Turkish Journal of Diabetes and Obesity / *Türkiye Diyabet ve Obezite Dergisi*
Original Article / Özgün Araştırma

The Relationship Between Medication Self-Efficacy and Self-Management in Individuals with Type 2 Diabetes and the Role of Type D Personality

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Cite this article as: Genç FZ and Uslu A. The relationship between medication self-efficacy and self-management in individuals with type 2 diabetes and the role of type d personality. Turk J Diab Obes 2023;3: 223-230.

ABSTRACT

Aim: To determine the relationship between medication self-efficacy and self-management in individuals with type 2 diabetes mellitus (T2DM), and the role of type D personality in this relationship.

Material and Methods: The study was conducted with 329 individuals with T2DM between May and July 2023. The data of the study were collected using the Introductory Information Form, Diabetes Medication Self-Efficacy Scale (DMSS), Diabetes Self-Management Questionnaire (DSMQ), and Type D Personality Scale (TDPS). The data were evaluated using the Pearson Correlation and the Maximum Likelihood method, which was a structural equation modeling.

Results: It was determined that 64.4% of individuals with T2DM had type D personalities. The relationship between the DMSS and the DSMQ was negative and weak, the relationship between the TDPS and the DSMQ was negative and weak, and no correlation was found between TDPS and DMSS. According to the results, it was determined that diabetes self-management had an effect on diabetes medication self-efficacy (β= -0.163, p=0.019), and diabetes self-management had an effect on TDPS (β= -0.185, p=0.013). According to the results of the structural equation modeling, it was determined that Diabetes Self-Management was associated with Diabetes Medication Self-Efficacy, but D-type personality had no mediating effect.

Conclusion: According to the scale evaluation scores, it was concluded that the individuals had good medication self-efficacy, their self-management was average, and more than half had D-type personalities. In addition, it was determined that type D personality had no mediating role in the relationship between medication self-efficacy and diabetes self-management in individuals with type D personalities.

Keywords: *Type 2 diabetes, Type D personality, Medication self-efficacy, Self-management*

Tip 2 Diyabetli Bireylerde İlaç Kullanım Öz Yeterliği ve Öz Yönetimi Arasındaki İlişki ve D Tipi Kişiliğin Rolü

ÖZ

Amaç: Bu araştırmada, tip 2 Diyabetes Mellituslu (DM) bireylerin ilaç kullanım öz yeterliği ve özyönetimi arasındaki ilişkiyi ve bu ilişkide D tipi kişiliğin rolünü belirlemek amaçlandı.

Gereç ve Yöntemler: Bu araştırma Mayıs-Temmuz 2023 tarihleri arasında kırsal alandaki 329 Tip 2 DM'li birey ile yürütüldü. Veri, Tanıtıcı Bilgi Formu, Diyabet İlaç Kullanım Öz Yeterliği, Diyabet Öz Yönetim Skalası ve D Tipi Kişilik Ölçeği ile toplandı. Veri analizinde Pearson korelasyonu ve yapısal eşitlik modeli olan Maximum Likelihood yöntemi kullanıldı.

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DOI: 10.25048/tudod.1345587

Received / *Geliş tarihi* : 18.08.2023
Revision / *Revizyon tarihi* : 07.10.2023
Accepted / *Kabul tarihi* : 6.11.2023

Bulgular: Tip 2 DM'li bireylerin %64,4'ünün D tipi kişiliğe sahip olduğu belirlendi. Diyabet ilaç kullanım özyeterliliği ile diyabet öz yönetimi arasındaki ilişki negatif yönlü ve zayıf ilişki; D tipi kişiliğin diyabet öz yeterlik ile negatif yönlü zayıf ilişki olduğu; D tipi kişilik ile diyabet ilaç kullanım özyeterliği ile ilişkisinin olmadığı belirlendi. Bulgulara göre, diyabet öz yönetiminin diyabet ilaç öz-etkililiği üzerinde etkisinin olduğu (β= -0,163, p=0,019), diyabet öz yönetiminin ise D tipi kişilik üzerinde etkili (β= -0,185, p=0,013) olduğu belirlendi. Yapısal eşitlik analizi sonucuna göre diyabet öz yönetimi ile diyabet ilaç kullanım öz yeterliğinin ilişkili olduğu fakat bu ilişkide D tipi kişiliğin aracılık etkisinin olmadığı saptandı.

Sonuç: Ölçek değerlendirme puanlarına göre bireylerin ilaç kullanım öz yeterliğinin iyi olduğu, öz yönetimlerinin ortalama olduğu ve yarıdan fazlasının D tipi kişiliğe sahip olduğu görülmektedir. Ayrıca D tipi kişiliğe sahip bireylerde ilaç kullanım öz yeterliği ile diyabet öz yönetim arasındaki ilişkide D tipi kişiliğin aracılık rolünün olmadığı belirlendi.

Anahtar Sözcükler: *Tip 2 diyabet, D tipi kişilik, İlaç kullanım öz yeterliği, Öz yönetim*

INTRODUCTION

Approximately 422 million people worldwide have diabetes, the majority living in low and middle-income countries, and 1.5 million deaths are directly attributed to diabetes each year (1). Diabetes is an important public health problem that brings an individual, economic, and social burden, characterized by high blood sugar levels that cause serious damage to the heart, blood vessels, eyes, kidneys, and nerves over time (1,2). Type 2 diabetes is the most common type of diabetes and causes the use of more than one drug (3). It is important for patients to continue their medication under different conditions and to be aware of it. In this sense, the self-medication of individuals should be evaluated (4). It was reported that 40% of patients did not comply with the prescribed medication use, and the most cited reason for non-compliance was that they did not see any benefit from taking the medication regularly (5).

Medication incompatibility in diabetes is mostly due to the thought that there is no need for medication when there are no symptoms (6). Generally, individuals with chronic disease think that the drug does not cure the disease, state that the drug does not affect their symptoms, and experience adverse effects of the drug, causing treatment non-compliance (5). In a study conducted in Turkey, it was determined that 15% of type 2 diabetes mellitus (T2DM) discontinued drugs, 21.2% missed insulin doses, and 36.7% experienced drug incompatibility (6).

Besides the use of medication, behaviors such as blood sugar monitoring, nutrition, and physical activity are included in diabetes management (7). These health behaviors are important in providing optimal glycemic control in diabetes (8,9). In addition to health behaviors, individuals' personality structures and emotional adjustments are effective in disease self-management (10). In a study, it was determined that emotional adjustment, self-efficacy to overcome obstacles, and self-regulation had the greatest impact on diabetes self-care (11). Considering individual differences, it has been determined that individuals with type D personalities who tend to experience negative emotions have worse diabetes management (12). Type D personalities are characterized by a combination of high negative affect and high social introversion. Although individuals with type D personalities tend to experience negative emotions such as anger, sadness, and anxiety (negative affect), they do not feel free to express themselves towards others (social introversion) (13,14). Studies have shown that 27% of individuals with diabetes have type D personalities (10,15). It has been determined that patients with type D personalities have a significantly higher rate of drug noncompliance, and it has been reported that personality screening can help identify those with a high risk of poor drug compliance (16).

In the literature, there are studies on medication self-efficacy (3,5), self-management (17) and type D personality (12, 16) among patients with diabetes. However, no study has been found in the literature aiming at determining the relationship between medication self-efficacy, self-management, and type D personality in individuals with type 2 diabetes mellitus (T2DM). This study aimed to determine the relationship between medication self-efficacy and self-management in individuals with T2DM, and the role of type D personality in this relationship.

Research questions were as follows: How are the drug use self-efficacy, self-management, and type D personality of individuals with T2DM; Is self-management related to medication self-efficacy of individuals with T2DM; Does type D personality have a mediating role in the relationship between medication self-efficacy and self-management in individuals with T2DM?

MATERIALS and METHODS

This research was conducted as a descriptive and correlational study. The research is reported according to the STROBE checklist.

The research was conducted on individuals with T2DM who were admitted to the internal medicine and endocrine outpatient clinics of a university hospital. Permission

(HRU/23.07.06) was obtained from the Clinical Research Ethics Committee for the implementation of the study. Permission to use the scale was obtained from the developers of the DMSS, DSMQ, and TDPS. Before starting the study, the patients were informed about the purpose of the study and the voluntariness of participation, and an "Informed Voluntary Consent Form" was signed.

It is stated in the literature that at least 200 samples are required for structural equation modeling (18). This research was conducted with 329 individuals. At the end of the study, a posthoc analysis was made using the G*Power program, and the relationship between medication self-efficacy and self-management was found as 0.163, and the strength of the study was determined as 100%. Individuals aged 18 years and over, who were literate, using diabetes medication, diagnosed as having T2DM for at least 6 months, had no problems in verbal communication, and voluntarily agreed to participate in the study were included.

The data of the research were collected face to face in 15-20 minutes between May-July 2023. To evaluate the applicability of the questionnaires, a preliminary test was performed on 10 patients and these data were not included in the study.

The data of the study were collected using an Introductory Information Form, the Diabetes Medication Self-efficacy Scale (DMSS), the Diabetes Self-Management Questionnaire (DMSQ), and the Type D Personality Scale (TDPS).

Personal Information

An introductory information form was created by the researchers in line with the literature (2,10,19,20). The form included questions on age, sex, marital status, educational status, employment status, diabetes history, and additional chronic disease status.

Diabetes Medication Self-Efficacy Scale

To determine medication self-efficacy in patients with DM in the community, the DMSS, which was developed by Sleath et al. (4) and adapted into Turkish by Kavuran and Türkoğlu (3), was used. The scale has a three-factor structure, is triple Likert-type, and contains 19 items in total. Scores on the diabetes medication adherence scale range from 19 (low self-efficacy) to 57 (high self-efficacy). An increase in the score means an increase in self-efficacy. The Cronbach's alpha value of the scale was 0.94, and the value in our study was 0.772.

Diabetes Self-Management Questionnaire

To measure diabetes self-management skills, the DSMQ, which was developed by Schmitt et al. (21) and adapted into Turkish by Eroğlu and Sabuncu (17), was used. The last 8 weeks of the individuals are taken into consideration and the individuals respond by thinking about it. The scale is a four-point Likert-type and consists of 16 items in total. The scale consists of four sub-dimensions (glucose management, diet control, physical activity, and healthcare use). The scores of nine items (5, 7, 10, 11, 12, 13, 14, 15, and 16) in the scale are calculated by reversing them. Scale scoring: (Total item score from the total scale or its sub-dimension)/(Maximum item-total score that can be obtained from the total scale or its sub-dimension) x10) For unanswered questions, 3 points are subtracted from the maximum item-total score that can be obtained from the total scale or its sub-dimension. A minimum of 0 and a maximum of 10 points are obtained on the scale. If an item is skipped, it is evaluated as -3 points. Diabetes self-management increases as the score gets closer to 10. In the Turkish validity and reliability study of the scale, Cronbach's alpha value was 0.85, and the value in our study was 0.640.

Type D Personality Personality Scale

The TDPS, developed by Denollet (13) and adapted into Turkish by Öncü and Vayısoğlu (14), was used to measure the tendency towards negative affect and social inhibition. The scale is a five-point Likert-type and consists of 14 items in total. Each item is scored as 0-4 points. Seven items measure negative affect and seven items measure social introversion. The scores of two items in the scale (1 and 3) are calculated by reversing. Subscales can take values between 0-28. The cut-off point of the subscales is ≥10. Cronbach's alpha reliability for the sub-factors of the scale is 0.85 for negative affect and 0.76 for social introversion. The Cronbach's alpha value of the scale in our study was 0.790.

Statistical Analyses

Data are summarized as numbers, percentages, mean, standard deviation, median, minimum, and maximum. The data were analyzed using the IBM SPSS V23 and IBM AMOS V24 software packages. The normality of data distribution was evaluated according to skewness kurtosis values and the range of -1.5 to +1.5 was taken into account. Data distribution was examined using the assumption of multiple normality. Relationships between DMSS, DSMQ, and TDPS scores were evaluated using Pearson's correlation coefficient. The mediation effect of type D personality in the relationship between medication self-efficacy and self-management was examined through structural equation modeling, and the maximum likelihood method was used for the calculation. Mediation effect models are used to test research questions that mediate the effect of an antecedent variable (predictor variable, independent variable) on the outcome variable (dependent variable). The maximum like-

lihood method allows the indirect effect to be tested with the bootstrap method, using 5000 resamplings, with a percentage technique and at a 95% confidence level (18). The significance level was accepted as p<0.050.

RESULTS

The mean age of all individuals (n=329) participating in the study was 56.88 ± 12.58 (range, 18-86) years, and nearly half had DM for over 10 years. Of the participants, 63.2% were women, 96.4% were married, 53% were literate, 79.9% were not working, and 73.6% had additional chronic diseases. Two hundred twelve (64.4%) had D-type personalities. Of the individuals with type D personalities, 71.7% were young, 65.1% were female, 95.3% were married, 54.7% were literate, 84.4% were unemployed, 76.4% had additional chronic diseases, and 42.4% had a diabetes duration of 10 years or more (Table 1).

It was determined that the DMSS scores of the participants (n=329) were 38.60 ± 6.00, the DSMQ score was 6.00 ± 1.37, and the TDPS score was 18.77 ± 9.47. According to the scale evaluation scores, the individuals had good medication self-efficacy, their self-management was average, and more than half had D-type personalities. It was observed that the medication self-efficacy score of individuals with type D personalities (n=212) was 38.61 ± 6.62, and the DMSS score was 5.98 ± 1.30 (Table 2).

The relationship between the personal information and scale scores of individuals with type D personalities is presented in Table 3. The relationship between DMSS and DSMQ was negative and weak (r= -0.163, p<0.05). It was determined that TDPS had a weak negative correlation with DSMQ (r= -0.185, p<0.01), and the relationship between TDPS and DMSS was not statistically significant (r=0.026, p>0.05).

The mediating role of TDPS in the relationship between DSMQ and DMSS was determined through structural equation modeling. The results are presented in Table 4 and Figure 1. According to the results, it was determined that

Table 1: Sociodemographic characteristics of the patients

Characteristics *	All Patients (n=329)	D Type Personality Positive (n=212)	D Type Personality Negative (n=117)
Age group			
18-64	237 (72.0)	152 (71.7)	85 (72.6)
65 and over	92 (28.0)	60 (28.3)	32 (27.4)
Gender			
Male	121 (36.8)	74 (34.9)	47 (40.2)
Female	208 (63.2)	138 (65.1)	70 (59.8)
Marital status			
Married	317 (96.4)	202 (95.3)	115 (98.3)
Single	12 (3.6)	10 (4.7)	2 (1.7)
Education status			
Literate	176 (53.5)	116 (54.7)	60 (51.3)
Primary/Secondary school	106 (32.2)	64 (30.2)	42 (35.9)
High school/University	47 (14.3)	32 (15.1)	15 (12.8)
Working status			
Yes	66 (20.1)	33 (15.6)	33 (28.2)
No	263 (79.9)	179 (84.4)	84 (71.8)
Additional chronic disease			
Yes	242 (73.6)	162 (76.4)	80 (68.4)
No	87 (26.4)	50 (23.6)	37 (31.6)
Diabetes duration			
1-4 years	104 (31.6)	61 (28.8)	43 (36.8)
5-9 years	82 (24.9)	61 (28.8)	21 (17.9)
10 years and above	143 (43.5)	90 (42.4)	53 (45.3)

* Data are presented as n (%)

diabetes self-management had an effect on diabetes medication self-efficacy (β= -0.163, p=0.019) and the regression coefficient was 0.027 in individuals with type D personalities. In other words, the rate of diabetes self-management explaining diabetes medication self-efficacy was 2.7%. In individuals with type D personalities, an increase in diabetes self-management by one unit decreased medication self-efficacy by 0.163 units. It was determined that diabe-

Table 2: Scale scores of patients

Scale Scores *	All Patients (n=329)		D Type Personality Positive (n=212)		D Type Personality Negative (n=117)	
Diabetes Medication Self-Efficacy Scale	38.6±6.00	96 (6-480)	38.61±6.62	40 (19-53)	38.59±5.88	39 (25-54)
Diabetes Self-Management Questionnaire	6.00±1.37	6.04 (2.08-9.79)	5.98±1.30	6.04 (2.5-9.17)	6.04±1.49	6 (2.1-9.8)
Glucose Management	6.79±1.48	6.67 (3.33-10)	6.75±1.51	6.67 (3.33-10)	6.87±1.42	6.7 (3.3-10)
Diet Control	6.05±1.63	5.83 (1.67-10)	5.90±1.70	5.83 (1.67-10)	6.32±1.46	6.7 (3.3-10)
Physical Activity	6.31±1.97	6.67 (2.22-10)	6.29±1.94	6.67 (2.22-10)	6.34±2.02	6.7 (2.2-10)
Healthcare Use	6.30±1.58	6.67 (1.11-10)	6.16±1.63	6.67 (1.11-10)	6.54±1.45	6.7 (3.3-10)
Type D Personality Scale	18.77±9.47	18 (0-52)	23.75±7.61	22 (10-52)	9.75±4.60	11 (0-18)
Negative Affect	11.48±6.42	11 (0-28)	14.84±5.32	14 (2-28)	5.40±2.66	6 (0-9)
Social Introversion	7.29±4.61	7 (0-24)	8.91±4.59	8 (0-24)	4.35±2.88	4 (0-9)

*Data are presented as Mean ± SD and Median (Min - Max). SD: Standard Deviation, Min: Minimum, Max.: Maximum

Table 3: Correlation table (n=212)

	1	2	3	4	5	6	7	8	9	10
1. Age	1									
2. Gender	-0.002	1								
3. Marital status	-0.243**	0.023	1							
4. Educational status	-0.316**	-0.428**	0.201**	1						
5. Working status	0.287**	0.341**	-0.150*	-0.313**	1					
6. Duration of diabetes	0.248**	-0.045	0.081	-0.003	0.123	1				
7. Additional chronic disease	-0.219**	-0.339**	-0.019	0.226**	-0.252**	-0.017	1			
8. Diabetes Self-Management Questionnaire	-0.024	0.044	-0.069	-0.009	-0.113	0.109	0.110	1		
9. Diabetes Medication Self-Efficacy Scale	0.112	-0.049	0.077	0.053	0.085	0.018	-0.013	-0.163*	1	
10. Type D Personality Scale	0.111	0.098	0.066	-0.076	0.193**	0.117	-0.194**	-0.185**	0.026	1

*p < 0.05, **p < 0.01

Table 4: Mediator role of type D personality in the relationship between medication self-efficacy and self-management

	Result variable			
	Type D Personality		Diabetes Medication Self-Efficacy	
	β	SE	β	SE
Diabetes Self-Management (c way)			-0.163*	0.069
R^2			0.027	
Diabetes Self-Management (a way)	-0.185**	0.073		
R^2	0.034			
Diabetes Self-Management (c' way)			-0.164***	0.070
Type D Personality (b way)			-0.004****	0.074
R^2			0.027	
Indirect effect			**-0.001 (-0.028 - 0.034)*****	

β: Standardized path coefficients, CI: confidence interval, SE: Standart error, *p=0.019, **p=0.013, ***p=0.021, ****p=0.945 *****p=0.945

tes self-management had an effect on TDPS (β= -0.185, p=0.013) and the regression coefficient was 0.034. In other words, the rate of diabetes self-management explaining type D personality was 3.4%. In individuals with type D personality, an increase in diabetes self-management by one unit decreased the type D personality by 0.185 units. In our study, it was determined that there was no mediating effect of type D personality (β= -0.001, p=0.945) in the relationship between medication self-efficacy and diabetes self-management in individuals with type D personalities (Table 4, Figure 1).

DISCUSSION

Diabetes mellitus is a chronic disease that imposes a significant burden of self-management on affected individuals and families (1,22,23). Most of the literature on emotions in diabetes focuses on negative emotional states such as irritability and anger (8). In this context, it was aimed to determine the type D personality traits of individuals with T2DM, the relationship between medication self-efficacy and self-management in these individuals, and the role of type D personalities in this relationship.

Our findings showed that more than half (64.4%) of the individuals participating in the study had type D personalities. Li et al. (10) and Spek et al. (15) determined that 27% of individuals with T2DM had type D personalities. We think that negative emotions and situations such as difficulty accepting the disease, feeling angry, and having difficulty coping are reflected in the personality characteristics of individuals with diabetes. Although we do not know the personality status of individuals before diabetes, we think that diabetes negatively affects personality traits and increases the tendency to type D personality.

In our study, it was revealed that all individuals, regardless of whether they had type D personalities, had good medication self-efficacy and their self-management was average. In addition, it was determined that medication self-efficacy and self-management of individuals with type D personalities were related. Although studies evaluating drug use self-efficacy for patients with diabetes are limited in the literature, patients have been evaluated regarding diabetes drug literacy and drug treatment knowledge. Liu et al. (23) determined that the rate of patients with T2DM experiencing medication noncompliance was 24.1% and only 22.1% had high medication compliance. Additionally, it was determined that there was a significant and positive relationship between self-efficacy and medication literacy, and that self-efficacy partially mediated the relationship between medication knowledge and medication compliance in patients with T2DM (23). Krzemińska et al. (24) reported that 52.47% of individuals had low compliance with treatment, 39.2% had moderate compliance, and only 8.33% had high compliance. Kang and Hur (25) determined that the most important factor in self-efficacy was medication compliance. Jiang et al. (26) found that self-efficacy had a direct contributing and mediating role in shaping diabetes self-management behaviors. Yao et al. (27) determined that self-efficacy in diabetes management was associated with self-management behaviors among individuals. Unlike the literature, it is thought that the reason for the negative relationship between diabetes self-management and medication use self-efficacy in our study is that individuals' medication use competencies are already high, that is, the result of one-on-one training by the diabetes education nurses from the moment diabetes is diagnosed. In addition, we think that because the patients' diabetes self-management

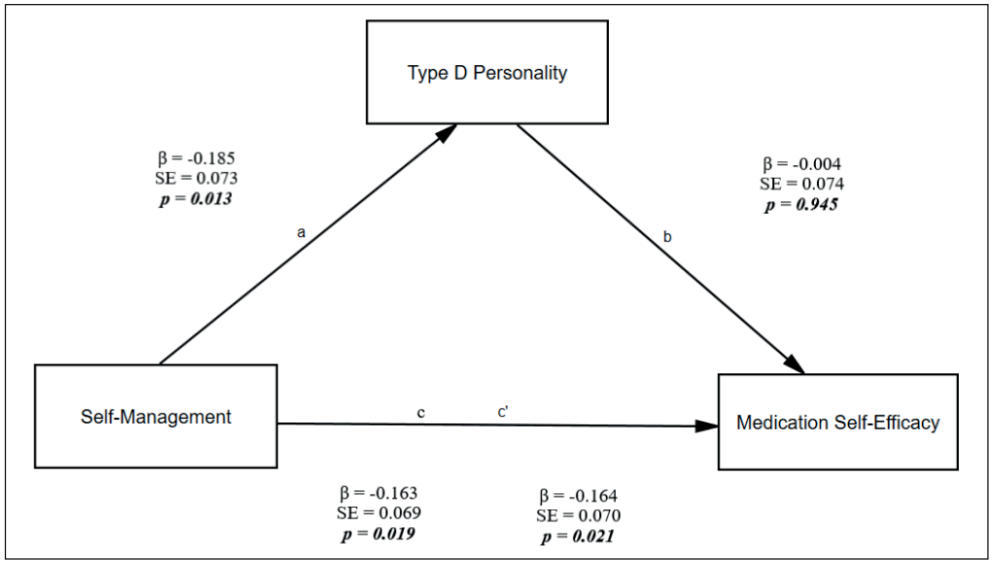

Figure 1. Mediator role of type D personality in the relationship between medication self-efficacy and self-management (n=212)

is average, they assume that their diabetes management is sufficient only when they use their medications regularly, and therefore they postpone self-management and self-care from time to time. Self-care behaviors should be developed, non-pharmacologic methods (28) should be taught, and clinical strategies should be implemented so that individuals with diabetes attach importance to their self-management as well as self-efficacy in drug use.

Huang et al. (22) showed that neuroticism, social support, and self-efficacy had direct or indirect effects on medication adherence in individuals with T2DM, and emphasized that healthcare providers should develop comprehensive intervention programs based on neuroticism, social support, and self-efficacy to improve medication adherence in patients with T2DM. Huang et al. (22) used the Neurotic Personality Questionnaire, but we used the TDPS in our study. In addition, although the variables in our study were similar, the measurement tools and results used varied. In our study, it was determined that type D personality was not related to medication self-efficacy. Regardless of the personality type, it is known that symptoms will not decrease and the disease will worsen without the use of medication in individuals with diabetes. For this reason, type D personality is not related to medication self-efficacy because individuals with diabetes accept the use of drugs for life.

As a result, in our study, it was determined that the relationship between drug use self-efficacy and diabetes self-management in individuals with type D personality was negative and weak, and that type D personality had no mediating effect on this relationship. A remarkable result was that individuals with diabetes had high self-efficacy in drug use, regardless of their personality type. At the same time, it was found that diabetes self-methods were at a moderate level. Interventions to increase patients' diabetes self-management should be planned and patients should be educated. It is recommended to conduct studies with different personality types because type D personality has no mediating effect on the relationship between drug use self-efficacy and diabetes self-management in individuals with type D personality.

This research cannot be generalized to the general population because it was conducted in only one region of Turkey. Study data are presented based on patient self-reports. The fact that the reliability coefficients of the two scales used in the study (Diabetes Medication Self-Efficacy Scale and Diabetes Self-Management Questionnaire) were lower than the Turkish adaptation also limits this study.

Acknowledgement
We thank, which conducted, and all participants in the present study for their generous cooperation.

Author's Contributions
Conceptualization, methodology, investigation, data curation, formal analysis, writing – original draft, Writing –review & editing, supervision: **Fatma Zehra Genç, Arzu Uslu.**

Conflict of Interest
The authors have no conflicts to report.

Financial Disclosure
There were no specific funding sources for this study

Ethical Approve and Informed Consent
The study was approved by Harran University Clinical Research Ethics Committee (HRU/22.19.29), and necessary permissions were obtained from the institution where the research was conducted. Written informed consent was obtained from the participants and permission was obtained from the developers of the scale via e-mail.

Peer Review Process
Extremely peer-reviewed and accepted.

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