personal health concerns and the expected beneficial impact of exercise on their health was their prior drive to be active. Finally, a couple of individuals reported to not be motivated by anything at all. These patients were also among those individuals with a low self-reported level of PA or a lack of exercise-related enjoyment.

“My concern for my health is what encourages me to exercise.” (f, CVD)

“Nothing. I don't have anything to encourage me to exercise.” (m, DM)

The majority of the patients perceived exercise (in the form of walking) to be an enjoyable activity. Two patients imagined it to be enjoyable if they were in good health, while another patient did not perceive PA to be enjoyable due to the perceived exhaustion and tiredness it was causing.

“I like walking. [I³]: Do you enjoy walking?]. Yes. [I: Why do you like walking?]. I enjoy watching people on the streets and enjoy the natural air. But the problem is walking is difficult in summertime. Very hot temperature.” (m, DM)

Perceived Basic Need Satisfaction Perceived autonomy in exercise

Patients usually felt self-determined in their exercise choices and most of them did not experience any external pressure.

“Of course, I am able to choose and nothing compels me to perform a specific type of exercise except my desire to maintain my health.” [self-confident voice] (f, CVD)

“I do exercises that match my abilities and that I like to do. I personally choose what is right for me.” (m, DM)

However, a few patients felt an external compulsion to exercise. Although one patient thought that this was the right course of action on the basis of clinical instruction (enforced by the physiotherapist), others did not appear pleased with what was demanded from them:

“They want me to walk as a kind of exercise. But I cannot. I feel tired.” [defensive attitude] (m, DM)

Perceived competence and capability in exercise

A feeling of being capable through required skills and knowledge to achieve a desired outcome has been soundly linked to positive behavior outcomes across various populations [25, 26, 35]. While within the SDT, perceived competence is part of the three basic psychological needs [16, 17], in the COM-B model, the conceptually related physical capability (physical skills) and psychological capability (knowledge, cognitive skills etc.) also forms one of the three essential system components for behavior change [18]. Themes in this category primarily emerged in two forms: good perceived exercise competence and no perceived competence. One patient reported to feel limited competence in exercise. Those with poor competence perception generally also belonged to the inactive patient group.

¹I = Interviewer speaking

“I have few skills and knowledge about the sport, and I need to be educated and informed to get better.” (f, CVD)

“Yes. I have sufficient knowledge and skills to help me perform the exercises correctly.” (f, CVD)

Physical capability was similarly distributed, with inactive patients attributing their low or moderate perception of capability to their poor state of health. Active patients, on the other hand, related their good physical abilities to the fact that they (gradually) adapted PA to their personal needs or health condition or tried to do their best within the limits of their possibilities.

“For me walking is easy because I started gradually according to my physical ability until I reached this stage. Any person must perform anything according to his ability and strength.” (m, DM)

“I do not have the physical ability to exercise. I am sick.” (f, DM)

“I am a diabetic man. It is normal for my physical abilities to be weak.” [expressed with conviction] (m, DM)

Psychological capability perceptions matched with physical capability and competence perceptions. Themselves as competent and capable perceiving patients generally felt a high psychological capability to engage in PA and were reportedly active, while incompetent and incapable patients generally felt a low psychological capability to engage in PA and were rather inactive.

Perceived relatedness, social support & social opportunity in exercise

The major source of social support was received by family members (children and spouse) and occasionally friends or neighbors. Perceived social support in form of encouragement or shared experience with important others, was commonly high in the active

patients and was generally perceived as important motivator for their PA adherence. In the inactive individuals, social support was not existent or not desired. It appeared that patients themselves or their family members held the belief that due to the chronic illness, exercise should be avoided. Some patients were able to share exercise experience with family or friends, while others (especially those who did not exercise) lacked a shared experience. A few patients expressed a desire for a shared experience, but cited children's lack of time, inability of friends due to age and health, or disinterest as an obstacle.

“My friends support me and encourage me, my family as well. But they don't share my exercise with me because my friends are old, and my sons are busy with their lives.”

(f, CVD)

“I like to share my experience with others. But they don't care about it.” (m, CVD)

A less common obstacle to good social support appeared to be an individual's reluctance to receive social support based on personal health beliefs.

“My family and friends are trying to support me, but I refuse the support. They all tell me I have to be more active. I tell them I am sick and tired so they stop talking about it.”

(f, DM)

Strongest preferences for social support in exercise among the patients was the one from family members and friends: preferred supporting behavior included shared exercise experience (e.g. walking together on the weekends), guidance, advise, encouragement to stick to routine and a caring attitude toward the patients' health.

Perceived physical opportunity and individual preference in exercise services (experience with existing services offers)

Most patients had never heard of any existing exercise programs or had never been offered such a service before. A couple was practicing physical therapy at a hospital.

“No one ever gave me any offers of exercises.” (f, CVD)

“I haven't heard of offers for exercise. Are there offers?” [Surprised expression] (m, DM)

“I don't think there are offers. I never heard of it.” (f, CVD)

When asked how an optimal exercise program would look like, several patients wished for individually tailored, health status-, ability- and age-matched exercise programs and good (public) accessibility. Other recurring preferences were an affordable price,

professional supervision and the inclusion of sport options, such as tennis, soccer or swimming.

“It should be a suitable program for me according to my physical abilities and my health, provided that it is suitable for others as well. I miss types of sports that I cannot practice now [lowering voice & sad expression], and I hope that the program will be inclusive for those sports such as tennis, table tennis and soccer. I love all these sports.” (M, DM)

“The program should be tailored to the needs and physical abilities of each patient. There should also be an education for the patient how to benefit from the program. If the family is involved, that is better, because the patient needs psychological support. The program should be available to the public and in easily accessible places. I seem too imaginative.” [Smiling] (f, CVD)

Furthermore, patients wished for educational program components, the inclusion of the family in the program for psychological support, the suitability to other persons as well or the provision of supervised programs at home.

Healthy Diet Habits

Personal diet beliefs

Most patients associated the standing term “following a healthy diet” with consuming “healthy” foods such as fruit, vegetables, salads or meat, and avoiding certain foods such as rice and sugar. The consumption of three meals a day and a diet suited to personal health conditions were also mentioned.

“It means healthy food. [I: So, tell me what you think of when I say following a healthy diet?]. I think of fresh fruits, vegetables and meat.” (f, DM)

“It comes to my mind that my food should contain salads and I should stay away from eating rice.” [Embarrassed appearance] (f, CVD)

Self-reported diet habits

The majority of patients reported to adhere to a HD and generally gave the impression of being informed about both appropriate and less suitable foods, as well as the necessity of dieting as a treatment measure to their condition.

“For 15 years, I am staying away from all unsuitable foods for my illness, such as sugar, sweets, salt and unhealthy oils. I follow a strict diet.” [Relaxed, confident appearance & voice tone] (m, DM)

“Yes, I follow a diet. I eat vegetables and meat and stay away from bread, rice and dates. I love dates very much, but I only eat 3 dates. I drink plenty of water.” [Pride in voice tone and attitude] (m, DM)

While fruits, vegetables, meat (protein) and (a lot) of water were part of the diet of the majority of patients, foods containing carbohydrates and/or sugar, fats and salt were avoided. Some patients did not adhere to any particular diet. These patients also belonged to the group of inactive individuals. The consumption of dates is a culturally anchored daily diet habit [36]. It appeared that the controlled ingestion (max. 3 pieces) of the high-sugar dried fruit was a prominent form of self-regulation for some patients.

Motivations for healthy diet practice

Encouragement and guidance from the family (children or spouse), as well as the doctor were two main motivators for patients to adhere to a HD. One patient mentioned personal health concerns to be the primary motivator. Two patients did not perceive any motivation at all.

“My daughter encourages and guides me about the type of food I eat.” (f, CVD)

“My wife and children.” (m, DM)

“My desire is to keep myself as healthy as possible.” (f, CVD)

Majorly, patients did not find a HD conduct to be a joyful habit and locus of behavioral control appeared rather external for the most. Some patients described a healthy nutrition as vital to their health and associated the enjoyment of their diet experience with the personal importance they attached to their behavior (i.e. “conscious valuing”).

“I follow a healthy diet because it is important for my health. I try to find food that is enjoyable for me.” (m, DM)

“It is fun because it is important to health.” (f, CVD)

The rest of the patients however, associated no joy with healthful nutrition.

“No, it's never fun. But it is good for my health. My doctor says that the diet controls sugar.” (m, DM)

I don't like diet food. I don't like the taste, nor do I like the fact that it forces me to eat certain types of foods.” [Frustrated and unhappy voice] (F, DM)

“No, it's never fun.” (M, DM)

Perceived Basic Need Satisfaction in Diet

Perceived autonomy in healthy diet practice

The patient group showed two primary patterns in their diet-related autonomy perception. While some patients felt self-determined in their behavioral choices,

“Yes, I am free to choose the food I want to eat. I coordinate with my daughter what I want to eat.” (f, CVD)

or rather self-determined,

“I have freedom in the diet within the permitted foods that are not harmful for me.” [Relaxed and confident voice tone] (M, DM)

Most patients felt externally forced to adhere to a certain diet regimen.

“I do not have the freedom to choose so I do not like dieting and do not like how the food tastes. [...]” [frustrated, unhappy voice tone] (f, DM)

“I am definitely forced into specific kinds of food [...]” [sad expression] (m, DM)

While a higher sense of autonomy went hand in hand with emotional reactions such as confidence and positive attitude, patients who felt forced to diet were noticed with unhappy and frustrated expressions.

Perceived competence and capability in healthy diet practice

Two patterns within the "perceived diet competence/knowledge" category emerged from the patient responses: individuals with good, and those with poor dietary competence/knowledge perception. Education was reportedly received from family members, the doctor, and nutritionist or through self-education (reading, internet research). Patients generally expressed a great psychological capacity (e.g. mental strength and endurance, resistance to temptation, discipline) to eat healthily and answers were often observed in connection with positive emotional expressions (e.g. pride, self-confidence). Psychological capability that was poorly perceived, however, frequently appeared with negative emotional reactions (e.g. distress, frustration).

“Praise be to God, I am mentally relaxed because the diet is good for my health and I follow the instructions regularly, because I know that it is good for me and my health.” [relaxed and confident voice] (m, DM)

“Psychologically, I do not have any psychological ability to stick to the diet. My psychological status is very bad when it comes to dieting.” [raising voice] (f, DM)

Perceived relatedness, social support & social opportunity in healthy diet practice

Perceived social support for diet adherence from family and friends was generally high among the patients, with just a few exceptions. Support was mainly perceived through guidance and knowledge exchange, encouragement and shared experience.

“My family is very supportive of me. This encourages me to want to follow healthy instructions.” (f, CVD)

“My wife eats the same food I do so that I don't feel alone. She supports me a lot.” (m, DM)

One patient shared her perception of the family members' effort to provide help but said that a lack of

time would hinder the needed support. It appeared that most patients attributed a lower importance to sharing a healthy diet experience (in contrast to exercise) with (important) others. Some patients seemed to believe that their loved ones should not suffer from the same restrictive diet experiences because of them, and accordingly placed less emphasis on a shared healthy eating experience.

“Yes. But they don't need it as they are healthy and not sick. They do not need suffering and deprivation.” [smiles] (f, CVD)

“Yes, it is possible. But why should I share them? [...] Maybe they don't want me to share with them. No one wants to live the experience of illness.” [sad expression] (m, DM)

“My husband committed to a healthy diet with me. He said he would commit to losing the extra weight. But I know he wants to join me in order to encourage me.” [touched voice tone] (f, CVD)

Most of all, patients valued the social support of their families (children or spouses) in eating healthily. Guidance, advice and encouragement helped many to adhere to their diet regimen. A lack of time from children as a barrier to desired support was also mentioned by one patient.

“My kids try to help. But they are all busy with work. My daughter comes to visit sometimes but she is busy and doesn't have enough time.” (f, DM)

Perceived physical opportunity in healthy diet practice (experience with existing services offers)

Two patterns arose from the data: provision of diet information from clinicians (doctor, nutritionist) or no provision of any information/service at all. Although clinicians informed some patients about suitable foods, offered written information or advised them to self-educate on the Internet, others said they had never received any kind of dietary advice or guidance. Participants did not report any current participation in any dietary program/intervention or other supportive services.

DISCUSSION AND RECOMMENDATIONS

This study aimed to elicit potential determining factors of two central health behaviors in a population of CVD and DM patients in Saudi Arabia. A number of interesting themes and patterns emerged from the content analysis, forming the basis of a number of assumptions that are encouraged to be examined on a larger scale.

Viewed at a higher level, our analysis indicated two major clusters in the study population: on the one hand, there were patients with rather healthy lifestyle practice, who at the same time frequently reported a high degree of psychological need satisfaction (i.e. high sense of competence, autonomy

and social support) in both behaviors. Second, there were patients who did not stick to a healthy lifestyle and generally reported very little psychological need support in all three dimensions.

At first glance, this pattern confirms the predictions made by the SDT, assuming that higher levels of psychological need satisfaction are associated with more positive behavioral outcomes [16, 17].

On closer observation, we were also able to repeatedly detect negative emotional reactions in patients with a low sense of autonomy and competence - expressed in unhappy, defensive and frustrated attitudes. In self-determined and more capable participants on the other hand, we observed emotionally positive responses associated with pride and confidence. This trend is coincident to a previously discovered association that suggests a low sense of autonomy to be correlated with poor mental health outcomes [25, 26].

As a result, high levels of perceived need support may be linked to positive behavioral and psychological outcomes in CVD and DM patients in KSA, whereas low perceived autonomy, competence and relatedness with regard to diet and exercise may lead to negative effects on the patient's behavioral and mental health. Although confirmed in other populations [25, 26, 35], future research might want to explore this relationship in local patient communities.

Another promising starting point could be the investigation of variations in the direction of effect of patient's autonomy perception within and between different health-related behaviors. For the following reason, this topic may be of particular interest when examined in the light of available behavior change support standards for different health behaviors: a paradoxical pattern emerged from our data, which reflected that healthy patients displayed rather autonomous forms of PA regulation and enjoyment, but that their dietary behavior was more defined by controlled forms of regulation and relatively little related enjoyment.

Such pattern we had recently discovered in a similar form in two related cross-sectional studies on behavioral regulation and motivational quality for PA and diet behaviors in outpatients with NCD in KSA [37, 38]. While we found that higher levels of autonomy were positively associated with exercise behaviors, this relationship could not be verified for healthy diet patterns in the same study population. So why would the effect of autonomy perception on actual conduct would differ across health behaviors?

Based on statements by Ng *et al.* [25] in this regard, we priorly hypothesized that health education for a particular behavior may "inhibit" the perception of

a patients' autonomy through the enforcement of diet-related "must-do's", but still successfully triggers the necessary behavioral adjustments. We further assume, accordant with previously detected gaps in data on PA counseling in the clinical setting in KSA [11], that patients would as per standard, receive more dietary than PA instructions from their practitioner, leading to an inequality in the provision of medical behavior change support across health habits. This is supported by the impression gained from our data, which indicates that the patients' perceived opportunities to promote their PA practices were less common than the perceived support for dietary changes. In addition, patients' perceptions of PA competence and capability were also fairly low.

In summary, we hypothesize the existence of an inequality in clinical behavior change support in favor of dietary counselling, which despite being effective to a certain extent, is suspected to commonly thwart the patients' sense of autonomy. Should this assumption be confirmed in future studies, clinicians in KSA may want to explore strategies to provide patients with optimal physical (environmental) opportunities to promote PA behavioral changes and PA-related competence. In addition, careful attention is warranted to the promote patients' sense of autonomy in nutrition counseling approaches (e.g. motivational interviewing).

In general, the availability, accessibility and personalization of corresponding behavior change offers in KSA still seems to allow a lot of room for improvement. On various occasions, research has detected gaps in the availability of health education standards in primary care facilities or hospitals in the Kingdom [11, 12], and has encouraged healthcare providers to consider personal, cultural and local determinants of patient behavior change [13]. Our data indicated an inconsistent provision of dietary advice/information by clinicians, and the rare offering of physiotherapy to the patients, if any. Patients appeared to rely primarily on the knowledge and advice of family members on health behavior concerns, which, if confirmed in the future, would be fairly insufficient given the importance of professional patient-centered provision of personalized PA and dietary treatment protocols for the achievement of clinically meaningful results. Non-surprisingly, patients expressed their desire for PA program offers tailored to their personal health, a good accessibility and low cost of suitable services. Larger studies could address this issue and attempt to derive generalizable recommendations with regard to increasing PA (and diet) intervention acceptability in chronic patients in KSA.

It is also advisable in this regard, to define population-specific barriers to respective health conduct. Directions emerging from the data suggest that perceived level of exhaustion, tiredness and subjective and social norms concerning the disease (i.e. "the ill

needs to rest”) might be inhibiting PA behavior change. Furthermore, a lack of enjoyment for healthy foods, restrictions in food choices and taste of food may be negatively impacting diet protocol adherence. Several of these factors have been detected as obstacles to proper PA and diet conduct in prior studies in the Kingdom [39-42, 12].

There are a few other considerations to be discussed in this context. First of all, the feeling of relatedness to important others should be mentioned as the third and final component of the three basic psychological needs. Just like in other Arab nations, in Saudi Arabia, family life in a strong social system is of utmost cultural importance [43]. Daily life, and thus health-related activity, takes place in frequent interaction with other family members. Congruently, we generally observed a high degree of relatedness perception in the healthily living individuals, with family support being a major motivator for both behaviors. At the same time, sub-optimally perceived support was often seen as an obstacle to better habits in the unhealthily living patients. Lacking social support has also been observed as barrier to healthy eating [42] and PA [39] in previous clinical population studies in KSA. We believe that a stronger focus on the systematic involvement of family members in behavior change programs holds a strong, but yet neglected potential to increase adherence and motivational quality in patients with DM, CVD and other NCD in the Kingdom.

In addition to family support, the participants' responses also revealed other motivators for healthier habits. Motivators for both PA and diet were concerns about personal health and the desire for health improvements. The urge to obey the doctors' instructions however, emerged purely as a driver of dietary behaviour. This matches in with our previous assumption, as it suggests behavioral diet regulation – as opposed to PA – to include elements of external control, such as compliance or reaction to external forces. Promisingly, the stated life goals of the patients were also generally intrinsically shaped and mainly related to personal health improvements, health-related independence or wellbeing for important others. This may also be an interesting starting point for clinical counselling strategies, since the alignment of behavioral change goals with intrinsic life aspirations has been suggested as a promising strategy to facilitate health-related behavior changes [19].

Limitations

The present study has a number of limitations: first, due to the qualitative nature of its design, identified themes cannot be generalized to other patient populations and the results should therefore be interpreted in light of current evidence available.

Furthermore, since self-reported interviews generally run the risk of recall or social-desirability bias [44], patients may have omitted personal feelings or may have offered favorable responses to the interviewers. However, we have sought to minimize this constraint as far as possible by educating the interviewer to create a pleasant and trustful interview atmosphere and by matching interviewers' and patients' gender and region of origin.

Finally, cross-language research poses a special challenge to complete and accurate transcription, translation and data analysis. We aspired to minimize all associated risks by implementing purposeful integrated data management and transformation processes involving team members with complementary expertise [45]. To maintain reasonable rigor, we used transcription logs, assigned culturally and linguistically competent translators, and used an iterative-collaborative data review process between team members.

CONCLUSION

We conclude that a range of psycho-social characteristics, such as the sense of autonomy, competence and perceived social support and motivation for personal PA and diet practice, as well as offered support in the physical environment may considerably impact the health conduct of patients with DM and CVD in KSA. Against the background of the implementation of a biopsychosocial treatment approach, the consideration of these factors by the clinician can sharpen his/her understanding of the patient-specific health behavior and thereby create the prospect for more targeted, holistic and personalized treatment strategies.

We further suspect that current diet education practice in KSA might have a somewhat thwarting impact on the patient's autonomy perception, thereby altering the direction of action that is normally observed between this construct and behavioral outcomes. We also assume that in standard local clinical protocols of chronic care management, there are disparities between the promotion of PA and HD via health education and other initiatives. In accordance with the conclusions of other scientists [11, 13, 12], we see the need to expand the current range of behavior-based interventions for patients with DM and CVD and provide PA and diet support programs taking personal, cultural and community-specific requirements, individual preferences and obstacles into account. Finally, we think that such programs would be particularly effective if they focused on supporting the basic psychological needs of the patient in the respective behavioral context. A high sense of autonomy, competence and relatedness perception should therefore be generally set as behavioral treatment targets. Future research is encouraged to examine the assumption made in this work and shed further light onto the psycho-social

determinants of health-related behavior in chronic patients in KSA.

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CONFLICT OF INTEREST

Declared none

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APPENDIX 1

Table-A.1: Theory-informed content categories

STD	COM-B	Category	Description	Reference
✓		Beliefs and attributions	Meaning individuals attribute to certain expressions that are often used in the context of health promotion	Marteau, 1989; Strecher, Champion, & Rosenstock, 1997
✓		Life aspirations	Long-term objectives that people use to guide their behaviors	Deci, & Ryan, 2008
n.a.	n.a.	Individual Behavior	Self-reported PA and diet behavior	n.a.
✓	✓	Personal motivations	Reasons or objectives that lead to action.	Ryan & Deci, 2000
✓		Intrinsic motivation	Motivation due to the inherent enjoyment obtained from the activity itself.	Ng. el al., 2012
✓		Basic Psychological Needs	Selection of universal psychological needs that must be addressed for successful functioning and psychological wellbeing.	Deci, & Ryan, 2008
✓		Perceived autonomy	Feeling of being the source of one's own actions and the experience of volition in personal behavior.	Ng. el al., 2012; Ryan & Deci, 2000
✓		Perceived competence	Feeling of being capable to achieve desired results.	
✓		Perceived relatedness /social support	Feeling understood, respected and cared for by others	
	✓	Physical capability	Physical abilities, endurance or strength of an individual	Michie, Atkins and West, 2014
	✓	Psychological capability	Psychological skills, strength or stamina to function throughout the required mental processes	
	✓	Social opportunity	Opportunities created by interpersonal factors	
	✓	Personal experience with existing offers (i.e. physical opportunity)	Opportunities created by interpersonal factors. Personal experience with existing PA & HD offers	
n.a.	n.a.	Individual preference in social support	Personal preferences in received support for PA & HD adherence	-
n.a.	n.a.	Personal preferences in programs	Personal preferences in offered PA & HD support programs & services	-

Note. PA = physical activity; HD = healthy diet

Appendix B

Table-B.1: Bilingual data collection instrument (English – Arabic)

No.	English	Arabic
	Domain: General Health and Life Goals	النطاق: الصحة العامة وأهداف الحياة
1	When you hear the sentence: “Living a healthy life” – What do you associate with that? Please be as specific as possible.	ما الذي يخطر في ذهنك عندما تسمع عبارة "الحياة بطريقة صحية"؟ الرجاء الإجابة بصورة محددة قدر الإمكان
2	I want to ask you about your long-term goals or aspirations. Like things that you hope to accomplish over the course of your life. Can you share your life goals with me?	أرغب في أ أسألك عن أهدافك الطويلة المدى أو تطلعاتك. مثلا الإنجازات التي تتطلع إلى تحقيقها في حياتك. هل بالإمكان أن تشاركني هذه الأهداف؟

No.	English	Arabic
	Domain: Exercise	النطاق: التمارين الرياضية
3	Do you exercise regularly? Please explain how many times a week you exercise, what exercise you do and how much time you normally exercise.	هل تمارس الرياضة بانتظام؟ الرجاء تحديد كم مرة في الأسبوع تمارس الرياضة؟ وماهي أنواع الرياضة التي تمارسها؟ وكم من الوقت تقضيه في التمرين عادة؟
4	Could you explain to me what motivates you (or could motivate you) to exercise regularly?	هل يمكنك أن تشرح لي ما هو الشيء الذي يشجعك أو بإمكانه أن يشجعك على الرياضة بانتظام؟
5	Is exercise a truly enjoyable activity to you? Please explain.	هل الرياضة تعتبر بالنسبة لك من النشاطات الممتعة؟ الرجاء شرح الإجابة
6	When it comes to your exercise routine: Do you feel that you can chose freely what to do, or do you feel forced / obligated to exercise in a certain way? Please explain.	عند الحديث عن النمط الذي تتبعه في الرياضة: هل تشعر بأنك قادر على إختيار نوعية الرياضة التي تقوم بها؟ أم أنك تشعر بأنك مجبر/أو ملزم بطريقة أو نوعية معينة؟ الجاء شرح إجابتك
7	When it comes to the skills and knowledge needed to exercise well/properly with your condition? Do you feel knowledgeable and skilled in exercising?	عند الحديث عن المهارات والمعرفة المطلوبة لأداء التمارين الرياضية بطريقة صحيحة في حالتك: هل تعتقد أن لديك المعرفة والمهارات الكافية؟
8	Can you describe how you see/perceive your physical capability to exercise? (Like your physical strength, skills or stamina)	هل يمكنك أن تصف لي كيف ترى/تتصور قدراتك الجسدية لأداء التمارين الرياضية؟ (مثلا: قوتك الجسدية، المهارة أو القدرة على التحمل)

Table-B.1: (cont.)

9	Can you describe how you see/perceive your psychological capability to exercise? (Like psychological strength & stamina)	هل بإمكانك أن تصف لي تصورك لقدراتك النفسية/استعدادك النفسي لأداء التمارين الرياضية؟ (مثلا: قوتك النفسية وقدرتك النفسية على التحمل)
10	Can you describe me how important people around you (family and friends) are supporting you to meet your exercise needs?	هل بإمكانك أن تصف لي أهمية الدعم المقدم لك من الأهل والأصدقاء لمساعدتك على أداء التمارين الرياضية التي أنت بحاجة لها؟
11	Do you feel that you can share the experience of exercising and being active with the people who are close to you?	هل تشعر بأنه بإمكانك أن تتشارك مع الأشخاص القريبون منك تجربتك في أداء التمارين الرياضية ونشاطاتك الرياضية؟
12	Can you describe how people around you could support you better to be (more) active and exercise regularly?	هل بإمكانك أن تصف لي كيفية دعمك من قبل الأهل والأصدقاء لمساعدتك على أن تكون أكثر نشاطا وانتظاما في أداء التمارين الرياضية؟
13	Can you share your opinion about the existing offer of special exercise programs (from gyms, hospitals, health professionals) for patients with your condition?	هل يمكنك أن تشاركني رأيك في العروض الموجودة حاليا بالنسبة للتمارين الرياضية الخاصة بمرضى في مثل حالتك (التي تتوفر في مراكز التدريب، المستشفى، مقدمة من أخصائيو صحتين)؟
14	Imagine someone could design a sport/exercise program just for you. The perfect program. One which is helpful, fun and meeting your needs. How would such a program look like/be?	تصور أن هناك من يمكنه أن يصمم برنامجا رياضيا لك شخصيا. يكون هذا البرنامج مفيدا، مرحا ويقابل إحتياجاتك الصحية. كيف في تصورك يكون ذلك البرنامج؟
	Domain: Diet	النطاق: التغذية
15	When you hear the sentence: "Following a healthy diet" – what do you associate with that? Please be as specific as possible.	عند سماعك لعبارة "إتباع حمية غذائية صحية" مالذي يتبادر إلى ذهنك؟ أو بماذا ترتبط التغذية الصحية برأيك؟ الرجاء أن تكون إجابتك محددة قدر الإمكان
16	You personally: Do you follow a healthy diet adapted to your condition? Please describe shortly what you normally eat during a day.	بالنسبة لك شخصيا: هل تتبع حمية غذائية صحية مناسبة لوضعك الصحي وحالتك المرضية؟ الرجاء وصف بإختصار ماذا تتناول عادة من الطعام خلال اليوم.
17	Could you explain to me what motivates you (or could motivate you) to eat healthily?	هل يمكنك أن تخبرني ما الذي يشجعك على أن تأكل أكلًا صحيًا؟

Table-B.1. (cont)

18	Is following a healthy diet enjoyable for you? Please explain.	هل إتباع الحمية الصحية سيكون ممتعا لك؟ الرجاء الشرح
19	When it comes to your diet: Do you feel that you can chose freely what to eat, or do you feel forced obligated to eat/not eat special foods? Please explain.	عند الحديث عن نظامك الغذائي: هل تشعر بأنك لديك الحرية لإختيار ما ترغب بأكله؟ أم أنك مجبر/ملزم بما تأكله/أو لا تأكله؟ الرجاء الشرح

20	When it comes to the skills and knowledge needed follow a healthy diet adapted to your condition? Do you feel knowledgeable in meeting the requirements?	عند الحديث عن المهارات أو المعرفة فيما يتعلق بإتباع حمية غذائية صحية مناسبة لوضعك الصحي: هل تشعر بأن لديك المعرفة الكافية لعمل ذلك؟
21	Can you describe how you see your psychological capability to follow a healthy diet? (Like psychological strength & stamina, resistance to temptations, discipline, motivation)	هل بإمكانك أن تصف لي قدرتك النفسية على إتباع حمية غذائية صحية؟ (مثلا قوتك النفسية، قدرتك على التحمل، مقاومتك للمغريات، التنظيم والإلتزام، الدافع)
22	Can you describe how important people around you (family and friends) are supporting you to eat healthily?	هل بإمكانك أن تصف لي أهمية الدعم المقدم لك من الأهل والأصدقاء لمساعدتك على الإلتزام بحمية غذائية صحية؟
23	Do you feel that you can share the experience of eating healthily with the people who are close to you?	هل تشعر بأنه بإمكانك أن تتشارك مع الأشخاص القريبون منك تجربتك في الإلتزام بحمية غذائية صحية؟
24	Can you describe how people around you could support you better to eat a healthier diet?	هل بإمكانك أن تصف لي كيفية دعمك من قبل الأهل والأصدقاء لمساعدتك على الإلتزام بحمية غذائية صحية؟
25	Can you describe to me how has your experience been with diet programs offered to you in the past (anywhere, hospital/gym/other offers)?	هل يمكنك أن تشاركني تجربتك بالنسبة لبرامج الحمية الغذائية الصحية الخاصة بمرضى في مثل حالتك التي تم توفيرها لك في الماضي في مراكز التدريب، المستشفى، مقدمة من أخصائيو صحتين؟