

Explaining the personal cognitive factors affecting physical activity and nutritional behaviors in the middle-aged at risk of coronary artery disease: A directed qualitative content analysis

Roghayeh Ezati Rad^{1,2}  | Zahra Hosseini³ | Shokrollah Mohseni³ |
Teamur Aghamolaei⁴  | Mohammad Mohammadi⁵ | Marzieh Nikparvar⁴

¹Research Committee, Faculty of Health, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

²Fertility and Infertility Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

³Social Determinants in Health Promotion Research Center, Hormozgan Health Institute, University of Medical Sciences, Bandar Abbas, Hormozgan, Iran

⁴Cardiovascular Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

⁵Food Health Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

Correspondence

Teamur Aghamolaei, Cardiovascular Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
Email: teaghamolaei@gmail.com

Funding information

Hormozgan University of Medical Sciences, Grant/Award Number: 4010055

Abstract

Background and Aims: Coronary artery disease (CAD) is the most common cardiovascular disease worldwide. Nutrition and physical activity are recognized as the major lifestyle-related behaviors to reduce the risk of noncommunicable diseases. It is essential to explain personal cognitive factors to identify potential ways to increase physical activity and improve nutritional behavior. Therefore, the present study aimed to explain the personal cognitive factors affecting physical activity and nutritional behavior in the middle-aged population at risk of a CAD.

Methods: The present qualitative study was conducted with a directed content analysis approach. A purposive sampling was used with maximum variety of sex, age, education, marital status, job, and risk factors of CAD. The data were collected through semistructured interviews with 20 middle-aged participants at the risk of CAD visiting comprehensive health centers in Bandar Abbas city. The interviews continued until data saturation.

Results: The present findings led to the identification of 4 main categories (i.e., self-efficacy, collective efficacy, outcome expectations, knowledge) and 10 subcategories.

Conclusion: It seems that to increase the self-efficacy, attention should be paid to individuals' past experiences, self-efficacy of action and maintenance and successful middle-aged peers. Measures should be taken to improve and strengthen it. Peer support, networking, forming online groups (in social networks), and a comprehensive use of social media can help increase collective efficacy. Expectations of positive and negative outcomes and the public knowledge can also be modified through accurate and appropriate information provided in different campaigns for awareness-raising.

KEYWORDS

cognition, middle aged, nutritional behaviors, physical activity, qualitative

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2024 The Authors. *Health Science Reports* published by Wiley Periodicals LLC.

1 | INTRODUCTION

Coronary artery disease (CAD), with a prevalence of more than 110 million worldwide, is the most common cardiovascular disease and a major cause of mortality in adults over 35 years of age.¹⁻⁵

The controllable risk factors of CAD include high blood pressure, high blood cholesterol, smoking, diabetes, overweight or obesity, and lack of physical activity.^{6,7} Although only one risk factor is sufficient to increase the risk of a disease, studies have shown that a combination of different risk factors can increase the risk of cardiovascular diseases and mortality.⁸

Inadequate physical activity is recognized as an independent risk factor for CAD in large population-based studies.^{9,10} According to the data from the National Health Interview Survey (NHIS) in 2015, 80% of adults in the United States did not abide by physical activity standards.¹¹ The findings of the third national monitoring of the risk factors of noncommunicable disease showed that 40% of middle-aged Iranians have inadequate physical activity.¹² The prevalence of low physical activity in Hormozgan province is reported to be 63.87%, which ranks 27th in the country.¹³ Reducing inadequate physical activity by 10% by 2025 is the third goal of the world health organization (WHO) Global Action Plan for the Prevention and Control of Noncommunicable Diseases.¹⁴

Many of the main risk factors of CAD, including blood lipids, high blood pressure, obesity and diabetes are related to inappropriate eating habits.¹⁵ Wrong nutritional behaviors are very common in Iran. It has often been observed that nutrition in Iran is limited to the consumption of a few special foods and there is no variety in the

dietary pattern.¹⁶ Research has shown that unhealthy eating habits develop dramatically in middle age.¹⁷

Cognitive factors are key to the adoption and maintenance of health behaviors. They help people follow a healthy diet and engage in physical activity.¹⁸

Social cognitive theory (SCT) is one of the most widely used theories of health behavior to initiate and achieve personal and group changes, maintain behavioral changes, and prevent relapse. In Bandura's extended version of SCT theory, human behavior is defined in terms of a threefold dynamic model in which behavioral factors, personal cognitive factors, and social-environmental influences interact with each other (Figure 1). In SCT, Bandura emphasizes the important role of cognitive factors in learning, understanding and predicting behavior.

Personal cognitive factors include the ability to self-regulate behavior, reflect and analyze experience, and personal ability to process information, apply knowledge, and change preferences.¹⁹

Cognitive factors in the SCT are divided into four main constructs: self-efficacy, collective efficacy, outcome expectations and knowledge.¹⁹

SCT is suitable for understanding health behaviors such as physical activity and nutritional behaviors due to the interaction of the individual, environment and behavior.²⁰

To the present researchers' knowledge, this study is the first in-depth investigation of personal cognitive factors affecting physical activity and nutritional behavior in the middle-aged at the risk of CAD in Iran. Increasing physical activity and nutritional behaviors in middle age is a way to reduce health risks in the later stages of life. Reducing inactivity and promoting healthy eating are important goals of the WHO¹⁴ and the National Action Plan and Control of Noncommunicable Diseases and Related Risk Factors in the Islamic Republic of

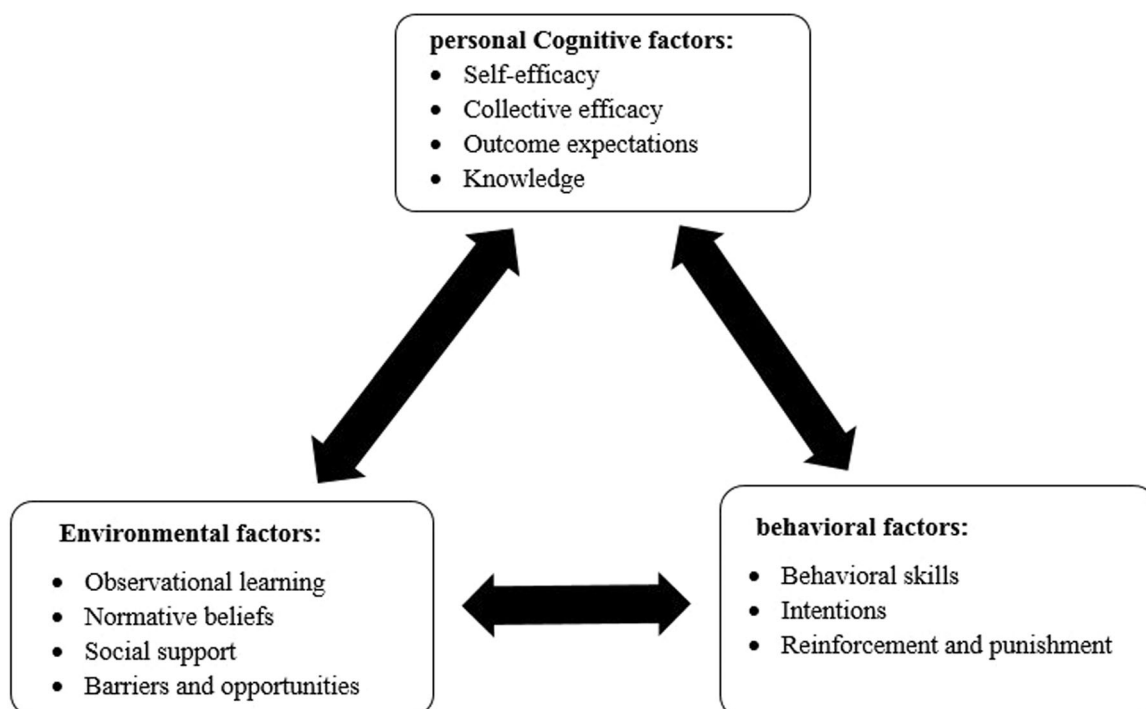


FIGURE 1 Constructs of social cognitive theory.

Iran.²¹ Also, physical activity and nutritional behaviors are changeable factors in people at the risk of CAD. Thus, the present study aimed to explain the personal cognitive factors affecting physical activity and nutritional behavior. It was conducted on middle-aged people at the risk of CAD.

2 | METHODS

The present qualitative study aimed to determine the cognitive factors affecting physical activity and nutritional behavior in middle-aged population at the risk of CAD. A directed content analysis was used to this aim. Due to the significance of cognitive factors, the cognitive constituent constructs of SCT were investigated.

2.1 | Participants and recruitment

The research population comprised the middle-aged with less than 150 min of physical activity per week and at least one risk factor of CAD such as hypertension, hyperlipidemia, diabetes, overweight, and obesity (BMI greater than 25).

Initially, the participants were contacted to learn about the purpose and significance of study. To participate in the study, a number of people volunteered to take part; thus, they provided an oral and written informed consent to take part in the study. They were selected using a purposive sampling with maximum variety (age, sex, education, marital status, employment status, risk factors, etc.). The interviews continued until data saturation.²²

2.2 | Inclusion and exclusion criteria

The inclusion criteria were:

1. at least one CAD risk factor (e.g., hyperlipidemia, hypertension, diabetes, overweight and obesity);
2. age of 35–55 years;
3. physical activity less than 150 min per week;
4. rich and useful experiences about living with this disease and willingness to share their experiences with others.

The exclusion criteria were:

1. incapability of sharing thoughts in speech;
2. lack of any of the inclusion criteria during the interview.

2.3 | Data collection

Semistructured interviews (based on the questions in Table 1) were used for data collection. The first author with a full command of Persian and local languages held all the interviews. The interviews lasted between 40 and 60 min. An AD sound recorder was used to record all the interviews. The time and place of the interview were decided by the participants for their convenience.

Rich data and maximum variety are sought for in qualitative studies. Here, the subjects were included from various health centers from areas with divergent demographic and cultural characteristics. The setting of the interview was set by the participants. To audio-record the interviews via a tape recorder, the subjects were asked for permission. To preserve the confidentiality of the information obtained from the subjects, participants' names were omitted and replaced by codes. To assure the anonymity of information. The semistructured interview used personal cognitive factors constructs of SCT: self-efficacy, collective efficacy, outcome expectations, and knowledge (Table 1).

These constructs provided a focus on the research question. Then, the theory was used as a guide for the analysis of initial codes. General questions were used at the beginning of the interviews (e.g., Tell me about the foods you eat. How do you define physical activity? What kind of physical activity do you do? What do you know about CAD?) When needed, further exploratory probes were asked to guide the interview and remove ambiguities. For instance, "Can you please explain more? What does it mean? Can you provide an example of this feeling so that I can better understand how you feel?"

2.4 | Data analysis

Initially, the interview content was typed in Microsoft Word by a participating researcher (R. E. R.) based on credible transcription regulations.²³ The second researcher (Z. H.) reread the transcripts several times for a thorough understanding of the interview. A directed content

TABLE 1 Interview guide.

Opening questions	Probing questions
Tell me about the kinds of food you consume.	How do you see yourself capable of doing physical activities for 30 min a day and at least 5 days a week?
How do you define physical activity? What physical activities do you do?	How do you see yourself capable of showing a proper nutritional behavior?
What do you know about the coronary artery disease?	Tell me about your experience of collective and group-based physical activity and nutrition behavior?
	What are the benefits of having an appropriate physical activity and nutritional behavior?
	What do you know about physical activity and nutritional behavior? And what else do you need to know?

analysis approach was used to analyze the data using cognitive constructs the SCT. Transcripts were inductively and deductively coded. Initially, the meaning units were found and they were coded. Afterward, the codes were contrasted with each other in terms of similarities or differences. Then, those which were similar conceptually formed groups called categories. The comparison was also made among the categories which led to the formation of larger categories in terms of similarity of concept.

In the next step, the main categories were classified into the cognitive constructs of SCT including self-efficacy, collective efficacy, outcome expectations, knowledge. The process of data analysis was appraised by the members of the research team in several sessions to reach an agreement about the accuracy of data analysis. To facilitate the organization and analysis of qualitative data, MaxQDA10 was used.

2.5 | Rigor

To assure of the trustworthiness of findings, the four criteria (i.e., credibility, transferability, dependability, and confirmability) proposed by Guba and Lincoln were used.²⁴ For credibility, the researchers engaged in the study for a relatively long time and dealt with the qualitative data. The results of analyzing interviews were provided to some participants. To increase the dependability of findings, a purposive sampling was used with maximum variety, as well as the review by a panel of experts. To increase confirmability, the opinions of expert professors in qualitative research were used, and efforts were made to preserve the evidence all throughout the study. To increase transferability, researchers tried to provide a comprehensive description of the procedure of study and its analytical process.

2.6 | Ethical considerations

All procedures abided by the Declaration of Helsinki. For ethical considerations, the project was approved by the Ethics Committee of the Hormozgan University of Medical Sciences (#IR.HUMS.-REC.1401.065). All individuals who took part in this study were supposed to sign a written informed consent to fill out the questionnaire on demographic information. All the required explanations about the necessity of recording conversations were provided to the participants. They had the right to withdraw from the study when they wanted. They were all sure of the confidentiality of information they provided.

3 | RESULTS

A total number of 20 middle-aged subjects participated in this study. Their average age was 45.85 years. Their demographic features are described in Table 2. Data analysis led to the extraction of 4 main categories and 10 subcategories. The main categories included self-efficacy, collective efficacy, outcome expectations, and knowledge. The subcategories were prior experiences, action self-efficacy,

maintenance self-efficacy, social modeling, peer support, networking, positive and negative, necessity of healthy behavior, health risks (Table 3).

3.1 | Category 1: Self-efficacy

Self-efficacy means the belief in one's own capability of successfully showing the right behaviors based on past experience or self-evaluation. The strength of their beliefs affects how they react to problems or critical conditions.²⁵ There are four subcategories: prior experiences, action self-efficacy, maintenance self-efficacy, and social modeling.

3.1.1 | Subcategory 1: Prior experiences

"Prior experiences" was a common theme that most participants cited for their positive or negative sense of capabilities. Many participants

TABLE 2 Research participants' demographic variables.

Variable	Category	N (%)
Age group	35–41	2 (10)
	42–48	15 (75)
	49–55	3 (15)
Sex	Female	10 (50)
	Male	10 (50)
Risk factors of CAD	Hypertension	10 (50)
	Hyperlipidemia	6 (30)
	Diabetes	6 (30)
	Overweight and obesity	6 (30)
	Smoking	4 (20)
Educational level	Illiterate	2 (10)
	Elementary school	3 (15)
	Diploma	6 (30)
	University	9 (45)
Marital status	Single	4 (20)
	Married	14 (70)
	Divorced/widowed	2 (10)
Number of children	0	2 (10)
	1–2	13 (70)
	≥3	5 (25)
Job	Employee	11 (55)
	Self-employed	5 (25)
	Unemployed	4 (20)

Abbreviation: CAD, coronary artery disease.

TABLE 3 Personal cognitive factors affecting physical activity and nutritional behavior in middle-aged population at the risk of CAD.

Main categories	Subcategories
Self-efficacy	Prior experiences
	Action self-efficacy
	Maintenance self-efficacy
	Social modeling
Collective efficacy	Peer support
	Networking
Outcome expectations	Positive
	Negative
Knowledge	Necessity of healthy behavior
	Health risks

Abbreviation: CAD, coronary artery disease.

failed to engage in regular physical activity and healthy eating, resulting in a poor self-efficacy. Here is an excerpt from the interviews:

I began to do physical activity and practice healthy eating several times, but after a while, I quit. This time, I am more careful and adamant as I am experienced (a 47-year-old man with hypertension).

3.1.2 | Subcategory 2: Action self-efficacy

Action self-efficacy was another subcategory. The participants brought different reasons for not doing regular physical activity and having a healthy diet. See the following two excerpts from the interviews:

I have a small child at home, so I can't go for a walk. The other children also go to school. I can't leave a three-year-old boy at home (a 44-year-old woman with hypertension and obesity).

There are family problems or economic problems that make me work all the time. I don't have any time left for physical exercises (a 46-year-old man with diabetic).

3.1.3 | Subcategory 3: Maintenance self-efficacy

Maintenance self-efficacy was another subcategory of self-efficacy. Some participants admitted they were not able to overcome the problems related to physical activity and healthy eating. Problems

such as bad weather conditions and shortage of time caused them not to perform the desired behavior. Here are two relevant excerpts:

To continue with it is farfetched. I often decide to eat salt-free and low-fat food. I go ahead for a while, but soon I get cold feet and quit (a 44-year-old woman with hypertension).

The weather in Bandar Abbas does not let me do it. Though I have been living here for almost 27 years, the weather still prohibits me from exercising for 8 months of the year. I am physically weak (a 51-year-old man with hypertension and diabetes).

3.1.4 | Subcategory 4: Social modeling

Social modeling is significantly involved in spreading ideas, values and behavioral styles. Seeing people who regularly exercised and enjoyed healthy eating habits was another factor that affected the enjoyed participants' self-efficacy. This exercising group included often the members who had the same problems as the other participants, yet managed to find time for exercising. Here are some relevant comments:

As soon as I saw many of my friends followed the same rules, I said to myself I can do it too. A friend of mine is a diabetic patient who does inject insulin anymore because he exercises instead and eats healthy food (a 52-year-old man with hypertension and hyperlipidemia).

There are many people who can exercise and eat healthy food despite many problems they have, so I can do it too (a 44-year-old man with hypertension and diabetes).

3.2 | Category 2: Collective efficacy

Collective efficacy defined as one's perceived ability of showing a group behavior. It is one's belief in doing group work and cooperating successfully to achieve a goal.^{26,27}

Collective efficacy is strongly correlated with action because people in groups have little motivation to act unless they believe their actions will bring desired outcomes.²⁸ This category is comprised of two subcategories: peer support and networking.

3.2.1 | Subcategory 1: Peer support

Support by the surrounding people and those who experienced similar problems was found as a subcategory of collective

self-efficacy. The participants experienced being supported while doing physical activities in groups with similar members (in terms of CAD risk factors), and they felt better while exercising together.

The participants stated that the support they received from the group, such as guidance, control of negative emotions, better interaction, reminding of not performing well contributed to their regular physical activity, and healthy eating. See the following excerpts:

Group work is much better because we share experiences. We share the experience of eating good and effective food stuff. I may ask peers what they eat if they have hypertension. I use their experiences (a 44-year-old woman with hypertension).

I am more comfortable with people who have the same problems I have. I can acquire as much information as I need from peers and, in return, give them the information they need (a 39-year-old man with hypertension, diabetes, and hyperlipidemia).

3.2.2 | Subcategory 2: Networking

Networking was another subcategory extracted in this study. The participants admitted that through online social networks, they could share experiences in the group and could do better physical activities and have a healthy diet.

The participants stated networking causes to feel empathy and sympathy, benefit from others' experiences, share information with each other, compete with each other, and learn new ideas.

My friend and I created a group on WhatsApp. We post images of the foods we cook and go for a walk in women's park. Thus, we remember the event and keep encouraging each other (a 43-year-old woman with obesity and hypertension).

It is possible to join online groups in current conditions. We can get to know more about each other and can also share important news in the group. It is better to have an administrator for the group, I mean someone who is more knowledgeable than others (a 36-year-old woman with obesity and hyperlipidemia).

3.3 | Category 3: Outcome expectations

There are two subcategories here: positive and negative expectations. Participants' expectations of the outcome of regular physical

activity and healthy eating were in some cases positive and in others negative.

The positive outcomes of regular physical activity and healthy eating mentioned by the participants were life expectancy, less need for medication, peace and quiet, disease control, self-satisfaction, lower treatment costs, vitality, weight control, and disease prevention. Among the negative outcomes of not having regular physical activity were getting sick, losing body strength, obesity, and premature death. Here are some relevant excerpts from the interview:

When I am physically active, I take less medicine. As I experienced myself, when I do regular physical activity, I need less medicine, even sugar or blood pressure medicine (an old 46 years old man with hyperlipidemia, diabetes, hypertension, a cigarette smoker).

Healthy eating is truly useful. I am trying to keep a healthy diet sometimes. For example, I try not to eat salty snacks or greasy food. It positively affects both my blood sugar and cholesterol (a 46-year-old women with hypertension, and a hookah smoker).

If I don't exercise on a regular basis and do not eat healthy food, I develop a heart disease (a 46-year-old man with hypertension and hyperlipidemia).

3.4 | Category 4: Knowledge

Knowledge is the understanding of health benefits and risks that threaten health and the information needed to perform a behavior.²⁹

This category includes two subcategories: Necessity of healthy behavior and Health risks.

The participants divided their perception of health in two, the necessity of healthy behavior and the health risks.

3.4.1 | Subcategory 1: Necessity of healthy behavior

The participants were aware of the significance of performing healthy behaviors and commented:

I have seen many friends use vehicles even for smallest purchases, even for short distances. But I try to walk for short distances because I know it is necessary to control the diseases I have, but that is not enough. I think I still need more (a 47-year-old man with hypertension, hyperlipidemia, and obesity).

I tried to reduce the amount of sugar used, because it affects both diabetes, pressure and cholesterol (a 46-year-old man with obesity, diabetes, hypertension, and smoker).

3.4.2 | Subcategory 2: Health risks

Participants mentioned the health threats and were aware of the diseases and risk factors of CAD. Diseases such as hypertension, hyperlipidemia, and diabetes were among the health threats of CAD and chronic diseases. Here are some instances:

I know if the blood pressure goes up, it will hurt the heart and we will have a stroke. I have to go for a walk and eat low-salt food so that I do not get into trouble (a 46-year-old woman with hypertension).

For the heart disease, I know I need to control my cholesterol and blood pressure, walk and exercise, and eat low-fat and low-salt food, all necessary for the health of heart. If they are not controlled, I will get into trouble (a 46-year-old man with hypertension and hyperlipidemia).

4 | DISCUSSION

The present qualitative study was conducted using a directed content analysis to explain personal cognitive factors affecting physical activity and nutritional behavior in middle-aged population at the risk of CAD in Bandar Abbas in the south of Iran.

The results of this research led to the identification of 4 main categories (self-efficacy, collective efficacy, outcome expectations, knowledge) and 10 subcategories.

Prior experience was a factor most participants mentioned for their positive or negative sense of efficacy. This finding is consistent with other studies.³⁰⁻³² Prior experience refers to one's belief in the capability of successfully performing the required behaviors based on past experience or self-evaluation.²⁵ In a qualitative study of hypertensive patients in Indonesia, the prior experience of infection with and recovery from the disease, and also family and friends helped form beliefs about physical activity and healthy eating.³³

Some research on Korean adults with a chronic disease showed that the prior experience of physical exercises and perceived benefits of exercises were the major predictors of doing physical exercises.³⁴ Health professionals emphasize the assessment of prior experience of physical activity and healthy eating in intervention programs to help the middle-aged at the risk of CAD become more physically active and improve nutritional behavior.

Action self-efficacy is an optimistic belief in the preaction phase. Here, the individual has not yet taken any action, but is developing the motivation to do so by imagining success and predicting the potential outcomes of different strategies.³⁵ A body of research showed that action self-efficacy is the major predictor of the intention to show healthy eating behaviors. Thus, when promoting eating behaviors, interventions should include details that aim to create action self-efficacy.³⁶ Several factors can increase self-efficacy in the nutritional behaviors and physical activity of the middle-aged population. Examples are the opportunities to try healthy food and different physical activities such as different places for walking, local game festival and traditional sport competitions in parks to add variety to physical activities.

Maintenance self-efficacy is an optimistic belief in the postaction phase in which the individual perceives the self capable of performing the behavior already formed in the face of barriers. Maintenance self-efficacy can affect planning to show the behavior (the postintention phase).³⁷ To continue physical activity and healthy eating in the middle-aged and develop appropriate interventions, it is essential to identify the existing problems and think of effective solutions to remove barriers.

Social modeling was another subcategory of self-efficacy in this study. Social modeling is an effective means of spreading ideas, values, and behavioral styles. There is research evidence that social modeling helps adjust the amount of food eaten and the amount of intake. It also promotes the use of snacks, fruits, and vegetables.³⁸ People eat differently depending on whether they eat alone or with someone, a stranger or a loved one, whether they are in a business meeting or spending a night out with friends.³⁹ It can be interesting to include successful and influential middle-aged characters in educational interventions to encourage peers to do physical activity and follow a healthy diet.

Peer support generally refers to a wide range of mental health resources that provide social or emotional assistance to peers and, in some cases, professional assistance.⁴⁰ Identifying the common risk factors among the middle-aged helps group them with similar problems (e.g., blood pressure, diabetes, obesity, blood fat). It can be effective to control the risk factors by increasing physical activity and healthy eating habits. Creating a group in social networks for them to share experiences of healthy eating habits and regular physical activities encourages the middle-aged to exercise more and improve nutritional behaviors.

Positive and negative expectations were the subcategories of outcome expectations in this study. Outcome expectation is known as a predictor of healthy eating and physical activity.⁴¹ Outcome expectations help people follow a healthy diet and increase physical activity.¹⁸

Studies have shown that the positive expectations from healthy behaviors and physical activity include living longer, feeling better, improving health, avoiding medication, higher satisfaction and pleasure, and better fitness.⁴² In other studies, expectation of the positive outcomes of a healthy diet was positively correlated with the participants' nutritional behavior.⁴³⁻⁴⁵ Developing appropriate

themes for effective interventions in the positive outcomes of physical activity and healthy nutrition can increase the behaviors in the middle-aged. It seems that the educational content should consider the negative outcomes of not showing the healthy behaviors in interesting and inspiring ways.

Most participants were aware of the role of CAD risk factors, which is consistent with another study conducted on children and their parents.⁴⁶ However, it seems that the knowledge of CAD risk does not necessarily translate into a behavior change. This apparent discrepancy in knowledge and behavior regarding healthy eating and physical activity has been observed in other studies too.^{47,48}

Hui and Morrow found that participants with a lower level of knowledge about diseases associated with physical inactivity were less likely to follow physical activity guidelines.⁴⁹ It seems that health promotion professionals should increase the knowledge of diseases related to physical inactivity in their programs, because this is positively correlated with physical activity levels.⁵⁰

The results of another study by Gradidge on African workers showed they were aware of appropriate nutritional behaviors, yet believed that the current lifestyle limited their opportunities. Also, the participants considered healthy eating unrealistic due to economic limitations.^{49,51} It appears that healthcare professionals can benefit from the information about specific health conditions related to healthy eating in developing appropriate educational content.

5 | LIMITATIONS

Though the sample was large enough to saturate the data, the qualitative approach of this study may limit the ability to obtain information from people with different social and demographic features, thus, limiting the transferability of findings.

The present study was conducted in an urban area with no rural participant. However, the qualitative study intended to explain a phenomenon and not to analyze the relationship between variables.

6 | CONCLUSION

Participants shared their experiences of individual cognitive determinants of physical activity and nutritional behaviors. Paying attention to the determinants of physical activity and nutritional behavior in the middle-aged population at risk of CAD will help program designers select the most appropriate methods and applications to improve physical activity and nutritional behaviors and reduce the burden of diseases in cardiovascular planning.

It is suggested to provide opportunities to experience healthy foods and various physical activities, including walking in different places, festivals of local and traditional games, sports competitions in parks, healthy cooking competitions, and use successful and influential middle-aged peers in educational interventions to

encourage people. It is important to identify problems and provide solutions to deal with barriers and problems.

Also, identifying middle-aged people with CAD risk factors and joining online groups with members with similar problems (hypertension, hyperlipidemia, diabetes, overweight and obesity) and sharing healthy eating ideas and regular physical activity can improve physical activity and healthy eating. It is also recommended to think of appropriate messages about the positive and negative outcomes, showing and not showing these behaviors. Providing correct information through attractive methods and through various and reliable channels can be effective in raising the awareness of middle-aged population of physical activity and nutritional behaviors.

AUTHOR CONTRIBUTIONS

Roghayeh Ezati Rad: Conceptualization; formal analysis; methodology; writing—original draft; writing—review & editing. **Zahra Hosseini:** Data curation; formal analysis; methodology. **Shokrollah Mohseni:** Validation; writing—review & editing. **Teamur Aghamolaei:** Methodology; formal analysis; data curation. **Mohammad Mohammadi:** Validation; writing—review & editing. **Marzieh Nikparvar:** Writing—review & editing.

ACKNOWLEDGMENTS

The authors would like to acknowledge the financial support of the Hormozgan University of Medical Sciences. This study received financial support from Deputy of Research, Hormozgan University of Medical Sciences (grant # 4010055). The funders had no role in the study design, collection, analysis and interpretation of data, or writing and submission of this article.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data sets used analyzed during the current study are not publicly available due the possibility that sharing interviews, which contain sensitive information about participants' identities, may compromise participant anonymity, however, the quantitative data are available from the corresponding author on reasonable request.

TRANSPARENCY STATEMENT

The lead author Teamur Aghamolaei affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

ORCID

Roghayeh Ezati Rad  <http://orcid.org/0000-0003-3139-2417>

Teamur Aghamolaei  <http://orcid.org/0000-0002-2504-8014>

REFERENCES

- Roth GA, Johnson C, Abajobir A, et al. Global, regional, and national burden of cardiovascular diseases for 10 causes, 1990 to 2015. *J Am Coll Cardiol*. 2017;70(1):1-25.
- Sanchis-Gomar F, Perez-Quilis C, Leischik R, Lucia A. Epidemiology of coronary heart disease and acute coronary syndrome. *Ann Transl Med*. 2016;4(13):256.
- Control CfD. Prevalence of coronary heart disease—United States, 2006-2010. *MMWR Morb Mortal Wkly Rep*. 2011;60(40):1377-1381.
- Benjamin EJ, Blaha MJ, Chiuve SE, et al. Heart disease and stroke statistics—2017 update: a report from the American Heart Association. *Circulation*. 2017;135(10):e146-e603.
- Berry JD, Dyer A, Cai X, et al. Lifetime risks of cardiovascular disease. *N Engl J Med*. 2012;366(4):321-329.
- Hajar R. Risk factors for coronary artery disease: historical perspectives. *Heart Views*. 2017;18(3):109.
- Malakar AK, Choudhury D, Halder B, Paul P, Uddin A, Chakraborty S. A review on coronary artery disease, its risk factors, and therapeutics. *J Cell Physiol*. 2019;234(10):16812-16823.
- Lowe LP, Greenland P, Ruth KJ, Dyer AR, Stamler R, Stamler J. Impact of major cardiovascular disease risk factors, particularly in combination, on 22-year mortality in women and men. *Arch Intern Med*. 1998;158(18):2007-2014.
- Lee I-M, Shiroma EJ, Lobelo F, et al. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet*. 2012;380(9838):219-229.
- Vasankari V, Husu P, Vähä-Ypyä H, et al. Association of objectively measured sedentary behaviour and physical activity with cardiovascular disease risk. *Eur J Prev Cardiol*. 2017;24(12):1311-1318.
- Ward BW, Clarke TC, Nugent CN, Schiller JS. Early release of selected estimates based on data from the 2015 National Health Interview Survey. *Natl Cent Health Stat*. 2016;46:1-20.
- Esteghamati A, Khalilzadeh O, Rashidi A, Kamgar M, Meysamie A, Abbasi M. Physical activity in Iran: results of the third national surveillance of risk factors of non-communicable diseases (SuRFNCD-2007). *J Phys Act Health*. 2011;8(1):27-35.
- Vizit. *Distribution of physical activity in Hormozgan province*. Accessed 2016. <https://vizit.report/panel/steps/en/main.html#/forestLocation>
- Rossi A, Calogiuri G. Patterns and correlates of physical activity in adult Norwegians: a forecasted evolution up to 2025 based on machine learning approach. *BMC Public Health*. 2018;18(1):913.
- Khani Jeihooni A, Jormand H, Saadat N, Hatami M, Abdul Manaf R, Afzali Harsini P. The application of the theory of planned behavior to nutritional behaviors related to cardiovascular disease among the women. *BMC Cardiovasc Disord*. 2021;21(1):589.
- Yahyavi SH, Pourrahimi M. Impact of dietary behaviors and exercise activities education on the self-efficacy of middle school students. *Med Sci J Islam Azad Univesity-Tehran Med Branch*. 2012;22(2):143-151.
- Hurree N, Jeewon R. An analysis of contributors to energy intake among middle aged and elderly adults. *Curr Res Nutr Food Sci J*. 2016;4:8-18.
- Koutoukidis DA, Lopes S, Atkins L, et al. Use of intervention mapping to adapt a health behavior change intervention for endometrial cancer survivors: the shape-up following cancer treatment program. *BMC Public Health*. 2018;18(1):415.
- Bandura A. Health promotion by social cognitive means. *Health Educ Behav*. 2004;31:143-164.
- Bandura A. Social cognitive theory: an agentic perspective. *Annu Rev Psychol*. 2001;52(1):1-26.
- Naderimaghani S, Abdollahi Z, Torabi P, et al. Elucidation of current status, implemented policies and interventions, achieved results, and future plans of Iran to control the risk factors of non-communicable diseases: a review article. *Iran J Diabetes Lipid Disord*. 2022;22(5):265-281.
- Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004;24(2):105-112.
- Dresing T, Pehl T. *Praxisbuch Interview, Transkription & Analyse: Anleitungen und Regelsysteme für qualitativ Forschende*: Dr Dresing & Pehl GmbH; 2015.
- Speziale HS, Streubert HJ, Carpenter DR. *Qualitative Research in Nursing: Advancing the Humanistic Imperative*. Lippincott Williams & Wilkins; 2011.
- Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychol Rev*. 1977;84(2):191-215.
- Bandura A. *Self-Efficacy: The Exercise of Control*. Freedom and Company; 1997.
- Bandura A. *Self-Efficacy: The Exercise of Control*. Macmillan; 1997.
- Bandura A. Exercise of human agency through collective efficacy. *Curr Dir Psychol Sci*. 2000;9(3):75-78.
- Alyahya M, Agag G, Aliedan M, Abdelmoety ZH, Daher MM. A sustainable step forward: understanding factors affecting customers' behaviour to purchase remanufactured products. *J Retail Consum Serv*. 2023;70:103172.
- Maxwell C, Robinson K, McCreech K. Understanding shoulder pain: a qualitative evidence synthesis exploring the patient experience. *Phys Ther*. 2020;101(3):pzaa229.
- Cromwell SL, Berg JA. Lifelong physical activity patterns of sedentary Mexican American women. *Geriatr Nurs (Minneapolis)*. 2006;27(4):209-213.
- Kao TSA, Caldwell CH. Family efficacy within ethnically diverse families: a qualitative study. *Fam Process*. 2017;56(1):217-233.
- Mizutani M, Tashiro J, Maftuhah H, Sugiarto H, Yulaikhah L, Carbut R. Model development of healthy-lifestyle behaviors for rural Muslim Indonesians with hypertension: a qualitative study. *Nurs Health Sci*. 2016;18(1):15-22.
- Shin Y, Yun S, Pender NJ, Jang H. Test of the health promotion model as a causal model of commitment to a plan for exercise among Korean adults with chronic disease. *Res Nurs Health*. 2005;28(2):117-125.
- Zhang CQ, Fang R, Zhang R, Hagger MS, Hamilton K. Predicting hand washing and sleep hygiene behaviors among college students: test of an integrated social-cognition model. *Int J Environ Res Public Health*. 2020;17(4):1209.
- Bandura A. Self-efficacy mechanism in human agency. *Am Psychol*. 1982;37(2):122-147.
- Schwarzer R, Lippke S, Luszczynska A. Mechanisms of health behavior change in persons with chronic illness or disability: the Health Action Process Approach (HAPA). *Rehabil Psychol*. 2011;56(3):161-170.
- Duffy KA, Green PA, Chartrand TL. Mimicry and modeling of health (-risk) behaviors: how others impact our health (-risk) behaviors without our awareness. *J Nonverbal Behav*. 2020;44(1):5-40.
- Vermeir I. How visuals affect food choice. *Foods*. 2020;9(12):1835.
- Price JAB, Ogunade AO, Fletcher AJ, et al. Peer support for public safety personnel in Canada: towards a typology. *Int J Environ Res Public Health*. 2022;19(9):5013.
- Prestwich A, Sniehotta FF, Whittington C, Dombrowski SU, Rogers L, Michie S. Does theory influence the effectiveness of health behavior interventions? meta-analysis. *Health Psychol*. 2014;33(5):465-474.
- Huang Z, Ho JS, Ven Yap Q, et al. Patterns of motivators and barriers to heart health behaviors among adults with behavior-modifiable cardiovascular risk factors: a population-based survey in Singapore. *PLoS One*. 2022;17(1):e0262752.
- Torkan N, Kazemi A, Paknahad Z, Bahadoran P. Relationship of social cognitive theory concepts to dietary habits of pregnant women. *Iran J Nurs Midwifery Res*. 2018;23(2):125-130.

44. Jalily M, Barati M, Bashirian S. Using social cognitive theory to determine factors predicting nutritional behaviors in pregnant women visiting health centers in Tabriz, Iran. *J Educ Community Health*. 2014;1(4):11-21.
45. Byrd-Bredbenner C, Abbot JM, Cussler E. Relationship of social cognitive theory concepts to mothers' dietary intake and BMI. *Matern Child Nutr*. 2011;7(3):241-252.
46. Fowokan A, Vincent K, Punthakee Z, et al. Exploring knowledge and perspectives of South Asian children and their parents regarding healthy cardiovascular behaviors: a qualitative analysis. *Glob Pediatr Health*. 2020;7:2333794X2092450.
47. Lilo EA, Muñoz M, Cruz TH. Perceptions of healthy eating among hispanic parent-child dyads. *Health Promot Pract*. 2019;20(2):231-238.
48. Protudjer JLP, Marchessault G, Kozyrskyj AL, Becker AB. Children's perceptions of healthful eating and physical activity. *Can J Diet Pract Res*. 2010;71(1):19-23.
49. Hui SSC, Morrow JR. Level of participation and knowledge of physical activity in Hong Kong Chinese adults and their association with age. *J Aging Phys Act*. 2001;9(4):372-385.
50. Fredriksson SV, Alley SJ, Rebar AL, Hayman M, Vandelanotte C, Schoeppe S. How are different levels of knowledge about physical activity associated with physical activity behaviour in Australian adults? *PLoS One*. 2018;13(11):e0207003.
51. Gradidge PJJ, Draper CE, Casteleijn D, Palmeira A. Pharmaceutical workers' perceptions of physical activity and healthy eating: a qualitative study. *BMC Res Notes*. 2021;14(1):350.

How to cite this article: Ezati Rad R, Hosseini Z, Mohseni S, Aghamolaei T, Mohammadi M, Nikparvar M. Explaining the personal cognitive factors affecting physical activity and nutritional behaviors in the middle-aged at risk of coronary artery disease: a directed qualitative content analysis. *Health Sci Rep*. 2024;7:e1982. doi:10.1002/hsr2.1982