Person-Centred, Occupation Based Intervention Program Supported with Problem-Solving Therapy for Type 2 Diabetes: a randomized controlled trial

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Research

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Abstract

Background: Individuals with diabetes mellitus both have difficulty in solving problems in meaningful occupations and have similar difficulties with self-care regimens. We examined the effects of occupation-based intervention supported with problem-solving therapy of individuals with type 2 diabetes mellitus on participation and satisfaction of meaningful occupations, diabetes-related psychosocial self-efficacy, preferred coping strategies and individual well-being.

Methods: This study was planned as a single-blind, randomized controlled study with a 3-months follow-up involving sixty-seven adults with type 2 diabetes. The Canadian Occupational Performance Measure, the Diabetes Empowerment Scale, the Brief COPE and the Five-item World Health Organization Well-Being Index were used. The intervention was conducted in six modules for six weeks, and each implemented about 60 minutes and for one session per week. The six modules included evaluations, diabetes education, and problem-solving therapy. The most important feature of the program is its focus on meaningful occupations for the person via a holistic perspective and provided an opportunity for the participants to apply problem-solving therapy through valued occupation. Differences between groups were analysed using the Mann-Whitney U test, and the Friedman test was used to calculate group-time interaction differences (i.e., baseline, after six weeks and after three months).

Results: Individuals with type 2 diabetes mellitus in both groups identified the most significant occupational performance problems in self-care as personal care. Significant improvement was reported in the intervention group when compared to the control group regarding the participation in meaningful occupation, the satisfaction of performance, psychological self-efficacy and well-being results (p<0.001) after the six modules and three months follow-up. The participants' use of effective coping strategies, active coping and acceptance strategies, self-efficacy as revealed results suggest improvement in favor of the intervention group (p<0.05). The intervention group showed significantly improving between measurements at baseline and after three months of modules except for ineffective coping style (p<0.001).

Conclusions: The occupation-based problem-solving therapy encourages participation in meaningful occupations, positive effects on psychological self-efficacy, and improves effective coping styles and well-being of type 2 diabetes mellitus. Problem-solving therapies that incorporate individuals’ priorities via meaningful occupation can be used to lead a meaningful and quality life of individuals with type 2 diabetes mellitus.

Background

Occupations and occupational performance are a focus of occupational therapy practice as it affects the health and well-being of people (1, 2). Occupation covers all the activities that people do to occupy themselves and bring meaning and purpose to life, such as looking after themselves, enjoying life, and contributing to the social and economic fabric of their communities (3). An individual's ability to carry out
everyday occupations (occupational performance) has positive effects on health and wellbeing (2). Each person has different characteristics that combine to produce specific occupations by particular clients in singular environments; therefore, the person-centred approach accepts the client’s uniqueness (4). Person-centered approaches have a holistic perspective and contextual factors, such as daily self-management experiences and cultural habits of the individual and facilitate the performance of everyday tasks and adaptation of settings in which the person works, lives and socializes (3).

Diabetes mellitus is a chronic disease that negatively affects every aspect of a person's life, and individuals may complain about some difficulties when participating in occupations as diabetes self-care, work or social engagements (5). Diabetes mellitus especially affects the participation of meaningful occupations by individuals (6). The participation of the individuals in meaningful occupations is important to serve in fostering of meaning in life (7). However, there is substantial evidence showing better motivation and participation in the recovery process when individuals are engaged in meaningful occupations (8). Thus, it is important to investigate the occupational performance problems of individuals according to their meaningful and valuable priorities (9, 10). Individuals can sustain through their pursuit of meaningful occupations and maintain a personally meaningful lifestyle (11).

Diabetes mellitus, which is one of the most complex chronic diseases, has a continuously changing dynamic structure and causes individuals to struggle with many obstacles at the same time (12-14). Healthy living with diabetes mellitus is a challenging process influenced by many personal and environmental factors (15). Individuals are advised to continue with their ordinary life while carrying out their self-care for diabetes to maintain healthy life (16, 17). Sometimes, participation in multiple occupations may lead to poorer health on individuals, for complexity (2). Individuals sometimes encounter conflicts between participating in activities that are meaningful to them and their diabetes self-management behaviour, and these situations may cause stress (18). A person should cope with stress, spiritual status, responsibility level, knowledge of diabetes, demands of complex situations, and the relationship between the individual's cultural, physical and social environment (13, 15, 19-21). Problem-solving therapy (PST) can be an effective way of developing the coping skills of individuals with type 2 diabetes (22).

Problem-solving therapy is a cognitive-behavioral intervention developed by D'Zurilla and Goldfried to alleviate individuals' mental and physical problems and improve their ability to cope with stressful life experiences (23). PST is considered a guiding method to clarify the goals of the individuals and develop alternative solutions (24). PST helps support the individual with a disease or disability to overcome the barriers of participation that develop as a result of the problems experienced (24-26). It is recommended that problem-solving interventions are adapted to include individual needs in the individual of diabetes (27). Problem-solving therapy has been used in many chronic disorders, but it has not been implemented through meaningful occupation problems by individuals concerning occupational therapy (28, 29).

The aim of this study is based on the hypothesis that a lack of adequate research on problem-solving therapy applied through meaningful occupation problems. In the current study, we tested the hypothesis...
that occupation-based problem-solving therapy could: (i) increase the rate of performance and
satisfaction of meaningful occupations, (ii) increase the rate of diabetes-related psychosocial self-
efficacy, (ii) improve the rate of effective coping strategies, (iv) enhancement the rate of well-being.

Methods

Study design and description of the participants

This study was designed as a single-blind, randomized controlled. The sample size was designed to use
5% (p = 0.05) Type 1 error, 80% strength through statistical power analysis, and a two-way hypothesis test
and consisted of 33 subjects per group. Participants for this

study were selected from individuals who presented at the internal medicine outpatient department of a
state hospital in Turkey. Individuals who were diagnosed with type 2 diabetes mellitus, were aged
between 18 and 65 and were literate in Turkish were included in this study, and individuals with a
diagnosis of mental illness or cancer were excluded from this study. A total of 86 individuals were
referred to this study.

Eligibility assessments of individuals were taken before allocation to the study groups. Among the 86
referred individuals, 10 were excluded from this study because they did not meet inclusion criteria. The
remaining 76 individuals were randomly assigned (using the simple random number table) to one of an
intervention group or control group (n = 38 each). For control and intervention groups, randomizations
were applied separately, using stratification variables produced by a web site of Research Randomizer/
https://www.randomizer.org/#randomize. The simple random number table was created for each group.
Numerical distribution was ensured as formed according to 2 sets and unique numbers per set.
Participants were included in the groups according to the number of randomizations. The baseline
evaluation was carried out at the first meeting that was individually planned for the participants in each
group after randomization. Nine subjects discontinued participation for various reasons in the process,
and this study was therefore completed with 67 individuals with type 2 diabetes. Figure 1 shows the
CONSORT flow diagram of this study.

All subjects gave consent after they were provided with verbal and printed information about this
research project. Our study was conducted in accordance with the Helsinki Declaration (revised in 2013)
after ethical approval was obtained (ethic number: GO15/731). This study was conducted between June
2015 and September 2017.

The scales described in detail below were applied to all participants. Both groups' participants completed
the scales face to face with the same therapist guidance. The individuals were assessed at baseline, after
the six modules (six weeks), and after the three months.

Measurements
Socio-demographic and clinical features form: Each participant was asked to complete a form to obtain demographic information, such as age, gender, marital status, health-related habits (e.g., smoking, alcohol consumption), body mass index (BMI) and medical history (e.g., monitoring, family history, comorbidity).

Primary outcomes

The Canadian Occupational Performance Measure (COPM): The COPM is based on a semi-structured interview method and helps individuals identify and prioritise activities of importance that they have difficulty in performing (30). COPM can both used as an intervention and assessment tool. Specifically, the COPM is a measure of self-perceived occupational performance areas in self-care (personal care, functional mobility and community management), productivity (paid/unpaid work, household management and play/school) and leisure (quiet recreation, active recreation and socialization). First, the importance of each occupation is rated on a 10-point scale where 1 is “not important” and 10 is “extremely important”. Then, up to five most important activities are rated for performance from 1 (“do not perform well”) to 10 (“perform very well”) and for satisfaction, also from 1 (“not satisfied”) to 10 (“very satisfied”). The performance and satisfaction scores obtained are collected separately and divided by the number of activities to obtain performance and satisfaction scores (31). The test-retest reliability of the COPM is within the acceptable range; intra-class correlation and obtained coefficients for individuals with chronic diseases range from the scores were 0.86 to 0.89 for performance and 0.76 to 0.88 for satisfaction (32-34). The COPM has shown Turkish validity and reliability (35). COPM is recommended to use in diabetic subjects to identify what is important and their priorities (9).

Secondary Outcomes

The Diabetes Empowerment Scale (DES): The Diabetes Empowerment Scale (DES) is used in the measurement of diabetes-related psychosocial self-efficacy and consists of 28 items with three subscales as follows: managing the psychosocial aspects of diabetes; assessing dissatisfaction and readiness to change, and setting and achieving diabetes goals (36). Each question is rated between 1 for “strongly disagree” and 5 for “strongly agree”. Thus, higher scores indicate better psychosocial self-efficacy levels. The DES is a valid and reliable scale in Turkish populations (37).

The Brief COPE: The Brief COPE measures strategies for coping with stress and includes 14 subscales that two-items are grouped in two coping strategies: effective- approach coping (active coping, acceptance, positive reframing, planning, use of emotional or instrumental support) and ineffective- avoidant coping (denial, self-distraction, substance use, behavioural disengagement, venting and self-blame) (38). Humor and religion subscales are uncertain items to being inside the effective or ineffective coping style; therefore, they were excluded from both analyses (39). Each question has a selection range from 1 (“I have not been doing this at all”) to 4 (“I have been doing this a lot”), and the highest subscale score means those coping strategies are used more. These tools are also valid and reliable in Turkish populations (40).
The World Health Organisation's Five Well-Being Index (WHO-5): The World Health Organisation's Five Well-Being Index (WHO-5) is used for the psychometric evaluation of emotional well-being, depression, and quality of life. This measure consists of five statements, which respondents' rate on a scale of 0 (“never”) to 5 (“all the time”) considering the last two weeks (41). The raw value, ranging from 0 to 25, is multiplied by four to determine the final score with 0 representing the worst possible well-being and 100 the best. WHO-5 has Turkish validity and reliability (42, 43) and a cut-off of less than <50% has been identified to screen for depression and reduced well-being (44).

Intervention

Participation in the everyday occupations of life is a vital part of humans and participation in meaningful occupations has a positive influence on health and well-being (45). Diabetes mellitus restrict individuals' participation in meaningful activities for the person (6). Diabetes mellitus is a complex disease and individuals need to choose from many topics to stay healthy in their ordinary daily life.

The intervention program focused on meaningful occupations defined by individuals. The PST method developed by D'Zurilla and Goldfried has been used to overcome the problems of participation of meaningful occupations. PST helps support the individual with a chronic disease to overcome the barriers of participation that develop as a result of problems experienced at home and in the community. This intervention program included the four steps of PST: the (1) problem definition, (2) generation of alternatives, (3) decision-making, (4) solution implementation, and verification (46). Especially, in the intervention program considered the demands and priorities of the person at the stage of "problem definition ", and the self-perceived occupational performance problems that were meaningful to the person.

This program that includes the assessment tools, education, and problem-solving therapy, was implemented by the same therapist who has a cognitive behavioural therapy certificate and three years of problem-solving therapy experience. The intervention program was designed in six modules and performed once a week for six weeks, and each session containing approximately 60 minutes. The intervention was made face-to-face and individually in a clinical setting at a suitable time for the person. Both groups join modules 1 and 6, while modules 3, 4 and 5 are designed only for the intervention group. The content of the modules explained in detail below.

Module 1: The first module applied to the same procedure for both groups. The purpose of the first session was to complete all measurements together therapist for each group's participant. For which participants were asked to keep a diary for a once, how to complete the diary for a typical day was also explained. The therapist and participants identified together with their problematic activities with COPM in both groups. The COPM allowed them to identify the goal by individuals of performance problems in their meaningful activities. The COPM has used as an evaluation tool for the control group; it was also used as the intervention tool for the intervention group in the next modules.
In addition, this module is equivalent to the “problem definition” step of problem-solving therapy for the intervention group. Briefly, it included setting as a measurable, realistic and attainable goal for the solution (47).

Module 2: The purpose of this session was to provide education with information about diabetes mellitus. The education was given one-to-one through a PowerPoint presentation. This educational information follows the National Standards for Diabetes Self-Management (48) and is based on a Person-Environment-Occupation Model (49). We, therefore, focused on therapeutic lifestyle changes to include basic knowledge and skills relating to diabetes as well as personal, environmental and occupational factors that affect the condition. The emphasis was on the elements of daily life that could support or prevent effective diabetes management and the importance of determining them.

Module 3: In this session, the “generation of alternatives” and decision making” step of problem-solving therapy was applied. It included the generation of alternatives to possible solution strategies and assessments of the advantages or disadvantages of each strategy to the action (47). The best solution strategy for the occupational performance problem that defined in Module 1 with the help of COPM was revealed. To determine the best strategy for overcoming the obstacles, alternative solutions were explored through brainstorming, and an action plan was created once the most appropriate approach had been identified. The individual was encouraged to recognize and use their environmental and personal resources. In addition, the completed diary was used to determine steps of action plans' time, frequency and duration when deciding daily schedules adaptation.

Module 4-5: In these sessions were contained in the "solution implementation and verification" step of problem-solving therapy. Moreover, shortly, it included the implementation of the strategies and verification of the solution (47). The action plan was reviewed through sharing the individual's experiences and possible alternatives and new strategies are defined when necessary. They discussed together when carried out the solution plan, the individual, environmental, supportive and preventive factors, and consequences of the plan and whether problem-solving efforts had been successful or need to revision.

Sample questions of sharing of the action plan experience are as follows: What were opportunities or obstacles in the action plan experience? How the individual approached unpredictable developments? Which events were coped with a good or bad way? How could it be possible to reach the target in a different way?

The action plan was revised to consider individuals' requirements when needs.

Module 6: The last session was designed for both groups, and all questionnaires were reapplied. Differently, the last session included the sharing of experiences and the discussion of future goals for the intervention group participants.

Statistical method
Data were analysed using IBM the Statistical Package for the Social Sciences (SPSS) version 21.0 software (50). Missing values were excluded from that analysis. A multiple regression analysis based on change score of the COPM, Brief COPE, DES and WHO-5 under controlling of gender, occupational status, diabetes duration and treatment regime. To use controlling variables in the regression analysis, dummy variables were produced for ordinal variables. The Shapiro-Wilk test was used to evaluate the distribution of the collected data (normal = p > .05, not normal = p < .05). The Chi-Square and Mann-Whitney U test was used for the differences in demographic variables between the groups (p < .05). Differences between the groups were analysed with the Independent t-tests (parametric) or Mann-Whitney U test (non-parametric). Group-time interaction differences (i.e., baseline, after six modules (six weeks) and after three months) were calculated using the Friedman test. The level of significance was set at 0.05. Quantitative variables were expressed as mean ± standard deviation (X ± SD), and qualitative data were described with percent (%) values.

Thematic analysis was used to evaluate the qualitative data of activities (COPM) and presented as percentages (%). The COPM data were categorized according to performance areas with MAXQDA code system and percentage data were obtained. Coding was conducted with MAXQDA 11.0 (51) through which the qualitative data were coded as self-care, productivity or leisure to develop a picture of occupational performance across all areas of life.

**Results**

Demographic variables analysis showed the mean age of the participants diagnosed with T2DM was 54.64 (±8.93) years in the intervention group (IG) and 55.76 (±8.16) years in the control group (CT). The participants stated that they exercised regularly, the rate of 26.5% in the CT and 12.1% in the IG. The mean exercise of the participants in the weekly rate was 1.75 (± 2.6) days in the IG and 2.47 (± 2.32) days in the CT. No significant difference between the demographic variables, as seen in Table 1.

Univariate and multivariate regression analysis results in both study and intervention groups were significant for ineffective and effective coping change scores (p<0.05). The direction of relationship was positive for COPM-performance difference for both effective and ineffective coping scores. Regression coefficients showed that effective coping score had highly effective than ineffective coping score in both study and intervention groups. Effect sizes for both ineffective and effective coping score were higher in the control group. The results are given in Table 2.

The COPM-performance qualitative data coded with MAXQDA codes indicated that both groups had the most difficulty in self-care activities, followed by leisure time and productivity activities, as illustrated in Table 3. The COPM-performance and COPM-satisfaction baseline scores of the control group (3.51 ± 2.11, 5.25 ± 2.61) were better than those of the intervention group (2.51 ± 1.19, 2.93 ± 1.42). At first, when COPM data were compared using a Mann-Whitney U test, the findings showed that the difference in performance and satisfaction of occupation between the groups was in favour of the control group. However, at the end of the intervention modules and three months after, the COPM-performance and the
COPM-satisfaction scores increased significantly in the intervention group. The Friedman tests showed an improvement in COPM performance and satisfaction scores after the intervention and after three months, which occurred over time in the intervention (COPM performance $\chi^2=45.690; p<0.001$; COPM satisfaction $\chi^2=41.081; p<0.001$) but not in the control group (COPM performance $\chi^2=0.485; p>0.05$; COPM satisfaction $\chi^2=1.040; p>0.05$). Details are shown in Table 4.

In the beginning, the diabetes-related psychosocial self-efficacy analysis showed that the control group had higher evaluation scores for readiness to manage the psychosocial aspects of diabetes (3.79 ± 0.64; 3.19 ± 0.63), dissatisfaction and readiness to change (3.81 ± 0.45; 3.37 ± 0.45), setting and achieving diabetes goals (3.87 ± 0.42; 3.32 ± 0.74) and psychosocial self-efficacy (3.82 ± 0.44; 3.31 ± 0.54). Mann-Whitney U tests were conducted after the intervention and three months after the intervention: significant improvements were seen in all scores in the intervention group compared to the control group. The Friedman tests showed significant improvements over time in the intervention group’s scores for readiness to manage the psychosocial aspects of diabetes ($\chi^2=52.452; p<0.001$), dissatisfaction and readiness to change ($\chi^2=41.785; p<0.001$) and setting and achieving diabetes goal ($\chi^2=46.934; p<0.001$). All details are illustrated in Table 4.

The coping strategies data tested with the Mann-Whitney U the intervention groups’ score was significantly better than the control group’s score ($p<0.05$) after three months. However, the Friedman test did not show significant improvement in the use of ineffective coping strategies in the intervention group ($\chi^2=0.638; p>0.05$). The intervention group’s effective coping strategies score was significantly better than the control group after three months of the intervention modules. The Friedman tests showed a significant increase in the use of effective coping strategies ($\chi^2=34.111; p<0.001$) in the intervention group. When we analysed the Brief COPE’s sub-score, the control group applied the following strategies more actively than the intervention group at the beginning ($p>0.05$): active coping, denial, emotional support and behavioural disengagement. After the intervention, behavioural disengagement was still more common in the control group; on the contrary, acceptance and self-blame were significantly more common in the intervention group ($p<0.05$). For the intervention group, the Friedman tests showed a significant decrease in the use of self-distraction ($\chi^2=-9.484; p<0.01$), while it showed a significant increase in the use of active coping ($\chi^2=11.954; p<0.01$), emotional support ($\chi^2; p=12.409; 0.002$), behavioral disengagement ($\chi^2=8.605; p<0.05$), planning ($\chi^2=6.686; p<0.05$) and acceptance ($\chi^2=27.136; p<0.001$) in the intervention group. All details are illustrated in Table 4.

The pre-intervention WHO-5 scores of both groups were found to be in the intervention group (53.69 ± 27.42) and in the control group (48.94 ± 20.79), using the cut-off point (<50%) revealed a relatively poor emotional state in both groups (no statistical difference). When the comparison of groups’ WHO-5 scores immediately and three months after the intervention modules showed a significant increase in favour of the intervention group ($p<0.05$). The Friedman tests showed that significant changes in the WHO-5 scores of the intervention group ($\chi^2=33.564; p<0.001$) after the intervention modules and three-month follow-up, but there was no change in the control group ($\chi^2=3.323; p>0.05$). All details are shown in Table 4.
Discussion

This single-blind, randomized controlled trial with a three-month follow-up indicated that the problems they experienced in meaningful occupations were overcome by individuals with T2DM; therefore, it supported both diabetes care and ordinary lives. Results showed that diabetic individuals' effective and ineffective coping scores significantly affects how individuals identify and prioritise activities of importance that they have difficulty in performing. The individuals also showed that they were readier to change their diabetes management behaviours and increase their psychosocial self-efficacy. Focusing on meaningful occupation problems and considered the demands and priorities of the person improved their participation motivation to solve these problems effectively. Moreover, the intervention group did better concern emotional well-being by the end of the process.

Problem-solving therapy helps cope with stressful life experiences. The ineffective coping style was more effective in univariate regression on individuals to identify and prioritize activities of importance, while the effective coping style was more effective in multiple regression, which showed us the importance of the relationship between the factors can affecting individuals' problematic activities. This is shown the significance of person-centered, occupation-based, and holistic approaches can be used to individuals with diabetes, that care about individuals' perspective and consider multiple factors.

This study revealed that diabetic individuals had problems participating in meaningful activities. The findings obtained in this study showed that solving meaningful occupation problems increased the occupational performance and satisfaction of the individuals. In individuals with diabetes, a need for a holistic approach has emerged that includes self-care, as well as other priorities and factors that add meaning to the person's life. Schultz and Schkade stated that occupational activities allowed individuals and therapists to benefit from meaningful action, and to meet their goals, the therapy program should be directly related to individuals’ occupations in daily life (52). Stevens stated that, after serious illness and disability, occupational engagement encourages individuals’ natural motivation, which leads to a sense of self-efficacy in the elderly who need to redesign and transform themselves (53). Similarly, focusing on personal priorities in our study might have increased personal effort in participating in professional performance through increased personal motivation. Consequently, the overall results suggested that interventions in diabetic individuals through person-centred and occupation-based activities can increase their motivation to overcome problems, and it may help prevent the struggles of stressful life events and diabetes-related problems.

One of the most important results of this study was that the intervention group participants were able to overcome their own meaningful occupational performance problems with PST; therefore, they developed improved self-efficacy over the control group. Individuals who have difficulty solving problems in daily life are likely to experience similar difficulties in daily self-care regimens (27). Corbin and Strauss reported that living with a chronic condition is associated with managing the effects of emotional problems and the chronic condition on daily life and roles, as well as the symptoms and problems (54). Bodenheimer et al. emphasized the importance of identifying and solving individuals’ problems for self-efficacy (55).
Since individuals’ illness-related perception of being powerless may affect their coping, Lorig and Holman indicated that their self-efficacy should be improved (56). When investigating self-efficacy in self-management programs, Packer suggested using strategies like problem-solving and behavioural change (57). In a one-year follow-up study based on this self-efficacy theory and emphasizing problem-solving strategies, Lorig et al. reported an improvement in individuals’ self-efficacy and health conditions (58). Gage and Polatajko suggested that the treatment must be associated with relevant personal performance accomplishments and that perceived self-efficacy in the individual would be higher if the individual was under control (10). In our study, we think that the participants may have discovered the potential to overcome obstacles with the participation of the occupations and in this way, they increase in self-efficacy can be explained. We are of the opinion that the individual approach with occupation-based PST can support increased self-efficacy. Bandura stated that performance-based procedures were the most effective way to increase perceived self-efficacy (59). All these studies highlight the importance of self-efficacy of individuals with diabetes, and the solution of their problems in daily life can improve the individuals’ self-efficacy in their struggle with diabetes. It should be kept in mind that increasing the self-efficacy with a person-centred, occupation-based approach for individuals with diabetes can also potential for the improvement of the self-care behaviours.

Another important result in our study was the significance of the improvement in effective coping strategies in the intervention group. Shayeghian et al. applied acceptance and commitment therapy to the coping styles of individuals with T2DM and concluded that acceptance promoted effective coping (60). Miles et al. applied a transactional model of stress and coping to understand diabetes self-management and emotion-focused coping, and they clarified that adaptive coping mediated the relationship between emotional and self-management behaviours, such as diet and exercise (61). McCoy and Theekebs analysed 22 quantitative studies, and this systematic review showed that social support decreased emotional distress (62). In our study, the intervention group preferred the use of emotional support, acceptance, planning and active coping strategies more, which is Brief Cope sub-parameters, after the intervention. The development of individuals participating in our study in their coping strategies may have supported by several different factors of our study. The increase in the use of emotional support strategy may show that the person-centred approach enhancement individuals’ effort to reach supporting factors. Focusing on meaningful occupational performance problems of the individuals may have increased the motivation for active coping, and PST has led to the development of individual competence in planning necessary to achieve a solution. This result showed the importance of these strategies in overcoming diabetes-related and other problems identified by individuals; therefore, we suggest that they should be considered in the treatment process.

Hajos stated that individuals’ psychological wellbeing is a basic component of their general quality of life (63). Eakman substantiated that improved psychological wellbeing was related to participation in meaningful activities (11). Frances showed the importance of meaningful activities through a study of artwork’s contributions to health and wellbeing (64). In addition, McCoy and Theekebs showed that positive, problem-focused coping styles developed psychological and physical health (62). This study’s evaluation of the results according to the WHO-5 (<50) cut-off point revealed that increased participation
in meaningful activities led to an improvement in the mood of the intervention group. The above-mentioned studies results demonstrate that overcoming meaningful occupation and participation problems can improve individuals’ levels of psychological wellbeing. Our study result revealed the importance of participating in meaningful occupations in chronic diseases, such as diabetes. Thus, the development of adaptation skills to ordinary daily life should be added to the intervention approaches to be performed in individuals with diabetes to improve well-being. Future research should be enhanced by person-centred, occupation-based interventions with a holistic perspective, emphasizing problem-solving to promote diabetes care and participation in ordinary life.

Limitations

Our study had a follow-up period of only three months, and we believe that the intervention should be supported with a longer follow-up duration to provide a higher level of evidence. We also noted that time management could be affected by the gender and working status of the participants, which are factors we did not consider in our study. We recommend that future studies should take gender roles and working status into account. Finally, we believe that the positive results of our study's intervention should be supported by biometric parameters that show changes in blood glucose values, such as A1C.

Conclusion

In summary, the key point of the current study was the intervention supported by PST, which enabled participants to identify, sort and solve problem areas according to their own meaningful priorities. We concluded that person-centred intervention programs that were designed to solve individuals’ meaningful occupational performance problems could support the development of self-care skills. We observed that it was important to approach individuals with a holistic point of view, to use a person-centred intervention program, and to provide the time and opportunities for them to experience the newly acquired skills. Finally, we claim that daily life and diabetes-related problems should not be separated from each other; instead, individuals should be empowered by problem-solving skills and therapies that incorporate individuals’ priorities via meaningful occupation.

Abbreviations

T2DM: Type 2 Diabetes Mellitus

PST: Problem-solving Therapy

COPM: Canadian Occupational Performance Measure

DES: Diabetes Empowerment Scale

WHO-5: World Health Organization Five Well-Being Index
Ethics Declarations

Ethics approval and consent to participate

This study was conducted after obtaining the ethical approval, which was obtained by the Hacettepe University Ethical Commission of Non-invasive Clinical Research with the confirmation number GO15/731.

Consent for publication

All volunteered signed a consent form after they were provided verbal and printed information on this project.

Competing interests

The authors declare that there are no competing interests.

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Authors’ contributions

ZBA: Literature search, concept development and design, data collection, processing, analysis and interpretation, article writing.

GE: Supervision, concept development and design, review and editing.

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Availability of data and materials

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

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Tables

Table 1: Demographic information of the intervention and control groups
|                           | Intervention group (IG) | Control group (CG) | p* values |
|---------------------------|-------------------------|--------------------|-----------|
| **Mean (min max) ± SD**   |                         |                    |           |
| **Age**                   | 54.64 (37-65) ± 8.937   | 55.76 (35-65) ± 8.16 | 0.591     |
| **Body mass index (BMI)** | 31.22 (19.4-47.5) ± 6.62 | 29.1 (19.03-45.1) ± 5.24 | 0.151     |
| **Monitoring in weekly (times)** | 3.55 (0-14) ± 5.33    | 4.87 (0-14) ± 5.1   | 0.153     |
| **Exercises in weekly (day)** | 1.75 (0-7) ± 2.6        | 2.47 (0-7) ± 2.32   | 0.097     |
| **n %**                   | **n %**                 | **p values**       |           |
| **Gender**                |                         |                    |           |
| female                    | 19 57.6                 | 23 67.6            | 0.394     |
| male                      | 14 42.4                 | 11 32.4            |           |
| **Occupation**            |                         |                    |           |
| - yes                     | 12 36.4                 | 4 11.7             | 0.018     |
| - no                      | 21 63.6                 | 30 88.3            |           |
| **Marital status**        |                         |                    |           |
| - married                 | 27 81.8                 | 28 82.4            | 0.954     |
| - single                  | 6 18.2                  | 6 17.6             |           |
| **Alcohol consumption**   |                         |                    |           |
| - yes                     | 4 12.1                  | 3 8.8              | 0.659     |
| - no                      | 29 87.9                 | 31 91.2            |           |
| **Smoke**                 |                         |                    |           |
| - yes                     | 7 21.2                  | 7 20.6             | 0.950     |
| - no                      | 26 78.8                 | 27 79.4            |           |
| **Monitoring**            |                         |                    |           |
| - yes                     | 14 42.4                 | 18 52.9            | 0.389     |
| - no                      | 9 57.6                  | 16 47.1            |           |
| **Family history**        |                         |                    |           |
| - yes                     | 24 72.7                 | 25 73.5            | 0.941     |
| - no                      | 9 27.3                  | 9 26.5             |           |
| **Regular exercise**      |                         |                    |           |
| - yes                     | 4 12.1                  | 9 26.5             | 0.141     |
| - no                      | 29 87.9                 | 25 73.5            |           |
| **Comorbidity**           |                         |                    |           |
| - yes                     | 16 48.5                 | 12 35.3            | 0.274     |
| - no                      | 17 51.5                 | 22 64.7            |           |
Table 2. Univariate and multivariate regression analysis for research parameter changes
|                                | Univariate   |                |                | Multivariate  |                |                |
|--------------------------------|--------------|----------------|----------------|--------------|----------------|----------------|
|                                | B  | t  | p   | B  | t  | p  |
| Intervention                   |    |    |     |    |    |    |
| (Constant)                     |    |    |     |    |    |    |
| COPM-Performance Change        | -1.312 | -1.539 | 0.134 | 4.092 | 0.853 | 0.405 |
| COPM-Satisfaction Change       | 0.215 | 0.302 | 0.765 | -0.876 | -1.105 | 0.283 |
| DES Change                     | 1.054 | 0.254 | 0.801 | -0.084 | -0.028 | 0.978 |
| Ineffective COPING Change      | 1.518 | 6.261 | 0.000 | 0.919 | 2.790 | 0.012 |
| Effective COPING Change        | 1.196 | 4.499 | 0.000 | 1.149 | 3.332 | 0.004 |
| WHO-5 Change                   | -0.124 | -1.574 | 0.126 | -0.026 | -0.431 | 0.671 |
| Gender                         | -0.538 | -0.154 | 0.879 | 2.668 | 0.815 | 0.425 |
| Occupation                     | 0.131 | 0.036 | 0.971 | 2.668 | 0.815 | 0.425 |
| Treatment history              | -1.860 | -0.541 | 0.593 | -3.691 | -1.411 | 0.174 |
| Diabetes duration (0-10 years) | -0.733 | -0.211 | 0.834 | -1.108 | -0.352 | 0.729 |
| Diabetes duration 2 (11-20 years) | 1.511 | 0.358 | 0.723 | -0.393 | -0.092 | 0.928 |
| Diabetes duration 3 (21-30 years) | 18.906 | 1.992 | 0.055 | -1.789 | -0.203 | 0.841 |

Control

|                                |    |    |     |    |    |    |
|--------------------------------|    |    |     |    |    |    |
| (Constant)                     |    |    |     |    |    |    |
| COPM-Performance Change        | -0.756 | -0.706 | 0.485 | -0.264 | -0.533 | 0.600 |
| COPM-Satisfaction Change       | 0.033 | 0.033 | 0.974 | -0.222 | -0.592 | 0.560 |
| DES Change                     | 0.290 | 0.075 | 0.941 | -2.368 | -1.539 | 0.139 |
| Ineffective COPING Change      | 1.518 | 6.366 | 0.000 | 1.104 | 7.506 | 0.000 |
| Effective COPING Change        | 1.395 | 8.249 | 0.000 | 1.058 | 9.618 | 0.000 |

|                                |    |    |     |    |    |    |
|--------------------------------|    |    |     |    |    |    |
| WHO-5 Change                   | -0.027 | -0.365 | 0.717 | -0.017 | -0.556 | 0.584 |
| Gender                         | -0.198 | -0.059 | 0.953 | -1.900 | -1.293 | 0.210 |
| Occupation                     | -3.217 | -0.670 | 0.508 | 0.631 | 0.281 | 0.781 |
| Treatment history              | -1.280 | -0.394 | 0.697 | -0.370 | -0.246 | 0.808 |
| Diabetes duration (0-10 years) | -2.643 | -0.844 | 0.405 | -0.978 | -0.574 | 0.572 |
| Diabetes duration 2 (11-20 years) | 2.500 | 0.685 | 0.498 | -0.718 | -0.334 | 0.742 |
| Diabetes duration 3 (21-30 years) | 2.485 | 0.270 | 0.789 | 3.786 | 0.924 | 0.366 |

R²: 0.619; F: 5.192; p<0.05

R²: 0.899; F: 25.436; p<0.05
**Table 3:** Occupational performance problems defined by individuals according to performance areas

| The Canadian Occupational Performance Measure | Intervention group | Control group |
|-----------------------------------------------|--------------------|---------------|
| **SELF CARE TOTAL**                           | 71.82              | 73.01         |
| -Personal care                                | 45.5               | 60.3          |
| -Functional mobility                          | 5.44               | 3.17          |
| -Community management                         | 20.88              | 9.51          |
| **PRODUCTIVITY TOTAL**                        | 1.81               | 1.59          |
| -Paid/unpaid work                             | 0.9                | 1.59          |
| -Household management                         | 0.9                | 0             |
| -Play/school                                  | 0                  | 0             |
| **LEISURE TOTAL**                             | 26.37              | 25.4          |
| -Quiet recreation                              | 0                  | 0             |
| -Active recreation-being active                | 21.83              | 20.64         |
| -Socialization                                | 4.54               | 4.76          |

MAXQDA 11.0, Coded as occupational performance area and calculated as percentage

**Table 4:** Comparison of the intervention and control groups inside and between themselves
|                      | Intervention group | Control group | Comparison of groups |
|----------------------|--------------------|---------------|---------------------|
|                      | Mean ± SD          | Mean ± SD     | z                   | p*      |
| CANADIAN OCCUPATIONAL PERFORMANCE MEASURE (COPM) |                   |               |                     |         |
| COPM-Performance BI  | 2.51 ± 1.19        | 3.51 ± 2.11   | -2.1                | 0.03    |
| AI                  | 6.03 ± 2.13        | 3.58 ± 2.45   | -4.11               | 0.00    |
| AI-3MNT             | 6.44 ± 2.21        | 3.48 ± 2.01   | -4.74               | 0.00    |
| p, p**              | 45.690; 0.000      | 0.485; 0.784  |                     |         |
| COPM-Satisfaction BI| 2.93 ± 1.42        | 5.25 ± 2.61   | -3.68               | 0.00    |
| AI                  | 7.19 ± 2.23        | 4.83 ± 2.70   | -3.39               | 0.00    |
| AI-3MNT             | 7.44 ± 2.37        | 4.4 ± 2.11    | -4.64               | 0.00    |
| p, p**              | 45.69; 0.000       | 0.485; 0.784  |                     |         |
| DIABETES EMPOWERMENT SCALE (DES) |               |               |                     |         |
| Psychosocial aspects BI | 3.19 ± 0.63       | 3.79 ± 0.64   | -3.43               | 0.00    |
| AI                  | 3.95 ± 0.73        | 3.67 ± 0.41   | -2.20               | 0.02    |
| AI-3MNT             | 4.36 ± 0.58        | 3.7 ± 0.43    | -4.66               | 0.00    |
| p, p**              | 52.452; 0.000      | 0.578; 0.749  |                     |         |
| Dissatisfaction and readiness to change BI | 3.37 ± 0.45      | 3.81 ± 0.45   | -3.53               | 0.00    |
| AI                  | 3.93 ± 0.5         | 3.76 ± 0.23   | -0.96               | 0.33    |
| AI-3MNT             | 4.25 ± 0.32        | 3.66 ± 0.4    | -5.49               | 0.00    |
| p, p**              | 41.785; 0.000      | 3.038; 0.219  |                     |         |
| Setting and achieving diabetes goals BI | 3.32 ± 0.74       | 3.87 ± 0.42   | -3.47               | 0.00    |
| AI                  | 4.28 ± 0.65        | 3.85 ± 0.36   | -3.15               | 0.00    |
| AI-3MNT             | 4.49 ± 0.5         | 3.74 ± 0.4    | -4.77               | 0.00    |
| p, p**              | 46.934; 0.000      | 2.032; 0.362  |                     |         |
| DES-total BI        | 3.31 ± 0.54        | 3.82 ± 0.44   | -3.80               | 0.00    |
| AI                  | 4.07 ± 0.55        | 3.76 ± 0.26   | -2.35               | 0.01    |
| AI-3MNT             | 4.46 ± 0.74        | 3.7 ± 0.35    | -5.33               | 0.00    |
| p, p**              | 53.786; 0.000      | 2.305; 0.316  |                     |         |
| BRIEF COPE |                   |               |                     |         |
| Ineffective coping BI | 26.27 ± 5.09      | 27.56 ± 4.64  | -1.038              | 0.299   |
| AI                  | 26.55 ± 5.01       | 27.09 ± 5.4   | -0.92               | 0.554   |
| AI-3MNT             | 25.09 ± 4.31       | 27.03 ± 4.39  | -2.007              | 0.045   |
| p, p**              | 0.638; 0.72        | 0.331; 0.84   |                     |         |
| Self-distraction BI | 6.45 ± 1.76        | 6.26 ± 1.44   | -0.95               | 0.33    |
| AI                  | 5.94 ± 1.56        | 6.41 ± 1.45   | -1.43               | 0.15    |
| AI-3MNT             | 5.58 ± 1.56        | 6.71 ± 1.21   | -3.05               | 0.00    |
| p, p**              | 9.484; 0.009       | 2.064; 0.356  |                     |         |
| Denial BI | 2.79 ± 1.61        | 3.74 ± 1.67   | -2.79               | 0.05    |
| AI                  | 3.33 ± 1.89        | 3.88 ± 1.71   | -1.37               | 0.16    |
| AI-3MNT             | 2.85 ± 1.52        | 3.44 ± 1.39   | 1.94                | 0.051   |
| p, p**              | 0.974; 0.615       | 2.849; 0.241  |                     |         |
| Substance use BI    | 2.94 ± 2.03        | 3.29 ± 1.94   | -1.24               | 0.21    |
| AI                  | 2.97 ± 2.06        | 2.82 ± 1.80   | -0.08               | 0.93    |
| AI-3MNT             | 2.67 ± 1.84        | 3.09 ± 2.06   | -1.32               | 0.18    |
|                      | BI                | AI                | AI-3MNT            | p      | \(p^*\)    |
|----------------------|-------------------|-------------------|--------------------|--------|------------|
| **Behavioral disengagement** | 2.82 ± 10.7        | 3.68 ± 1.62       | -2.29              | 0.02   |            |
|                      | 2.48 ± 1.06        | 3.35 ± 1.32       | -2.29              | 0.03   |            |
|                      | 3.27 ± 1.73        | 3.56 ± 1.63       | -0.89              | 0.36   |            |
|                      | 8.605; 0.014       | 1.723; 0.422      |                    |        |            |
| **Venting**          | 5.42 ± 1.92        | 5.53 ± 1.54       | -0.14              | 0.88   |            |
|                      | 6 ± 1.69           | 5.94 ± 1.53       | -0.18              | 0.85   |            |
|                      | 5.39 ± 1.51        | 5.79 ± 1.40       | -1.09              | 0.27   |            |
|                      | 1.089; 0.580       | 3.519; 0.172      |                    |        |            |
| **Self-blame**       | 5.85 ± 1.87        | 5.06 ± 1.27       | -1.81              | 0.06   |            |
|                      | 5.82 ± 1.81        | 4.68 ± 1.60       | -2.69              | 0.00   |            |
|                      | 5.33 ± 1.83        | 4.44 ± 1.44       | -2.12              | 0.03   |            |
|                      | 2.931; 0.231       | 2.902; 0.172      |                    |        |            |
| **Effective coping** | 29.79 ± 5.14       | 34.09 ± 5.09      | -3.27              | 0.001  |            |
|                      | 35.39 ± 5.92       | 33.85 ± 4.215     | -1.278             | 0.201  |            |
|                      | 34.111; 0.000      | 1.316; 0.518      |                    |        |            |
| **Active coping**    | 5.33 ± 1.16        | 6.12 ± 1.61       | -2.34              | 0.01   |            |
|                      | 6.24 ± 1.65        | 5.71 ± 1.33       | -1.73              | 0.08   |            |
|                      | 6.58 ± 1.48        | 5.85 ± 1.37       | -2.32              | 0.02   |            |
|                      | 11.954; 0.003      | 1.887; 0.389      |                    |        |            |
| **Acceptance**       | 6.21 ± 1.69        | 6.87 ± 1.46       | -1.56              | 0.11   |            |
|                      | 7.79 ± 0.41        | 6.94 ± 0.98       | -3.97              | 0.00   |            |
|                      | 7.45 ± 0.71        | 6.82 ± 1.38       | -1.95              | 0.051  |            |
|                      | 27.136; 0.00       | 0.068; 0.96       |                    |        |            |
| **Positive reframing** | 5.09 ± 1.8        | 5.76 ± 1.56       | -1.37              | 0.16   |            |
|                      | 5.79 ± 1.43        | 5.85 ± 1.30       | -0.07              | 0.93   |            |
|                      | 5.7 ± 1.89         | 5.76 ± 1.10       | -0.28              | 0.77   |            |
|                      | 2.069; 0.68        | 4.368; 0.263      |                    |        |            |
| **Planning**         | 5.82 ± 1.42        | 6.18 ± 1.26       | -0.97              | 0.32   |            |
|                      | 6.42 ± 1.62        | 5.79 ± 1.46       | -1.68              | 0.09   |            |
|                      | 6.7 ± 1.35         | 6.09 ± 1.48       | -1.75              | 0.07   |            |
|                      | 6.686; 0.035       | 0.263; 0.877      |                    |        |            |
| **Use of emotional support** | 3.33 ± 1.72        | 4.76 ± 1.89       | -3.3               | 0.00   |            |
|                      | 4.36 ± 2.01        | 5.12 ± 1.71       | -1.73              | 0.08   |            |
|                      | 4.55 ± 1.92        | 4.47 ± 1.77       | -0.16              | 0.86   |            |
|                      | 12.409; 0.002      | 2.113; 0.348      |                    |        |            |
| **Use of instrumental support** | 3.97 ± 1.96        | 4.44 ± 1.69       | -1.23              | 0.21   |            |
|                      | 4.88 ± 2.05        | 4.35 ± 1.53       | -0.89              | 0.37   |            |
|                      | 5 ± 2.03           | 4.03 ± 1.08       | -1.94              | 0.052  |            |
|                      | 5.961; 0.051       | 1.152; 0.562      |                    |        |            |
| **Humor**            | 4.42 ± 2.33        | 4.85 ± 2.02       | -0.958             | 0.338  |            |
|                      | 4.33 ± 2.2         | 4.26 ± 1.62       | -0.191             | 0.848  |            |
|                      | 4.58 ± 2.04        | 5.03 ± 1.89       | -1.066             | 0.287  |            |
|                      | 1.938; 0.38        | 3.436; 0.179      |                    |        |            |
| **Religion**         | 5.82 ± 2.18        | 5.18 ± 2.3        | -1.164             | 0.244  |            |
|                      | 5.88 ± 1.99        | 4.94 ± 2.10       | -1.862             | 0.063  |            |
|                      | 5.79 ± 2.04        | 4.97 ± 2.63       | -1.427             | 0.154  |            |
|                      | 0.317; 0.853       | 3.303; 0.192      |                    |        |            |

**World Health Organization Well-Being Index (WHO-5)**
WHO-5 | BI | 53.69 ± 27.42 | 48.94 ± 20.79 | -0.82 | 0.4
| AI | 72.24 ± 25.42 | 56.4 ± 24.43 | -2.7 | 0.00
| AI-3MNT | 81.33 ± 16.26 | 51.8 ± 25.42 | -4.65 | 0.00

p* Man Whitney U, p** Friedman's Tests, BI: before the intervention, AI: after the intervention, AI-3MNT: 3 months after the intervention

**Figures**

**Figure 1**

The CONSORT Flow Diagram Chart of Enrollment