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Quantitative Research Article

Effects of Realistic Acceptance Enhancing Program on Self-Care Behaviors and Foot Health in Patients with Type 2 Diabetes in Thailand

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Abstract

Background/Problem: Diabetic foot ulcers (DFUs) are a common and preventable complication among individuals with type 2 Diabetes Mellitus (T2DM), often leading to lower limb amputation. Promoting effective self-care behaviors is crucial in minimizing the risk of DFUs.
Objective/Purpose: The aims of this study were to design and evaluate a 12-week realistic acceptance enhancing (RAE) program in improving self-care behaviors and foot health in adults with T2DM in Thailand.
Design and Methodology: A randomized controlled trial was conducted with 96 participants randomly assigned to either the experimental or control group (n = 48 per group). This program was developed based on the theory of self-care of chronic illness integrated with acceptance and commitment concepts. Research instruments included the self-care of diabetes inventory, the self-care evaluation instrument to prevent diabetic foot, Thai visual analogue scale-foot and ankle, and foot health status form.
Results: The results demonstrated significant improvements in the experimental group's self-care behaviors and foot health status at Weeks 8 and 12 ($p \leq .001$), compared to the control group. No significant differences were found in pedal pulses and protective sensation.
Conclusion and Implications: This health promotion initiative integrating realistic acceptance could foster psychological flexibility and value-based actions, thereby enhance self-care behavior engagement and sustain long-term foot health outcomes. Nurses and health care providers can use this program to improve adherence to self-care behaviors and promote better foot health.

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Diabetes mellitus (DM) is a major global health issue, with current estimates showing 589 million adults living with diabetes in 2024 (International Diabetes Federation, 2025). Uncontrolled DM contributes to severe complications such as nephropathy, cardiovascular disease, retinopathy, and neuropathy, with approximately 47% of individuals at risk for diabetic foot ulcers (DFUs) potentially leading to amputations (Tang et al., 2024). Persistent hyperglycemia and inadequate foot self-care are key contributors to DFUs (Amini et al., 2023; Chen & Wu, 2023). Although consistent DM and foot care are essential, individuals with type 2 diabetes (T2DM)—especially those at low DFU risk, often prioritize glucose control and neglect foot health, resulting in poor practices and underestimated risks.

Effective self-care requires sustained physical, emotional, and mental effort, which many find difficult due to stress, lifestyle changes, and limited motivation (Eva et al., 2018; Schmitt et al., 2014). Educational efforts alone often fail to maintain behavioral change beyond 8 weeks due to diabetes-related distress (Goodall et al., 2020; Madit et al., 2024). To promote long-term self-care, nursing interventions should include behavioral and psychological strategies (Astasio-Picado et al., 2021). However, such integrated approaches are currently lacking in Thailand.

The integration of the self-care of chronic illness (SCC) theory (Riegel et al., 2012) with acceptance and commitment therapy (ACT) (Hayes et al., 2011; 2012) provides a comprehensive framework for enhancing foot self-care among individuals with T2DM. While SCC theory structures the processes of self-care maintenance, monitoring, and management, ACT complements help to promote psychological flexibility and relieve diabetes-related distress that often undermines sustained behavioral change. To address this gap, the present study introduces a realistic acceptance enhancing (RAE) program that integrates these two theoretical perspectives into a unified nursing intervention. This program is designed to strengthen foot self-care behaviors, reduce psychological barriers, and ultimately contribute to the prevention of diabetic foot complications. This study aimed to examine how the RAE program affects self-care behaviors and foot health status among Thai adults with T2DM at low risk for DFUs.

Literature Review

This section synthesizes previous research that illustrates how diverse interventions, including the reduction of psychological barriers, psychological flexibility enhancement, and educational and skills-based training, have contributed to improved self-care behaviors and foot health in individuals with type 2 diabetes.

The Context of Thailand

Self-care behaviors in people with T2DM include dietary control, exercise, stress management, medication adherence, and foot care, all of which are essential for maintaining optimal glycemic control (Jerawatana et al., 2021). Thai adults with T2DM classified as low-risk for diabetic foot ulceration (DFU) often perceive minimal threat from their condition, leading to premature discontinuation of essential self-care and foot care practices, which subsequently increases their risk of developing complications (Jerawatana et al., 2021). This challenge is further compounded by deeply rooted cultural beliefs within Thai Buddhist society, which feet are traditionally considered unclean and direct contact with them is discouraged, creating significant psychological barriers to proper foot self-care among individuals with diabetes (Khunkaew et al., 2019).

Systematic reviews and empirical studies have shown that effective interventions that combine education with skills practice, delivered individually or in groups and supported by follow-up, can enhance self-care knowledge, promote appropriate practices, increase confidence, and strengthen risk management (Goodall et al., 2020; Riegel et al., 2021). Short-term outcomes are typically observed within 4 to 8 weeks, while clinical outcomes such as Hemoglobin A1c (HbA1c) levels, foot health status, minor complications, and ulcer prevention require longer follow-up periods ranging from 3 months to 2 years (Goodall et al., 2020). Although these programs improve self-care behaviors, adherence often declines after 12 weeks, emphasizing the need for psychological strategies to sustain long-term behavior change (Al-Hammouri & Aldalaykeh, 2020).

While traditional educational approaches have shown initial success, emerging evidence suggests that incorporating psychological flexibility concepts and acceptance-based interventions may be crucial for achieving long-term self-care maintenance and optimal foot health outcomes, particularly among individuals at low risk for diabetic foot ulcers who often underestimate their need for preventive care. In the present study, the developed program was based on SCC (Riegel et al., 2012), focusing on the process of self-care behaviors among individuals with chronic illness and ACT (Hayes et al., 2011; 2012) which grounded in psychological flexibility theory, encompassing acceptance, cognitive defusion, being present, values clarification, and committed action. Therefore, the investigators expected that the developed intervention program in this study would benefit participants' inner strength, such as emotional resilience, leading to positive outcomes in sustainable self-care behaviors.

Theoretical Background

The theoretical background of this study was based on the SCC and the ACT concepts. SCC focuses on the maintenance, monitoring, and management of health behaviors in individuals with type 2 diabetes mellitus (Riegel et al., 2012). The theory emphasizes creating a strong sense of effective self-care activities

through interaction between nurses and patients. To enhance these behaviors, acceptance and commitment therapy (ACT) is integrated to promote psychological flexibility through being present and value-driven actions (Hayes et al., 2011; 2012).

In this context, despite emotional distress or asymptomatic progression, psychological flexibility strategies entail diabetes acceptance through mindful self-monitoring and adaptive health choices, while commitment mechanisms promote value-based actions that sustain self-care. Thus, the combination of SCC's practical framework with ACT's psychological flexibility mechanisms provides a comprehensive approach to strengthening diabetes self-management and reducing diabetic foot ulcer risk. Developing nursing interventions that incorporate realistic acceptance, acknowledge internal experiences, and build emotional resilience is critical for sustaining self-care behaviors (Dochat et al., 2021; Hayes et al., 2012; Sakamoto et al., 2022). ACT supports patients in accepting challenges, staying present, and committing to meaningful self-care, which improves both mental and physical outcomes, and enhances self-care confidence (Dochat et al., 2021). Integrating ACT with foot care education is, therefore, key to strengthening diabetes self-management and reducing DFU risk.

Research Variables

The independent variable in this study was the realistic acceptance enhancing (RAE) program. While the dependent variables included self-care behaviors and foot health status in patients with type 2 diabetes mellitus who participated in the study.

Research Hypotheses

H1: Adults with T2DM who participate in a RAE program will demonstrate a statistically significant improvement in self-care behaviors and foot health status from baseline to post intervention assessment.

H2: Adults with T2DM who participate in a RAE program will demonstrate a statistically significant improvement in self-care behaviors and foot health status, as compared to those who do not participate in the program.

H3: Adults with T2DM who participate in a RAE program will have no more escalations in DFU severity than those who do not participate in the program.

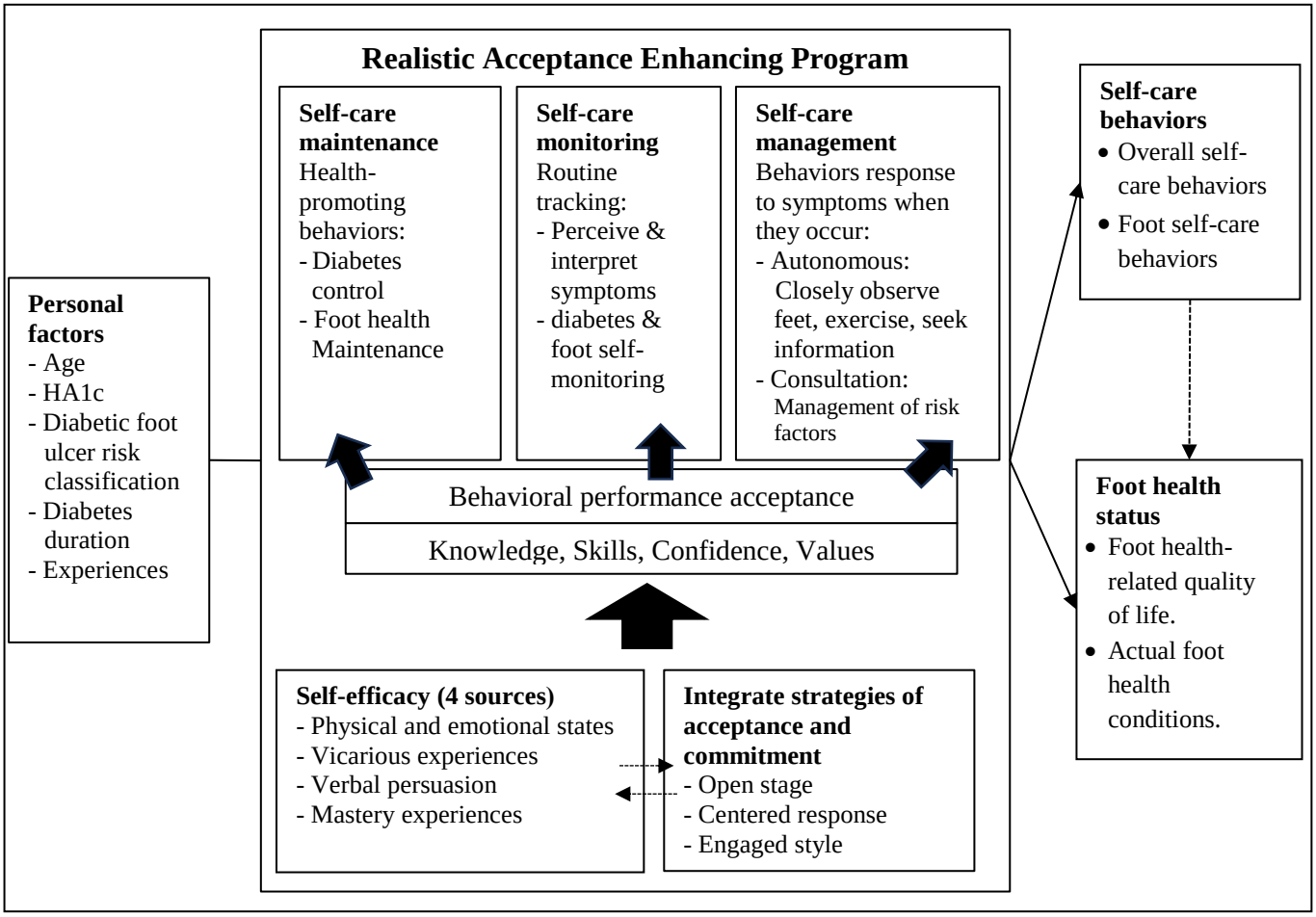
Conceptual Framework

The conceptual framework of this study is developed based on the SCC theory (Riegel et al., 2012) integrated with ACT principles (Hayes et al., 2011; 2012). According to the SCC theory, individuals with chronic illness engage in self-care through personal decision-making influenced by factors such as knowledge, skills, confidence, and values, which are based on personal factors such as age, DFUs risks, diabetes duration, Hemoglobin A1c, and experiences. Multiple activities in the RAE program begin with fostering inner psychological strength and acceptance of diabetes, aiming to prepare participants and support goal-setting for realistic self-care behaviors aligned with personally chosen life values. These activities are grounded in the core concepts of ACT and further draw on the application of ACT in chronic illness contexts by Al-Hammouri and Aldalaykeh's (2020), which emphasizes three key components: openness, central response, and engaged style. Based on this modified scheme model, these components are interconnected with the four sources of self-efficacy. Together, they create a psychological process that encourages value-driven actions, enhances confidence, and supports successful self-care behavior implementation.

The RAE program enhances self-care through confidence-building and acceptance strategies, including nurse-patient interactions, peer support, role modeling, and individualized strategy sharing (Riegel et al., 2012; 2019). Implementation occurs via education, demonstration, skill training, behavioral encouragement, and multi-channel feedback within a continuous, iterative cycle encompassing three core components: maintenance, monitoring, and management. Enhanced maintenance skills improve monitoring capabilities and symptom management, while effective management strengthens monitoring commitment and integrates new strategies into routine maintenance, creating a continuous care cycle that improves self-care behaviors and foot health outcomes. The study's conceptual framework is presented in Figure 1.

Figure 1

Proposed Conceptual Framework



Method

Research Design

This study conducted a randomized controlled trial with a repeated measures design and followed the guidelines in the Consolidated Standards of Reporting Trials (CONSORT) statement (Schulz et al., 2010).

Research Setting

This study was conducted at the diabetes center of excellence at a university hospital in a province in the central region of Thailand, with data collected from March to July 2024

Participants

This study targeted Thai adults aged 30 to 69 years with type 2 diabetes mellitus diagnosed by an endocrinologist using foot assessments and ankle-brachial index criteria as per the international working group on the diabetic foot guidelines 2023 (IWGDF, 2023, as cited in Schaper et al., 2024). Eligible participants were those registered at the diabetes center of excellence who met several criteria: both males and females, short portable mental status questionnaire (SPMSQ) scores of at least 8, patient health questionnaire-9 (9Q) scores of at least 7, literacy in Thai, and the ability to use mobile applications such as LINE. Exclusion criteria included severe complications, such as diabetic crises, stroke, or end-stage kidney disease, and conditions such as organic brain injury or mental disorders that impaired self-care.

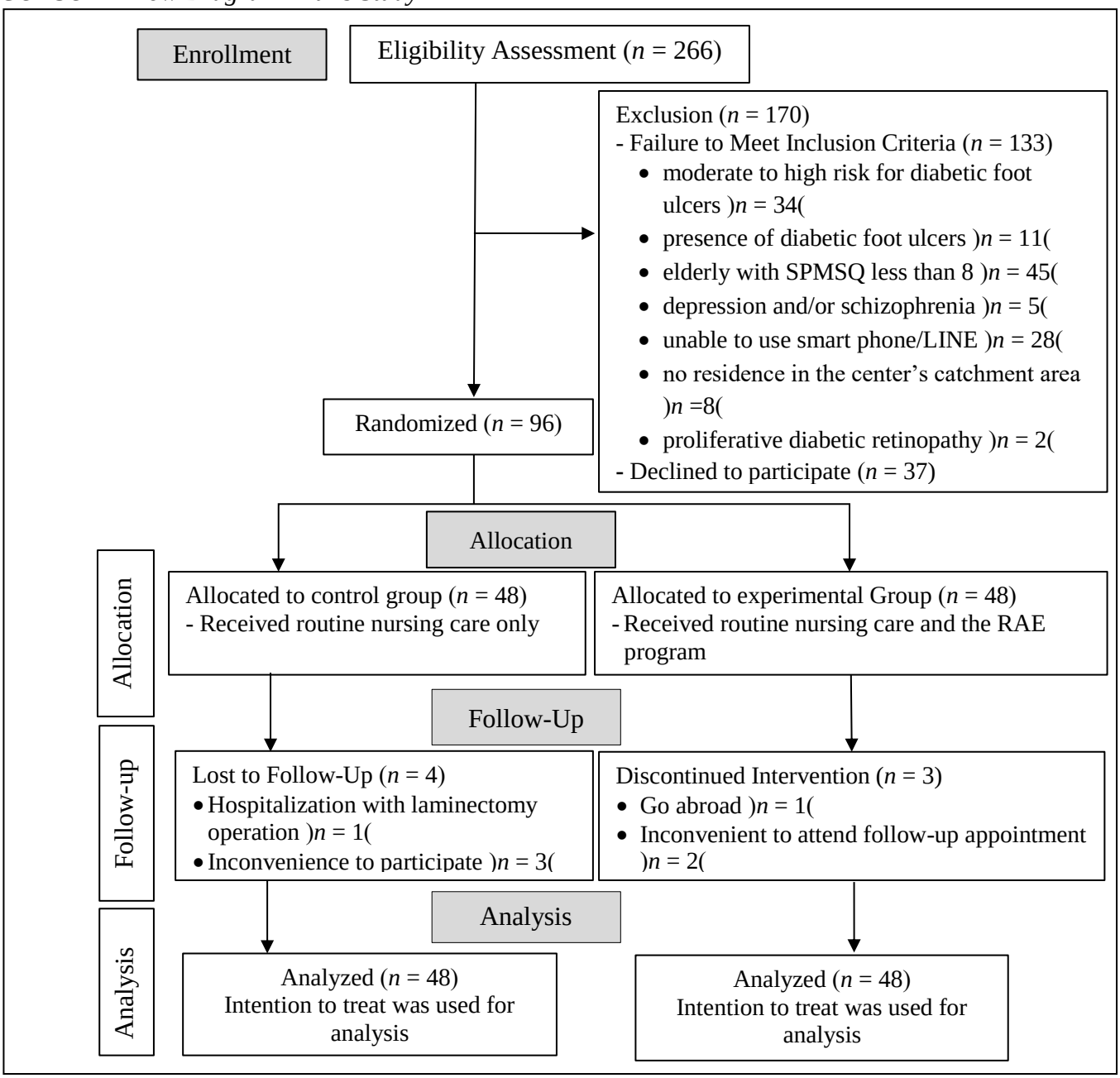
Sampling and Procedures

The sample size was determined using a medium effect size (Cohen's $f = .35$) from a prior study on podiatric care in diabetes patients (Chuepan, 2016; Srisatidnarakul, 2012). Using G*Power 3.1.9.2 with

multivariate analysis of variance (MANOVA), power of .8, alpha of .05, and 3 repetitions, the required sample was 82. To account for a 15% attrition rate, the final sample size was adjusted to 96 (48 per group) (Grove & Gray, 2022). Participants were randomly assigned using stratified block randomization, matched by age (30–59, 60–69 years) and DFUs risk level (very low, low risk) in a 1:1 ratio. This method helped control extraneous variables based on literature and the study context. The study adhered to CONSORT guidelines (Schulz et al., 2010), and the flow diagram outlined four phases: enrollment, allocation, follow-up, and analysis, as shown in Figure 2.

Figure 2

CONSORT Flow Diagram in this Study



Instruments

Outcome Measures

The self-care behavior outcomes were collected at baseline (week 0), week 8, and week 12. Two blinded outcome assessors evaluated overall diabetes self-care behaviors by using the self-care of diabetes

inventory, along with foot self-care behaviors by using the self-care evaluation instrument to prevent diabetic foot through face-to-face assessments. The foot health status outcomes were collected at baseline and week 12 by the outcome assessors through face-to-face assessments as well. The Thai visual analogue scale-foot and ankle was used to assess the quality of life related to foot function, while the foot health status form was used to evaluate the actual foot conditions. Participants were blinded to group assignment and informed of the study's purpose and procedures. Results were shared after the study, and the control group was later offered the RAE program at a convenient time. To minimize bias, data collection and interventions were conducted separately from the control group in private settings and on different clinic days.

Self-Care of Diabetes Inventory (SCODI). The SCODI in the Thai version, adapted from Madit et al (2024), evaluates overall self-care behaviors which are composed of self-care maintenance, monitoring, management, and self-efficacy across 40 items on a 5-point Likert scale. Scores are scaled to 100, with higher scores reflecting better self-care; the Thai version showed strong validity (CVI = .93) and reliability (Cronbach's alpha of .84).

Self-Care Evaluation Instrument to Prevent Diabetic Foot (ISPDF). The ISPDF, developed by Guerra and Arellanos (2022), measures foot self-care behaviors across 26 items, including maintenance, monitoring (with and without symptoms), and management. ISPDF was translated into Thai by the researcher with permission from the original authors, using a standard process of forward translation by two experts (a healthcare professional and a language specialist), back-translation by two English language experts unfamiliar with the content, and final review by the original authors to ensure accuracy and cultural relevance. The ISPDF demonstrated strong reliability, with a Cronbach's alpha of .86.

Thai Visual Analogue Scale – Foot and Ankle (TH VAS-FA). The scale TH VAS-FA was adapted from the *short form*-36 domains and translated into Thai by Angthong et al. (2011). This instrument assesses self-reported foot health in terms of pain, function, and discomfort using a 0–100 mm scale, with higher scores indicating better perceived foot health. It comprises 20 items and has demonstrated excellent test-retest reliability (r = .95, p = .00)

Foot Health Status Form (FHSF). The actual foot health conditions were assessed using FHSF, developed by the present researcher based on prior literature. The FHSF evaluates objective foot health across four dimensions: skin condition, toenail health, sensory function (assessed via the monofilament test), and pedal pulse strength. Each dimension is scored dichotomously as 0 (abnormal) or 1 (normal), yielding a maximum possible score of 20, with higher scores indicating better foot health. This instrument was utilized over a three-month period to monitor changes in modifiable risk factors associated with diabetic foot ulcers (DFUs). The FHSF demonstrated high reliability, with an intraclass correlation coefficient (ICC) of .93 (p = .00).

Procedure

RAE intervention

The 12-week RAE program comprised six sessions delivered over two weeks with subsequent six-week follow-up support. Sessions 1-3 emphasized acceptance, emotional resilience, and SMART goal-setting through interactive group learning, while Sessions 4-5 provided practical self-care training and practice reinforcement, followed by weekly motivational follow-ups via phone or video calls to sustain motivation. Educational materials included a foot care manual, logbook and tracking forms with content validated by experts to ensure relevance and accuracy. A comprehensive overview of the activity timeline is provided in Table 1.

Intervention Group

The RAE program was implemented for the experimental group (EG) alongside standard care. Intensive sessions were conducted in the first two weeks, followed by home-based self-care from weeks

3 to 7 using a guided manual. Weekly progress was tracked in a logbook with small group discussions at week 8 to evaluate progress and address barriers. Follow-up support was provided via phone or LINE.

Table 1
Details of the RAE program

Week/Session	Strategies according to the theories (SCC & ACT)	Activities
Week 1		
Session 1: Open mind – open stage to increase diabetes acceptance.	Cognitive defusion and acceptance Emotional state of self-efficacy linking with centered response (being present and self as context)	Participants express thought and feelings about their self-care experiences. Teaching unhooking exercise through metaphors; prioritizing problems, and distinguishing between helpful and unhelpful actions.
Session 2: Providing intensive knowledge for performance acceptance.	Knowledge transfer Nurse and patient interaction	Teaching knowledge about T2DM for controlling blood glucose level and foot self-care Small groups discussion and sharing experiences
Session 3: Identifying health values and commitment to action.	Engaged style (identify values and committed action)	The investigator let the participants setting their goals of their performance
Week 2		
Session 4: Enhancing self-care confidence and hands-on skill training	Mastery experiences	Supporting and discussion regarding success at self-care skills
	Vicarious experiences	Offering successful model to present and demonstrate effective self-care actions
	Verbal persuasion physiological and emotional states	- Encouraging and supporting patients - Addressing physical and emotional barriers affecting patients' confidence and helping them reframe symptoms and emotions
Session 5: Promoting self-care practices continuously	Self-care maintenance	Providing participants with a diabetic foot self-care manual that offered essential information on maintenance HbA1C and foot health
	Self-care monitoring	Demonstrating for foot self-examination for abnormal signs and symptoms
	Self-care management	Coaching participants how to manage symptoms autonomously or through consultation when symptoms occur.
Week 3,4,5,7,9,11		
Session 6: Monitoring performance and evaluation	Monitoring performance and evaluation	Small group discussion and reflection self-care activities, success, barriers which accord to evaluate goal setting and action plans with recording into telephone tracking record form

Control Group

The control group (CG) received standard diabetic care, including routine nursing services such as basic foot exams, diabetes self-care education, monofilament testing for sensation loss, peripheral arterial

disease (PAD) screening, nail trimming, callus removal, and referral to physicians if needed. Self-care behaviors and foot health were assessed at the same timepoints as the intervention group.

Statistical Method

Baseline data collection occurred right after participants' eligibility was determined and consent signed; data were gathered on participants' characteristics, self-care behaviors, and foot conditions. The participants completed the SCODI, and ISPDF after completion of all intervention sessions at 8-week follow up. Lastly, at week 12, the SCODI, ISPDF, TH VAS-FA, and FHSF were performed to collect all data composed of self-care behaviors and foot health conditions.

Data Analysis

Statistical analysis was performed using SPSS (Version 21.0) (SPSS Inc., Chicago, IL, USA), with missing data addressed through intention-to-treat (ITT) analysis using the expectation-maximization (EM) algorithm. Descriptive statistics summarized participant data, while chi-square, Fisher's exact test, t-test, and one-way MANOVA assessed group homogeneity for baseline equivalence. Repeated measures MANOVA evaluated the RAE program's effects on self-care behaviors, and one-way MANOVA assessed foot health outcomes. Assumptions, including multivariate normality, linearity, homogeneity of variances, equality of variance-covariance matrices, compound symmetry, and homoscedasticity, were thoroughly tested. For all analyses, the level of significance was set at $p < 0.05$.

Ethical Considerations

This study adhered to established ethical principles for research. The researcher implemented comprehensive protection measures: (1) providing detailed study information to all participants prior to obtaining written informed consent or thumbprint authorization; (2) ensuring voluntary participation through explicit demonstration of willingness to engage; (3) maintaining strict data confidentiality with anonymous presentation of aggregated results only; and (4) implementing immediate session termination protocols with endocrinological consultation if participants experienced serious diabetes-related conditions, dangerous complications, or acute diabetic emergencies during participation

Results

Sample Characteristics

Participants were classified into very low-risk (91.7%) and low-risk (8.3%) DFU groups, with age evenly distributed between 30–59 and 60–69 years. The mean age was 57.34 years, with a mean HbA1C of 8.28%, diabetes duration of 9.44 years, and BMI of 24.77 kg/m². Most participants were females (54.2%), married (77.1%), non-smokers (77.1%), and had stopped drinking alcohol (58.3%), as detailed in Table 2.

Descriptive Results

MANOVA analysis confirmed no significant baseline differences between experimental and control groups across all self-care variables (SC1-SC4), foot self-care measures (FSC1-FSC3), foot health (FH), and foot conditions (FC) ($p > 0.05$) (Table 4).

Hypotheses Testing Results

Self-Care Behaviors. Table 3 shows that Repeated Measure MANOVA revealed significant differences in the mean scores for self-care and foot self-care behaviors between groups [Pillai's Trace = .73, $p \leq .001$]. All variables also showed significant changes over time [Pillai's Trace = .90, $p \leq .001$], with notable interaction effects between group and time [Pillai's Trace = .79, $p \leq .001$].

Table 2

Demographic Characteristics and Health History Data

Sociodemographic and Health History Data	Total (N = 96)	Experimental Group (n = 48)	Control Group (n = 48)	p-value
Gender: Female *n* (%)	51 (53.10%)	25 (52.10%)	26 (54.20%)	.84[a]
Age (years), M (SD)	57.34 (9.62)	57.38 (8.99)	57.31 (10.29)	.98[d]
- 30-59 years	34 (35.40)	17 (35.40)	17 (35.40)	1.00[a]
- 60-69 years	62 (64.60)	31 (64.60)	31 (64.60)	
DM Duration (years), M (SD)	9.44 (3.44)	9.35 (2.70)	9.52 (4.07)	.81[d]
HbA1C Level, M (SD)	8.28 (1.47)	8.24 (1.53)	8.31 (1.42)	.79[d]
Marital Status *n* (%)				
- Single	12 (12.50)	5 (10.40)	7 (14.60)	.82[a]
- Married/Committed	74 (77.10)	38 (79.20)	36 (75.00)	
- Divorced	10 (10.40)	5 (10.40)	5 (10.40)	
BMI, M (SD)	24.77 (3.73)	24.96 (4.20)	24.59 (3.23)	.63[d]
Alcohol Use *n* (%)				
- No	56 (58.30)	29 (60.40)	27 (56.30)	.68[a]
- Yes	40 (41.70)	19 (39.60)	21 (43.80)	
Smoking Status *n* (%)				
- No	74 (77.10)	38 (79.20)	36 (75.00)	.63[a]
- Yes	22 (22.90)	10 (20.80)	12 (25.00)	
Risk of DFU *n* (%)				
- Very Low Risk	88 (91.70)	44 (91.70)	44 (91.70)	1.00[b]
- Low Risk	8 (8.30)	4 (8.30)	4 (8.30)	

Note. [a] = Pearson's chi-squared test (X^2), [b] = Fisher's exact test, [c] = likelihood ratio chi square, [d] = independent sample *t*-test, *M* = mean, *SD* = standard deviation.

Table 3

Repeated Measures MANOVA of Mean Scores of Self-Care Behavioral Scores, Disaggregated by Group and Time Periods

Variance	Pillai's Trace	*F*	Hypothesis *df*	Error *df*	*p*-value	Partial Eta Squared
Between Subjects						
Intercept	.99	24457.38	7	88	.00	.99
Group	.73	33.57***	7	88	.00	.73
Within Subjects						
Time	.90	53.81***	14	81	.00	.90
Time*Group	.79	21.84***	14	81	.00	.79

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Post-hoc analyses demonstrated comparable baseline scores between groups, with the EG achieving significant improvements across all behavioral variables from baseline to weeks 8 and 12 ($p < .001$), peaking at week 12. The CG showed transient week 8 improvements followed by significant deterioration, while the EG maintained superior and sustained behavioral enhancements throughout the study period (Table 4, Figure 3).

Table 4

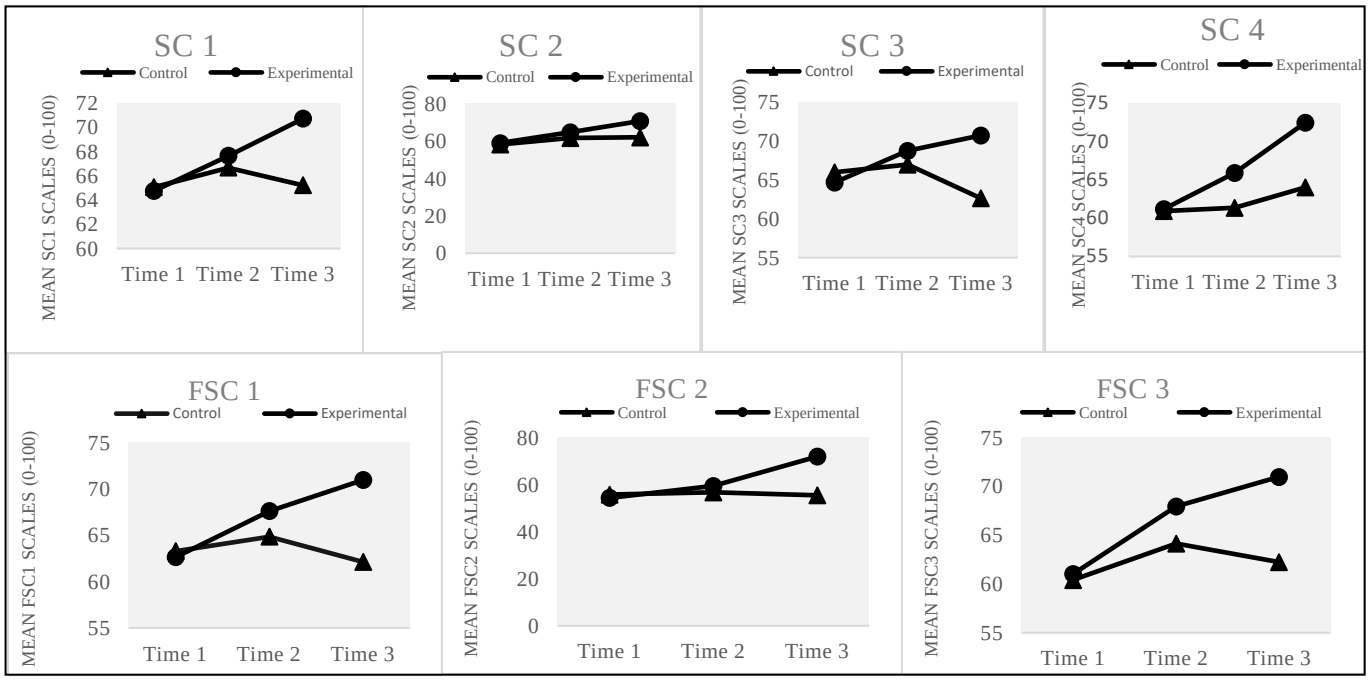
Post Hoc Comparison of Mean Scores of Self-Care Behaviors at Different Periods by Time and Group.

Variables/Time	Between Groups		Within Group (Post Hoc)	
	Group	Mean ± SD	Mean Difference	
			Week 8	Week 12
SC1				
Baseline	EG	64.75 ± 3.46	–2.89***	–5.97***
	CG	65.06 ± 3.77	–1.60**	–
Week 8	EG	67.64 ± 3.48	–	–3.08***
	CG	66.66 ± 2.50	–	1.46**
Week 12	EG	70.72 ± 2.65	–	–
	CG	65.21 ± 2.77	–	–
SC2				
Baseline	EG	59.00 ± 4.59	–5.70***	–12.30***
	CG	58.20 ± 4.73	–3.49***	–3.85***
Week 8	EG	64.70 ± 3.54	–	–
	CG	61.70 ± 3.56	–	–
Week 12	EG	71.30 ± 4.55	6.60**	–
	CG	62.06 ± 3.94	–	–
SC3				
Baseline	EG	64.67 ± 3.77	–4.08***	–6.30***
	CG	65.97 ± 3.93	–	3.34***
Week 8	EG	68.75 ± 3.75	–	–
	CG	66.97 ± 3.00	–	4.34***
Week 12	EG	70.97 ± 4.12	2.22**	–
	CG	62.63 ± 3.75	–	–
SC4				
Baseline	EG	61.20 ± 3.91	–4.70***	–11.28***
	CG	60.92 ± 4.39	–	–.10***
Week 8	EG	65.90 ± 2.73	–	–6.58***
	CG	61.34 ± 2.75	–	–2.69***
Week 12	EG	72.48 ± 3.15	–	–
	CG	64.02 ± 3.25	–	–
FSC1				
Baseline	EG	62.23 ± 4.73	–5.37***	–7.51***
	CG	63.28 ± 5.16	–	–
Week 8	EG	67.60 ± 3.25	–	–2.14***
	CG	64.84 ± 3.27	–	2.72***
Week 12	EG	69.74 ± 3.35	–	–
	CG	62.12 ± 3.30	–	–
FSC2				
Baseline	EG	54.33 ± 3.70	–5.12***	–17.55***
	CG	55.79 ± 4.90	–	–
Week 8	EG	59.45 ± 3.61	–	–12.43***
	CG	56.70 ± 3.54	–	–
Week 12	EG	71.88 ± 3.97	–	–
	CG	55.43 ± 4.13	–	–
FSC3				
Baseline	EG	61.01 ± 5.70	–6.92***	–11.39***
	CG	60.41 ± 5.30	–3.72**	–
Week 8	EG	67.93 ± 4.74	–	–4.47***
	CG	64.13 ± 4.65	–	1.91**
Week 12	EG	72.39 ± 4.65	–	–
	CG	62.22 ± 4.56	–	–

Note. * $p < .05$. ** $p < .01$. *** $p < .001$; SC1: self-care maintenance; SC2: self-care monitoring; SC3: self-care management; SC4: self-care confidence; FSC1: foot self-care maintenance; FSC2: foot self-care monitoring; FSC3: foot self-care management.

Figure 3

Mean Changes in Self-Care Behaviors and Foot Self-Care Behaviors.



Note. Changes in Mean Score of Self-Care Maintenance (SC1), Monitoring (SC2), Management (SC3), and Confidence (SC4) Between the Two Groups at Baseline, Week 8, and Week 12, Changes in Mean Score of Foot Self-Care Maintenance (FSC1), Monitoring (FSC2), and Management (FSC3**)** Between the Two Groups at Baseline, and Week 12.

Foot Health Status

In order to compare the mean scores on foot health status, which can be divided into foot health-related quality of life (FH) and foot health conditions (FC) between groups. Tables 5 and 6 show that, after 12 weeks the EG showed significant improvements in FH and FC ($p < .001$), while the CG showed decreased FH and minimal FC improvement. Only the EG demonstrated significant improvements in skin and toenail health ($p < .05$), with no DFU progression in either group. These findings suggest the RAE program effectively enhanced foot care and helped prevent DFU escalation.

Table 5

Multivariate Testing for Foot Health Status Variables.

Effect	Pillai's Trace	*F*	Hypothesis *df*	Error *df*	*p*-value	Partial Eta Squared
Intercept	.99	11117.75	4.00	91.00	.00	.99
Group	.50	23.06***	4.00	91.00	.00	.50

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 6

Pairwise Comparisons of Mean Scores for Foot Health and Foot Health Conditions Between Groups at Baseline and After Implementing the RAE Program for 12 Weeks

Times	Variable	Between Groups (Pairwise Comparison)				
		Mean ± SD Control	Mean ± SD Experimental	Mean Difference	SE	Sig.
Baseline	FH	69.90 ± 7.68	70.31 ± 7.61	.42	1.56	.79
	FC	15.79 ± 1.25	15.92 ± 1.32	.13	.26	.64
Week 12	FH	66.71 ± 4.39	71.61 ± 6.07	4.89	1.08	.00***
	FC	16.09 ± 1.09	18.27 ± 1.10	2.18	.22	.00***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$; FH: Foot Health, FC: Foot Conditions.

Discussion and Conclusion

Discussion of Main Results

The study investigated the effects of the RAE program on self-care behaviors and foot health status among Thai adults with T2DM. Regarding H1, adults with T2DM who participate in a RAE program demonstrated a continuous increase in self-care behaviors. The analysis revealed a dose-response relationship, with the largest effect sizes observed between baseline and the 12-week follow-up across all behavioral variables ($p < .001$) and foot health scores ($p < .001$). This suggests that the RAE program's effects were not only immediate but also progressive, with continued improvement throughout the intervention period. In practical terms, this improvement was reflected in higher mean self-care scores in the EG, indicating that participants more consistently engaged in daily activities such as regular foot inspections, medication adherence, and dietary management.

The participants were predominantly female adults of working age (34-68 years). Most had a prolonged diabetes duration (> 10 years). They had lived with T2DM and demonstrated established self-care behaviors independently. These findings are consistent with those reported by Komaratat et al. (2021). Despite the sample exhibiting uncontrolled glycemic status (HbA1C ≥ 7%), which is clinically significant given that levels above 8.0% are associated with increased amputation risk (Sinha & Ghosal, 2021), the RAE program effectively addressed these challenges and supported the maintenance of optimal health. The participants in EG were promoted positive attitudes toward diabetes and aligned self-care activities with participants' personal values, thereby fostering authentic self-care behaviors. This process involved developing inner strength and acceptance of the chronic condition, which proved crucial for sustaining these behaviors long-term (Dochat et al., 2021).

These findings are consistent with previous studies. For example, Karekla et al. (2019) demonstrated that integrating ACT improves self-care in chronic conditions. Sakamoto et al. (2022) found that ACT enhances self-care skills and acceptance in T2DM patients. Sustained improvements in the experimental group support Riegel et al.'s self-care theory, demonstrating successful integration of maintenance, monitoring, and management, as participants shifted from external compliance to autonomous, routine self-management (Riegel et al., 2012, 2019, 2021). Additionally, Spatola et al. (2024) showed that a brief ACT intervention supported lifestyle changes and sustained self-care behaviors in cardiac patients. The RAE program focused on positive psychoeducation. It encouraged participants to accept their diabetes. This approach aligned with other studies by Jaworski et al. (2018) and Marchand et al. (2018). The findings highlighted the benefits of promoting a positive attitude toward illness and emphasized cognitive psychology-based learning. These approaches improved self-care adherence and preventive behaviors.

The H2 was supported, as the post-intervention test scores for self-care behaviors and foot health status differed significantly between the EG and CG ($p < 0.001$). The intervention combined instruction, demonstration, and daily practice of foot inspection with systematic documentation that reinforced knowledge across diabetic foot care dimensions. Interactive strategies such as group discussion, demonstration, and counseling helped participants sustain self-care behaviors, build confidence in detecting and reporting symptoms, and share their experiences with diabetes (Riegel et al., 2012; 2019).

Several previous studies are relevant to the present study. For example, a systematic review found that foot care education programs using various modes such as foot assessment, discussion, counseling, and telephone calls with a follow-up period of at least one month were effective in improving self-care practices among people with T2DM (Oluchi et al., 2023). These findings also align with an 8-week diabetes self-management education program that improved foot self-care behaviors and foot conditions including dirt, dryness, and improper nails (Frisca, 2021).

Additionally, the principal investigator combined group and individual strategies integrating personal experiences accessibility devices and weekly expert feedback sessions supporting participants development of autonomous self-care evaluation and adjustment capabilities which aligns with Astasio-Picado et al. (2021) and Kanan et al. (2023) findings that continuous promotion of self-efficacy through ongoing

reinforcement leads to superior clinical outcomes. These interventions successfully prevented dryness callus formation, corns, and ingrown toenails, which are primary diabetic foot ulceration risk factors, while facilitating comfortable weight-bearing activities and enhanced quality of life.

However, for H3, no statistically significant differences were found in changing in pedal pulses and protective sensations ($p > .05$). Over the 12-week study, no significant neuro-vascular changes were observed between the EG and CG, likely due to the short duration and gradual nature of the changes. Neuro-vascular deterioration in diabetic feet typically results from multiple factors and often requires more than three months to manifest (Nickinson et al., 2020). Additionally, a study by Chin et al. (2018) found that over 30% of participants in Taiwan were unawarpe of peripheral vascular insufficiency symptoms, indicating a lack of awareness in routine self-monitoring.

In conclusion, the data suggests that the RAE program can be an effective intervention to improve self-care abilities, enhance acceptance, and sustain behavioral changes in areas such as self-care maintenance and monitoring. This, in turn, leads to improved foot health status, as reflected in both participants' reported outcomes (FH) and objective foot health measures (FC) among individuals with type 2 diabetes mellitus. However, no significant differences were found in the escalation of DFU severity between the RAE and routine care groups. Both groups maintained similar risk profiles for first-ever DFUs according to the IWGDF guidelines.

Limitations

The three-month duration of this study may have been insufficient to observe long-term outcomes such as the development of diabetic foot ulcers, suggesting the need for extended follow-up in future research to assess sustained risk reduction. This limitation aligns with findings from Yazdanpanah et al. (2024), who conducted a two-year follow-up study and demonstrated that longer observation periods are essential for capturing meaningful clinical outcomes. Additionally, the results are context-specific and may only apply to populations with similar treatment regimens and healthcare settings. Since the participants were individuals with type 2 diabetes at very low to low risk for DFUs, the findings may not be fully generalizable to those with moderate or high risk. Furthermore, because the study was conducted in a single hospital, the external validity of the results may be restricted, thereby limiting their applicability to broader healthcare systems.

Implications for Behavioral Science

The findings support the effectiveness of theoretically integrated interventions that combine evidence-based self-care frameworks with acceptance and commitment approaches, providing a robust foundation for sustainable chronic illness behavioral change programs. For nurses, this implies the need to adopt a structured workflow in clinical practice, such as assessing patients' self-care behaviors, integrating the RAE program into routine education, reinforcing ACT-based strategies during follow-up, and monitoring long-term adherence.

Further Research

Future research should include longer follow-up periods to assess the sustained effects of diabetic foot prevention. Broader studies are needed to confirm outcomes in varied populations and healthcare settings. Including individuals with moderate to high DFU risk will improve generalizability. These steps will strengthen evidence on long-term impact and applicability.

Conclusion

This study aimed to evaluate the effectiveness of a 12-week realistic acceptance enhancing (RAE) program in improving self-care behaviors and foot health in individuals with type 2 diabetes mellitus. The program included educational sessions, skill training, and psychological strategies based on self-care theory and acceptance and commitment concepts. The findings demonstrated significant improvements in self-care behaviors and foot health status in the experimental group, with no risk of diabetic foot ulcers.

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Declarations

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Conflicts of Interest: The authors declare no conflicts of interest.

Ethical Approval Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Human Research Ethics Committee of Thammasat University, (Science), (HREC-TUSc) approved this research proposal for the Human Research Ethics Committee on February 1, 2024, COA No.008/2567. After the research approval by the Human Research Ethics Committee of Thammasat University (Science), (HREC-TUSc), the researcher received permission from Ethical Review Board of Thammasat University Hospital on March 8, 2024 for data collection. This research was registered from the Thai Clinical Trials Registry (TCTR) and approved on November 1, 2023. The ID number of this study was TCTR 202301101001.

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