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The Effect of a New Structured Motivational Interview Model on Diet and Exercise Behaviors in Type 2 Diabetes Patients at Primary Care: A Randomized Controlled Study

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ABSTRACT

Objectives: In this study, it was aimed to evaluate the effect of structured short motivational interviewing in exercise and diet-related behavioral changes in type 2 diabetes patients in primary care.

Methods: Participants were divided into control and intervention groups. The study was single-blinded, and only the researchers knew the participants in each group. The intervention group received a motivating interview-based intervention a total of 4 times in the 1st month of the study and followed up in the 3rd month. The control group was followed by family physicians and evaluated at 3 months without any motivational intervention. One-week pedometer, international physical activity questionnaire (IPAQ2) scores, daily calorie intake, EuroQoL (EQ5D), multidimensional diabetes questionnaire (MDQ), and motivational assessment scale were used at the beginning of the study and the 3rd-month follow-up.

Results: The study included 84 (51.5%) participants in the intervention group and 79 (48.5%) patients in the control group. There was a significant difference between the control and intervention groups in terms of a 1-week pedometer (2785.0 [1002.0–7240.0] step/day vs. 5231.0 [1364.0–11827.0] step/day, $p<0.001$), IPAQ2 scores (0.0 [0.0–1056.0] vs. 495.0 [0.0–1396.0], $p<0.001$), EQ5D scale total scores (5.0 [5.0–10.0] vs. 5.0 [5.0–8.0], $p=0.006$), and MDQ scale total scores (607.0 [244.0–847.0] vs. 730.0 [235.0–847.0], $p<0.001$) at the 3rd-month follow-up.

Conclusion: A structured motivational interviewing model is an effective tool for developing lifestyle changes in type 2 diabetes mellitus patients.

Keywords: Lifestyle, motivational interviewing, type 2 diabetes mellitus



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INTRODUCTION

Diabetes mellitus (DM) is a metabolic disease caused by insufficient production of insulin or an inability of the body to use insulin properly and requires continuous monitoring.^[1] The prevalence of DM worldwide is estimated to increase to 10.2% (578 million people) in 2030 and 10.9% (700 million people) in 2045. 90% of these rates are type 2 DM patients.^[2] “diabetes, hypertension, obesity, and endocrinology diseases prevalence in turkey, study-II (TURDEP-II)” reports that DM prevalence in Turkish adults is 13.7%.^[3]

It is emphasized that various lifestyle changes, especially diet, exercise, and drug adherence, are crucial in DM treatment.^[1,4] Patients with type 2 DM are recommended to do a minimum of

150 min of moderate aerobic physical activity program per week, according to healthy eating habits. Lifestyle changes are recommended before medical treatment.^[1,5-7]

One of the patients' resistance reasons to lifestyle changes is the limitations to receiving lifestyle-changing recommendations from physicians. This is due to lack of care of physicians on lifestyle changes.^[5,8] It's reported that patients give more importance to medication than diet and exercise.^[4] Patients with type 2 DM complain that managing their daily life for DM is affecting their quality of life.^[9]

Behavioral approaches are effective in providing lifestyle changes by increasing motivation; however, they are not specifically tailored for the management of chronic diseases such as type 2 DM in primary care.^[10] Short interview techniques are particularly effective in resistance to lifestyle changes, adjustment problems, and risky behaviors. They are different types of short interview techniques, such as Bathe, Frames, problem-solving therapy (PST), and Five A.^[11,12] While Bathe and Frames are utilized more in the follow-up of chronic diseases, the PST and Five A models are preferred in addiction problems.^[10-12] Chronic illnesses like DM need long-term physician-patient interaction for lifestyle changes. Hence, approaches to increase the motivation of the patient and to manage the chronic disease process in primary care should be improved.^[13] With this need, it was aimed to develop a supportive, patient-based, structured motivational model to ensure: an effective tool for primary care physicians to change behavior in type 2 DM patients by conducting interviews with the patients' parameters on diet and exercise behaviors, using an emphatic language in the interviews to increase patients' awareness on how to change this obstacle(s); the major role of the physician is supporting the patient while he/she is planning how to deal with this obstacle(s) and change behavior.

In this study, it was aimed to evaluate the effect of structured short motivational interviewing in creating exercise and diet-related behavioral changes in type 2 DM patients in primary care.

METHOD

This research is a single-blind, randomized controlled study and was carried out between October 1, 2015, and March 31, 2016, in a primary care Centre in Kartal, İstanbul. The participants who were treated for type 2 DM for at least 1 year and were treated for the same regimen for at least 3 months, and aged between 40 and 65 were included in the study.

The sample was calculated for a 95% confidence level, and 80% statistical power, and it was determined that each group should have 54 participants. Eighty participants were included in the study for both intervention and control groups.

Modified Morisky scale and Beck depression scale were administered to all participants at the beginning of the study. Consequently, a score of <4 on the Modified Morisky scale was considered non-adherence to medication, and a score of >7 on the Beck depression scale was considered a measure of depression risk, and these participants were not included in the study. Moreover, the participants with HbA1c values between 7% and 10%, body mass index >25 kg/m², and failed to follow at least one recommended lifestyle change for DM treatment were excluded from this study.

Sociodemographic characteristics form, number of steps taken with a 1-week pedometer, the nutritional record for daily calory intake, international physical activity questionnaire short form (IPAQ2), EuroQol (EQ5D) scale for quality-of-life, multidimensional diabetes questionnaire (MDQ), and Motivation Assessment Score of participants in both groups at the beginning. Subsequently, the participants included in the study were randomly divided into two groups using single-blind using the closed envelope method. The intervention group received a motivating interview-based intervention in the 1st month of the study and followed up in the 3rd month. An intervention with a motivational interviewing model structured for the study was conducted for 1 month with 4 interviews in the intervention group. In the 1st month of the study, the participants in the intervention group were given one-on-one motivational interview interventions lasting a maximum of 15 min, with weekly interviews. The content of the intervention interviews is as follows: in the first interview, review the current situation of the patient, identification of the problematic points, consensus on problems with the patient, and raising awareness of the patient. At the end of this interview, it was aimed to write down a list of obstacles/problems to better management of DM. Patients are requested to reflect on this list until the next interview to list the factors that facilitate the occurrence of each obstacle/problem on the list, possible supportive factors, and possible solutions. In the second interview, the list of problems that the patient reflects on is reviewed, and it is aimed to clarify and agree on the difficulties, the most difficult situations, facilitators, and supporters. Possible solution suggestions and alternative solutions are discussed. This interview aims to produce alternatives with the patient and to come up with an agreed action plan. For example: "How can you change behaviors that are not suit-

able for your diet and exercise?," "What can you do about this obstacle?," "How can we support you?," and "How do you think this plan can be applied?." With such questions, the patient is tried to be included in the process and decision. At the end of the interview, the action plan for the common goals is presented, and the patient is expected to realize this plan until the next interview. The third and fourth interviews are the supportive interviews. The patient is asked to convey his/her experience while implementing the action plan for behavior change, possible additional problems and challenges are discussed, and the patient's self-confidence is supported to overcome these situations. These interviews aim to monitor the behavior change process, to support the patient.

On the other hand, the control group was followed by family physicians and evaluated at 3 months, without any motivational intervention and following national guidelines. Figure 1 shows the flow chart of the study.

The socio-demographic characteristics of the patients in the study were obtained using a questionnaire form. One-week pedometer and daily calorie intake were evaluated at the beginning of the study, and 3-month follow-ups of participants in both groups. Moreover, the EQ-5D quality of life questionnaire, IPAQ2, the MDQ, and the Motivation Assessment Score were applied to all participants before the first interview and 3 months after the intervention.

Socio-demographic Characteristics Questionnaire: The age, gender, education year, working status, living status, diabetic history, and additional diseases were asked to determine the demographic characteristics of the participants.

Physical Activity: Both groups were given a pedometer (PM2000 TNV) with the same features before the first interview, and it was aimed to keep track of the step counts of the patient for 7 days before the first interview. Participants were asked to use a pedometer 7 days before their interview to at the end of 3 months. In the intervention group, it was planned to increase an average of 1300 steps in the patients for whom exercise was recommended.^[14] In addition, it was aimed to increase the activity level from Category 1 to Category 2 according to the IPAQ2.^[15]

Diet: Both group participants were requested to keep a daily diet diary before the first interview and before the interview at the end of the 3rd month, and the total calorie and fat-protein-carbohydrate content was calculated by the dietician. It is aimed to reduce the daily calories of those with high energy intake by 300 calories.^[16]

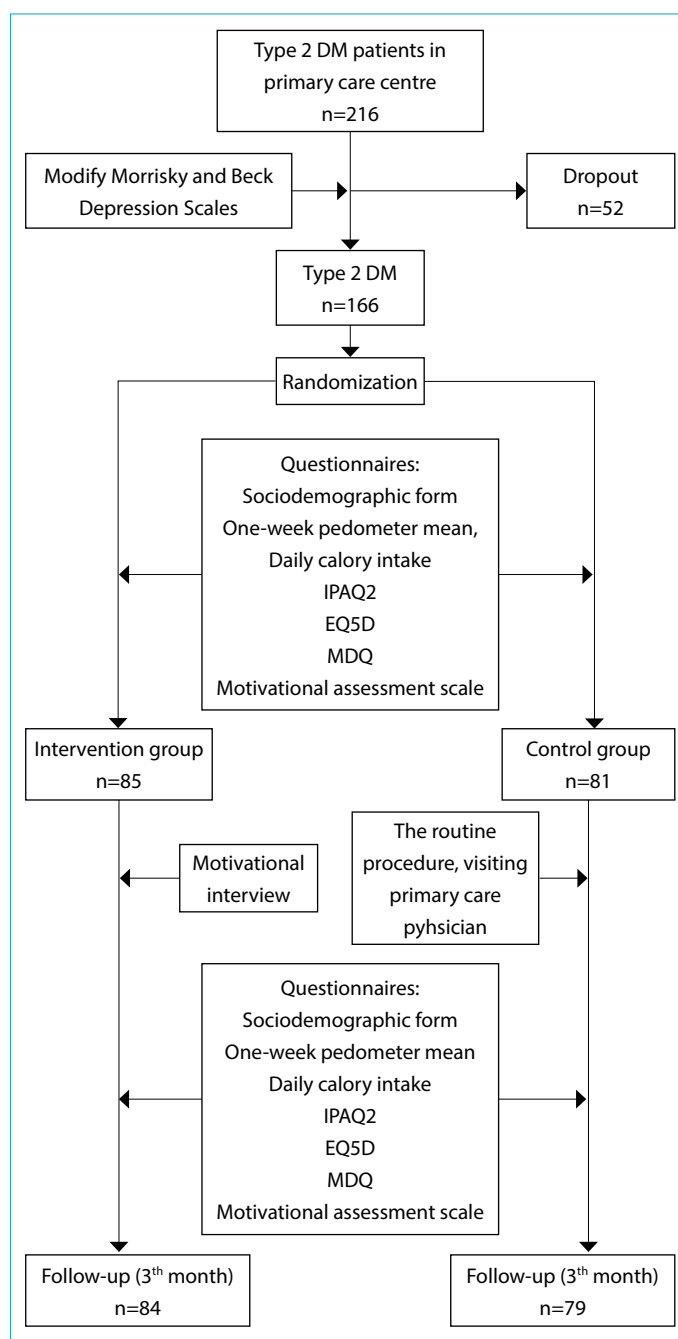


Figure 1. Flow chart of the study.

The EQ-5D: The EQ-5D is a self-report scale and evaluates the five quality of life dimensions with 5 questions. These five dimensions are mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each item of the scale is evaluated with a triple Likert-type scale.^[17] Kahyaoğlu and Ünsar found that the Turkish version of the EQ-5D scale is valid and reliable with the test-retest method.^[18]

IPAQ2: The IPAQ2 is used to roughly calculate the energy consumed by the person during the day. METs represent

the basal metabolic coefficient of the activity. MET-minute is considered to be equivalent to the number of kilocalories a person with an average of 60 kg burns while doing the same activity. The kilocalories a person burns during the activity can be calculated using the formula MET-minute \times (kilo/60 kg). There are three levels of physical exercise intensity: light, moderate, and vigorous. Vigorous activity requires a minimum of 1 h of moderate activity or at least half an hour of vigorous activity per day. The moderate-intensity activity is not performed every day and usually involves half an hour of moderate activity. Light activity refers to the activity that does not fall into either of the previous two categories.^[19] Saglam et al. found that it's a reliable and valid tool in the Turkish version in 2010.^[20]

MDQ: Developed by Talbot et al., the original MDQ consists of 3 parts, 7 sub-dimensions, and 41 items.^[21] The scale does not have a total score, and each scale is evaluated separately. Part one generally focuses on how the daily activities of the patient are negatively affected. Part two questions the level of attitudes of the patient's spouse (or someone important to him) that are supportive or not supportive of the self-care activities related to DM. Part three includes questions investigating the individual's perception of self-efficacy and outcome expectancy regarding the management of the disease. High scores indicate high perceived self-efficacy and outcome expectancy.^[21,22] Coşansu and Erdoğan found that the Turkish version of the scale is valid and reliable in 2010.^[22]

The Motivation Assessment Score: This score is about how much the patient cares about diet and exercise, which are among the lifestyle changes required by the disease, and the perception of his/her ability to adhere to the diet and exercise (self-confidence).^[14] We asked directly to the participants, "How do you think diet and exercise are important for your diabetes treatment?" and "What point do you give yourself to your confidence to lifestyle changes? Give a point 0 to 10."^[14]

SPSS 25 statistic program was used for data analysis. Frequency, percentage, median, minimum and maximum values were used for descriptive statics. The normality assumption tests were performed with Skewness and Kurtosis coefficients. Mann-Whitney U test and Wilcoxon signed-rank tests were used for non-normally distributed continuous variables. Moreover, the Chi-squared test was used for categorical variables. $p < 0.05$ was taken as statistically meaningful for the results.

RESULTS

In this study, there were 84 (51.5%) participants in the intervention group and 79 (48.5%) patients in the control group, respectively. The socio-demographic characteristics of the participants in the control and intervention groups at the beginning of the study are summarized in Table 1.

While there was a significant difference between the control and intervention groups in terms of 1-week pedometer at the beginning of the study, there was a significant difference between the control and intervention groups in terms of 1-week pedometer, IPAQ2 score, EQ5D total score, MDQ total score, self-confidence in diet behavior in motivational assessment scores, self-confidence in exercise behavior in motivational assessment scores in the 3rd-month follow-up of the study ($p=0.032$, $p>0.001$, $p<0.001$, $p=0.006$, $p<0.001$, $p<0.001$, and $p<0.001$, respectively). Exercise behaviors, diet, and motivational assessment in control and intervention groups in the beginning and the 3rd month are summarized in Table 2.

There was a significant difference between the baseline and 3rd-month follow-ups in terms of 1-week pedometer, daily calorie intake, EQ5D scale total score, MDQ scale total scale, and self-confidence in exercise behavior in motivational assessment scores in the control group ($p<0.001$, $p<0.001$, $p=0.005$, $p=0.026$, and $p=0.013$, respectively). Moreover, there was a significant difference between the baseline and 3rd-month follow-ups in terms of 1-week pedometer, IPAQ2 score, EQ5D scale total score, MDQ scale total scale, self-confidence in diet behavior in motivational assessment scores, and self-confidence in exercise behavior in motivational assessment scores in the intervention group ($p<0.001$, $p<0.001$, $p=0.006$, $p<0.001$, $p<0.001$, and $p<0.001$, respectively). Exercise behaviors, diet, and motivational assessment in the beginning and the 3rd month in both groups are summarized in Table 3.

DISCUSSION

The type 2 diabetic patients' opinions on their diseases, it was noted that physicians prioritize medical treatment in the management of type 2 DM patients, do not emphasize the importance to exercise and nutrition, and therefore do not provide adequate counseling to their patients on this issue.^[23] In primary health care, individual-centered counseling should be provided. The short interview model in this study is a practical method for physicians to conduct an individual-centered approach.

Table 1. Socio-demographic characteristics of the participants in the control and intervention groups at the beginning of the study

	Control group (n=79)	Intervention group (n=84)	p
Gender			
Female	48 (60.8)	56 (66.7)	0.515
Male	31 (39.2)	28 (33.3)	
Year of education			
<8 years	64 (81.0)	79 (94.1)	0.016
>8 years	15 (19.0)	4 (5.9)	
Working status			
Not working	42 (53.2)	52 (61.9)	0.024
Working	25 (31.6)	11 (13.1)	
Retired	12 (15.2)	21 (25.0)	
Living together			
Living alone	0 (0.0)	5 (6.0)	0.059
Living with someone else	79 (100.0)	79 (94.0)	
Duration of DM			
<5 years	26 (32.9)	38 (45.2)	0.144
>5 years	53 (67.1)	46 (54.8)	
Comorbidity			
Hypertension	51 (64.6)	41 (48.8)	0.058
Hyperlipidemia	11 (13.9)	13 (15.5)	0.828
Coroner arterial disease	6 (7.6)	10 (11.9)	0.434
Hypothyroidism	6 (7.6)	10 (11.9)	0.434
Other	12 (15.2)	14 (16.7)	0.833

DM: Diabetes mellitus.

Data is presented as n (%).

Chi-square test.

The BATHE is reported to be mostly used in addressing the psychosocial areas of the problems in primary care and is associated with improved patient satisfaction in health service delivery. Besides, in this approach, the patient is encouraged to think about activities that may help him go through a difficult period emotionally, and the interview is ended with an expression of empathy.^[13] The BATHE technique has also been shown to significantly support the empowerment of type 2 DM patients.^[24] FRAMES short interview technique is a recommended technique in cases of substance use and medical nonadherence, and it encourages the individual to choose a personalized treatment or lifestyle changes to increase the likelihood of behavioral changes. However, there is limited information about whether both short interview techniques described above are useful in the management of non-pharmacological treatment of chronic diseases.^[11,25]

It has been determined that the rate of admission to centers providing primary health care services due to reasons

related to chronic disease in the USA is 37% of total admissions.^[26] The data in Turkey are limited; however, evidence shows that the rates of chronic diseases have increased in recent years and will increase in the coming years.^[3,27] Therefore, it can be said that chronic diseases cause a significant workload in primary care and that there is a need for short interview techniques that can be utilized for non-pharmacological management of therapy processes in individuals with chronic diseases.

In a randomized controlled study conducted by De Greef et al., a pedometer was given to both groups and group interviews were held using the behavioral method in the intervention group. At the end of the 12 weeks, an increase of 2000 steps was observed in the number of steps in the intervention group. At the end of 1 year, a significant difference continued in the number of steps in the intervention group. Using only the pedometer was not enough to provide enough motivation to increase the number of steps, but with the addition of interviews, the number of steps

Table 2. Exercise behaviors, diet and motivational assessment in control and intervention groups in the beginning and the third month

	Beginning			3. month		
	Control group (n=79)	Intervention group (n=84)	p	Control group (n=79)	Intervention group (n=84)	p
One-week pedometer (step/day)	2817.0 (1203.0–7216.0)	2768.5 (1260.0–8541.0)	0.032	2785.0 (1002.0–7240.0)	5231.0 (1364.0–11827.0)	<0.001
Daily calorie intake (calorie/day)	1400.0 (650.0–3000.0)	1450.0 (700.0–2600.0)	0.382	1450.0 (700.0–2950.0)	1450.0 (800.0–2450.0)	0.955
IPAQ2 scores	0.0 (0.0–1056.0)	0.0 (0.0–800.0)	0.240	0.0 (0.0–1056.0)	495.0 (0.0–1396.0)	<0.001
EQ5D scale total scores	5.0 (5.0–12.0)	5.0 (5.0–9.0)	0.100	5.0 (5.0–10.0)	5.0 (5.0–8.0)	0.006
MDQ scale total scores	566.0 (242.0–846.0)	586.0 (282.0–846.0)	0.567	607.0 (244.0–847.0)	730.0 (235.0–847.0)	<0.001
Motivational assessment scores						
Giving importance to diet behavior	10.0 (0.0–10.0)	10.0 (0.0–10.0)	0.949	10.0 (0.0–10.0)	10.0 (8.0–10.0)	0.200
Self-confidence in diet behavior	10.0 (0.0–10.0)	9.5 (0.0–10.0)	0.810	10.0 (0.0–10.0)	10.0 (3.0–10.0)	<0.001
Giving importance to exercise behavior	10.0 (0.0–10.0)	10.0 (8.0–10.0)	0.710	10.0 (0.0–10.0)	10.0 (10.0–10.0)	0.058
Self-confidence in exercise behavior	10.0 (0.0–10.0)	8.0 (0.0–10.0)	0.369	10.0 (0.0–10.0)	10.0 (3.0–10.0)	<0.001

EQ5D: EuroQol; IPAQ2: international physical activity questionnaire short form; MDQ: Multidimensional diabetes questionnaire
Data is presented as median (min and max).
Mann-Whitney U test.

remained high for a year.^[28] Another study with type 2 DM patients reports that prescribing exercise alone to reduce cardiovascular risk increased fewer than 3000 steps/week.^[29] Besides, following up with the use of a pedometer alone in primary care did not lead to a significant physical activity increase.^[30] In a review published in 2009, the necessity of utilizing structured behavioral interviews for exercise was highlighted to increase the physical activity of type 2 DM patients.^[31] In another study involving primary care physicians' interventions in patients with type 2 DM, positive behavioral changes were not observed regarding physical activity and diet. There was not any motivational approach in interventions.^[32] This study revealed that the short motivational interview model significantly increased the number of steps per week in type 2 DM patients, thus providing improvement in physical activity. Hence, the short motivational interview model contributes to increasing physical activity in diabetics in primary care.

In one study, it is recommended that type 2 DM patients reduce their daily calorie intake by 800–1000 kcal/day, reduce their daily energy intake from carbohydrates to <26%, and have a diet with a minimum of 60 g of protein

intake per day for 8 weeks.^[32] To achieve these goals, support patients, and increase their motivation, 15–20 min of patient interviews were held in the 2nd, 4th, and 8th weeks in 2 months. Participants were also given a self-help booklet with sample menus and recipes. The results showed that significant differences were obtained in the intervention group for the targeted outcomes compared to the control group. However, no structured interview model was applied, the patients were motivated by patient-physician interviews conducted at regular intervals, and an approach to the management of type 2 DM patients was not specified. Another study has shown that motivational interviewing is beneficial for the number of meals to be followed and planning the meals in patients with type 2 DM.^[33] Evidence has shown that there is no continuity of patient adherence to unclear recommendations such as “eat less and often” or “reduce your portions.” Even if the amounts are explained to the patients using the units of measurement such as glass, ladle, tablespoon, and dessert spoon it will be more useful to explain the measurements with visual examples while keeping a food diary.^[34] For this reason, diet and exercise recommendations should be repeated more clearly

Table 3. Exercise behaviors, diet and motivational assessment in the beginning and the third month in both groups

	Control group (n=79)			Intervention group (n=84)		
	Beginning	3. month	p	Beginning	3. month	p
One-week pedometer (step/day)	2817.0 (1203.0–7216.0)	2785.0 (1002.0–7240.0)	<0.001	2768.5 (1260.0–8541.0)	5231.0 (1364.0–11827.0)	<0.001
Daily calorie intake (calorie/day)	1400.0 (650.0–3000.0)	1450.0 (700.0–2950.0)	<0.001	1450.0 (700.0–2600.0)	1450.0 (800.0–2450.0)	0.038
IPAQ2 scores	0.0 (0.0–1056.0)	0.0 (0.0–1056.0)	0.574	0.0 (0.0–800.0)	495.0 (0.0–1396.0)	<0.001
EQ5D scale total scores	5.0 (5.0–12.0)	5.0 (5.0–10.0)	0.005	5.0 (5.0–9.0)	5.0 (5.0–8.0)	0.176
MDQ scale total scores	566.0 (242.0–846.0)	607.0 (244.0–847.0)	0.026	586.0 (282.0–846.0)	730.0 (235.0–847.0)	<0.001
Motivational assessment scores						
Giving importance to diet behavior	10.0 (0.0–10.0)	10.0 (0.0–10.0)	1.000	10.0 (0.0–10.0)	10.0 (8.0–10.0)	0.102
Self confidence in diet behavior	10.0 (0.0–10.0)	10.0 (0.0–10.0)	1.000	9.5 (0.0–10.0)	10.0 (3.0–10.0)	<0.001
Giving importance to exercise behavior	10.0 (0.0–10.0)	10.0 (0.0–10.0)	0.059	10.0 (8.0–10.0)	10.0 (10.0–10.0)	0.180
Self confidence in exercise behavior	10.0 (0.0–10.0)	10.0 (0.0–10.0)	0.013	8.0 (0.0–10.0)	10.0 (3.0–10.0)	<0.001

EQ5D: EuroQol; IPAQ2: international physical activity questionnaire short form; MDQ: Multidimensional diabetes questionnaire
Data is presented as median (min and max).
Wilcoxon signed rank test.

at each patient visit, the patient should be asked in detail about her/his diet, and s/he should be asked to fill out a food consumption questionnaire and questioned in detail.

The limitations of the study are; although it was planned to structure the interviews under two separate headings as physical activity and diet, and to evaluate the outputs, as a result of patients' not keeping the nutrition diaries properly, the effect of our interview model on the decrease in calorie amount and eating habits could not be evaluated as desired; there is only one researcher who completes the intervention. Further investigation is needed to reveal the effect of multi-center interventions in large groups.

CONCLUSION

The motivational short interview model, which can be used quickly and easily by primary care physicians in the current patient density, is effective for successful lifestyle changes in DM patient treatment and follow-up. On the other hand, more research is needed on dietary behavior, which is one of the lifestyle change parameters. In the future, it is recommended to apply our motivational short interview model in multi-center studies in different chronic diseases, to evaluate its output and to investigate how effective it will be in the process management of chronic diseases followed in primary care.

Disclosures

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Conflict of Interest: None declared.

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Authorship Contributions: Concept – B.D., M.A.; Design – B.D., S.A., M.A.; Supervision – M.A.; Materials – B.D., M.A.; Data collection and/or processing – B.D.; Analysis and/or interpretation – B.D., M.A.; Literature search – B.D., S.A., M.A.; Writing – B.D., S.A., M.A.; Critical review – B.D., S.A., M.A.

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