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The Lived Experience of Patients with Diabetes Mellitus Participating in Rubber Ball Foot Exercise Intervention: A Qualitative Study Using Interpretative Phenomenological Analysis

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ABSTRACT
Diabetes mellitus is a chronic condition that requires comprehensive and long-term management, including non-pharmacological interventions that support patients' quality of life. Rubber ball foot exercise represents a simple, low-cost physical activity designed to enhance peripheral circulation and strengthen lower extremity function. This study aims to explore the lived experiences of individuals with type 2 diabetes mellitus who participated in a structured rubber ball foot exercise intervention. Employing a qualitative approach through Interpretative Phenomenological Analysis (IPA), the study provides an in-depth understanding of participants' perceptions, emotions, and reflections throughout the intervention process. Findings reveal that the exercise not only offers physiological benefits but also fosters self-confidence, hope, and social connectedness, serving as a meaningful space for psychosocial recovery. Despite practical challenges in home implementation such as limited space, family dynamics, and lack of structured reminders participants demonstrated notable adaptive strategies, including visual cues, family involvement, and spatial modifications. These responses highlight the importance of context-sensitive and participatory design in enhancing program adherence and sustainability. From an economic perspective, the intervention's affordability, accessibility, and potential for independent practice underscore its relevance for resource-limited settings. Its integration into national programs such as Prolanis and Posbindu PTM may strengthen primary healthcare systems and promote community engagement in chronic disease prevention. Given its clinical efficacy, social relevance, and cost-efficiency, rubber ball foot exercise holds strategic potential as a sustainable, community-based intervention for non-communicable disease control.

Keywords: Diabetes Mellitus, Rubber Ball Foot Exercise, Patient Experience, Sustainable.

ABSTRAK
Diabetes melitus merupakan penyakit kronis yang memerlukan penatalaksanaan jangka panjang dan berkelanjutan, termasuk intervensi nonfarmakologis yang mendukung kualitas hidup penderita secara holistik. Senam kaki bola kasti merupakan salah satu bentuk aktivitas fisik sederhana yang dirancang untuk meningkatkan sirkulasi perifer dan memperkuat fungsi ekstremitas bawah, dengan keunggulan berupa biaya rendah, kemudahan akses, dan potensi pelaksanaan mandiri di rumah. Penelitian ini bertujuan untuk memahami makna pengalaman penderita diabetes melitus dalam mengikuti intervensi senam kaki bola kasti, serta mengeksplorasi relevansinya dalam konteks keberlanjutan dan efisiensi ekonomi. Studi ini menggunakan pendekatan kualitatif dengan metode Interpretative Phenomenological Analysis (IPA), yang memungkinkan eksplorasi mendalam terhadap persepsi, emosi, dan refleksi partisipan selama menjalani intervensi. Hasil penelitian menunjukkan bahwa aktivitas ini tidak hanya memberikan manfaat fisiologis, tetapi juga membangkitkan rasa percaya diri, harapan, dan keterhubungan sosial, serta menjadi ruang pemulihan yang bermakna bagi peserta. Selain itu, partisipan menunjukkan kapasitas adaptif dalam mengatasi hambatan praktis di lingkungan rumah, yang mencerminkan potensi intervensi ini untuk diadopsi secara luas dalam program pengendalian penyakit kronis berbasis komunitas. Dengan mempertimbangkan efektivitas klinis, relevansi sosial, dan efisiensi biaya, senam kaki bola kasti memiliki nilai strategis sebagai intervensi promotif dan preventif yang berkelanjutan dalam sistem layanan kesehatan primer.

Kata Kunci: Diabetes Melitus, Senam Kaki Bola Kasti, Pengalaman Penderita, Keberlanjutan.

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from impaired insulin secretion, insulin action, or a combination of both (Boulton et al., 2005; Yagihashi et al., 2011). Globally, the prevalence of diabetes mellitus continues to show a significant upward trend. According to the International Diabetes Federation, over 537 million people were living with diabetes in 2021, and this number is projected to rise to 783 million by 2045 (Magliano et al., 2021). In Indonesia, the prevalence of diabetes mellitus has shown a notable upward trend, rising from 10.9% in 2018 to 11.7% in 2023 (Kementerian Kesehatan Republik Indonesia, 2023). This escalation underscores the growing burden of chronic metabolic disorders and highlights diabetes as one of the primary contributors to national morbidity and escalating healthcare costs. The increasing prevalence reflects both lifestyle transitions and systemic challenges in early detection and long-term management, necessitating urgent, context-sensitive public health interventions (Badan Kebijakan Pembangunan Kesehatan, 2023). The rising prevalence underscores the urgency of adopting comprehensive management strategies that integrate curative, promotive, and preventive components especially those rooted in community engagement and contextual relevance.

Chronic complications of diabetes mellitus including peripheral neuropathy and diabetic foot ulcers play a critical role in the incidence of non-traumatic lower extremity amputations, highlighting the need for early preventive and rehabilitative strategies (Yagihashi et al., 2011) (Enders et al., 2023; Salawu et al., 2018). Evidence suggests that diabetic foot ulcers affect between 15–25% of patients with diabetes mellitus over the course of their lives, with nearly 85% of non-traumatic lower limb amputations originating from these ulcers. This underscores the critical need for early detection, preventive care, and community-based rehabilitation strategies (Boulton et al., 2005). Beyond its physical consequences, this condition substantially impairs individuals' overall well-being, reducing their quality of life and limiting their capacity to engage in daily activities and maintain productivity (Savelieff et al., 2025). Accordingly, implementing preventive interventions within community settings is essential to mitigate the risk of diabetes-related complications and to promote greater functional independence among patients.

As a non-pharmacological intervention, diabetic foot exercises have demonstrated efficacy in promoting peripheral circulation, reinforcing lower limb musculature, preserving joint flexibility, and restoring sensory responsiveness and postural stability, key components in preventing complications and supporting functional independence (Enders et al., 2023; Abdurrasyid, Sahar, & Widyatuti, 2020; Cruvinel-Júnior et al., 2025). In addition, this form of exercise has been shown to support glycemic control and enhance peripheral vascular function, as reflected in improved Ankle Brachial Index values (Monteiro et al., 2018; Win et al., 2020). Integrating a rubber ball into diabetic foot exercises introduces a novel proprioceptive stimulus that strengthens neuromuscular coordination and supports postural control. Its affordability, ease of use, and dual educational-recreational appeal render it especially suitable for community-based programs targeting older populations, where simplicity and engagement are key to sustained participation (Abdurrasyid, Sahar, & Widyatuti, 2020).

In Indonesia, quantitative research shows that diabetic foot exercises can lower blood glucose levels and improve foot sensitivity. For example, a study (Qona'ah et al., 2022) reported an average fasting glucose level of 171.60 mg/dL after counseling and training. Meanwhile, the Wilcoxon test showed a significant effect on foot sensitivity (Uba et al., 2025). Additionally, the use of tennis balls in foot exercises reduced blood sugar levels by 5.1% in elderly individuals with T2DM (Abdurrasyid, Sahar, & Widyatuti, 2020). However, despite these positive quantitative results, studies exploring patients' subjective experiences related to foot exercises, particularly with tools like rubber balls, are still very limited.

These research gaps are evident in several aspects. First, qualitative studies using the Interpretative Phenomenological Analysis (IPA) approach to explore patients' lived experiences with foot exercise interventions are still very limited. Second, foot exercise interventions using rubber balls have not been systematically explored in Indonesia, so their effectiveness in the local socio-cultural context is still unknown. Third, patients' perceptions regarding motivation, comfort, barriers, and personal significance of foot exercises are still poorly understood, even tho this understanding is crucial for designing relevant, sustainable, and socially accepted interventions.

The IPA approach allows this study to deeply explore patients' subjective experiences, providing humanistic and participatory insights into how foot exercises affect their daily lives. Thus, this study not only assesses the physical effects of the exercises but also understands the meaning perceived by the patients, their motivation to participate, and the challenges they face in routine practice. The novelty of this study lies in the integration of several elements that have not been simultaneously examined, namely the use of rubber balls as a training tool, application within Indonesian communities, and the IPA methodological approach to capturing patients' subjective experiences.

The contribution of this research is expected to be scientific, providing new evidence about patient experiences and the impact of rubber ball-based foot exercises; practically, it will provide a foundation for designing more inclusive, adaptive, and patient-centered community intervention programs. National programs such as Prolanis and Posbindu PTM can serve as strategic platforms for the application of these findings, strengthening community-based chronic disease management. The results of this study are expected to assist healthcare workers in developing more reflective, contextual, and sustainable interventions, while also strengthening the role of the community in preventing diabetes complications.

RESEARCH METHODS

This study employed a qualitative approach using Interpretative Phenomenological Analysis (IPA) to explore and understand the subjective meanings embedded in the lived experiences of individuals with type 2 diabetes mellitus who participated in a home-based foot exercise intervention using a rubber ball. The IPA method enabled the researcher to interpret the essence of participants' experiences through rich, reflective, and contextually grounded personal narratives, allowing space for deep and individualized meaning-making (Smith & Osborn, 2015). The IPA method adopted in this study is illustrated (Figure 1) to give a birds-eye view of the analysis process (Darley et al., 2025). In IPA research, the position of the researcher greatly determines the interpretation. The researcher in this study is a health program student who actively records self-reflections during data collection and analysis to manage interpretative bias. Assumptions and personal views are limited to keep the interpretation focused on the participants' experiences. This approach allows for a more authentic understanding of the participants' subjective experiences while maintaining transparency and objectivity in the analysis.

This research delves into the in-depth experiences of twelve individuals with type 2 diabetes mellitus (T2DM) who regularly participate in foot exercises using a baseball in the Posbindu PTM and Prolanis communities, located within the working area of the Kebon Jeruk Subdistrict Health Center, West Jakarta. Participants were purposively selected based on their ability to provide rich, reflective, and meaningful insights regarding their experiences with this intervention. Inclusion criteria include: (1) confirmed medical diagnosis of T2DM; (2) age 40 years and above; (3) participation in at least four foot exercise sessions with a rubber ball in the past month; (4) adequate verbal communication skills; and (5) willingness to participate and sign an informed written consent form. Exclusion criteria include communication or cognitive disorders that may hinder interviews, as well as severe complications such as active foot ulcers or amputations that limit physical involvement in training activities.

Through in-depth interviews and participatory observations from June to August 2025, in line with the continuation of the national chronic disease management program, the researchers sought to understand how these simple activities shape meaning, motivation, and transformation in the daily lives of participants. This study emphasises the subjective experiences of participants in the local context, while capturing the social, health, and behavioural dynamics that emerge during their involvement in the community-based program.

To obtain rich and relevant data, purposive sampling was employed selecting participants based on their alignment with the study's objectives and research questions. This technique is commonly used in phenomenological research, where the emphasis lies not on the number of participants but on the depth and richness of insights derived from lived experiences. In addition, a snowball sampling approach was utilized to reach additional participants through referrals from initial informants, particularly those who met the inclusion criteria but were not easily accessible

to the researcher. The number of participants in this study was determined based on the principle of data saturation, defined as the point at which additional interviews no longer yield new information or meaningful variations in interpretation. This principle ensures that the data collected are sufficient to address the research questions in a comprehensive and nuanced manner. This Study was performed approved by the Ethics Review Board of Esa Unggul University. All participants provided informed written consent, ensuring voluntary participation and understanding of the research procedures. Both exercise sessions and interviews were audiotaped with written consent of participants unit. Audio was de-identified via coded IDs and pseudonyms. Written informed consent was obtained from each participant, as an official confirmation of participation in the study.

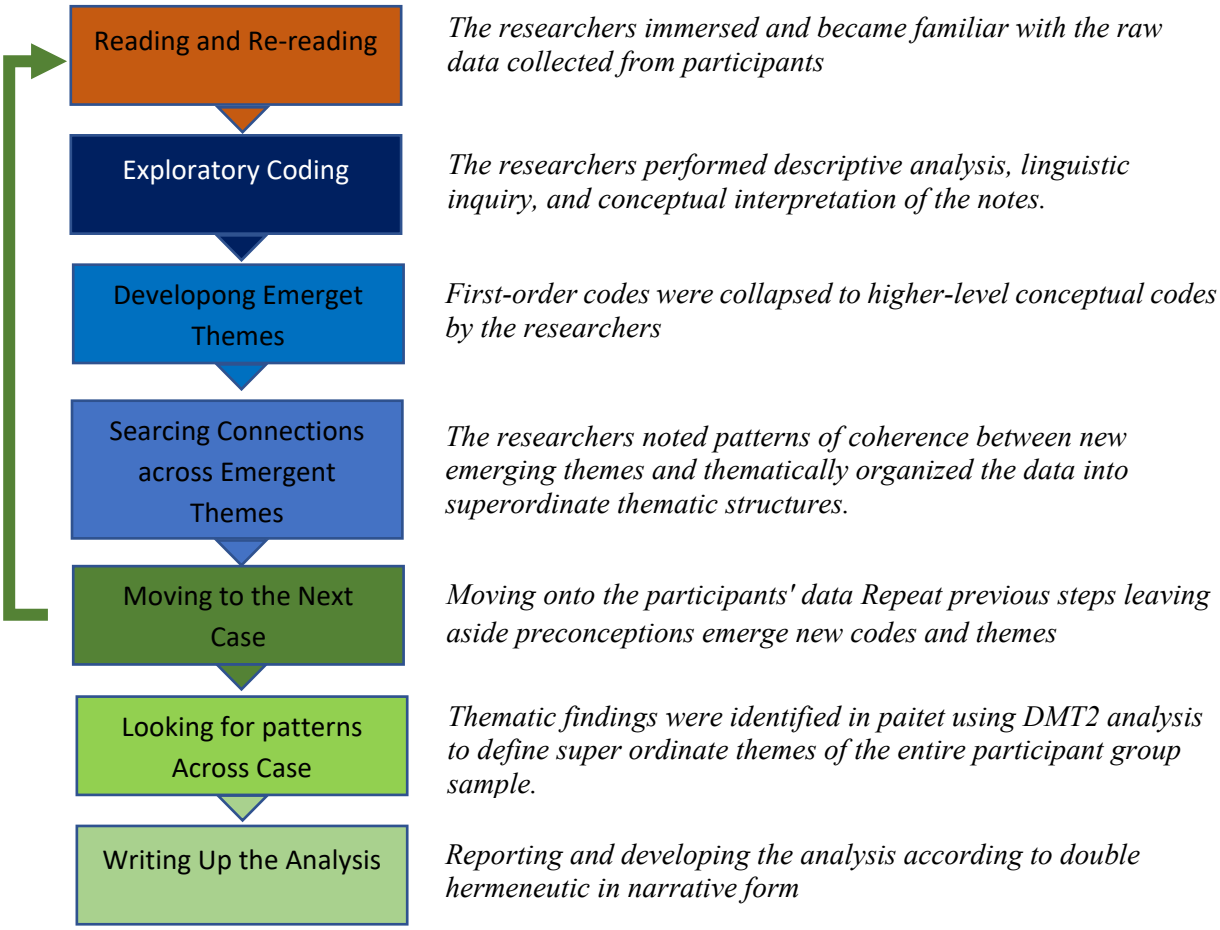

Figure 1. Analysis Data Using IPA.

Data analysis was conducted following the classical procedure of Interpretative Phenomenological Analysis (IPA) to capture the subjective meaning of participants' experiences in depth. Each interview transcript is read repeatedly to understand the context and nuances contained in the participants' narratives. The researcher then makes initial notes in the form of descriptive, linguistic, and interpretative comments, which serve as the basis for identifying significant patterns and meanings. From these notes, themes emerge inductively, which are then analyzed to find connections between themes and to understand the broader structure of the phenomenon. Next, a cross-case analysis was conducted to review the similarities and differences in experiences among participants, so that the interpretation reflects individual variations as well as general patterns relevant to the research question.

To ensure the trustworthiness of the findings, this study employs several strategies. Member checking was conducted by asking participants to verify preliminary interpretations, while peer debriefing was used to evaluate the consistency and objectivity of the analysis thru discussions with research colleagues. The entire process of data collection and analysis is

systematically documented as an audit trail, including transcripts, analysis notes, and emerging themes. In addition, credibility, dependability, and confirmability are maintained thru researcher reflexivity and data triangulation, which combines interviews, observations, and field notes to ensure accurate and in-depth interpretations.

RESULTS

Rubber ball exercises for the legs are a structured and low-impact intervention aimed at improving blood circulation, leg muscle strength, and joint flexibility in individuals with diabetes mellitus (Abdurrasyid, Sahar, & Widyatuti, 2020). Each session begins with light warm-up and ends with cooling down, while the core movements are repeated to provide gentle physical stimulation. Participants sit on a stable and comfortable chair throughout the session, which includes eight core movements with a rubber ball, each performed several times per leg (Figure 2). The movements include activities such as rolling, catching, oscillation, short pass, rotation, flexion, extension, as well as grasp and lift, which are designed to safely and controlledly improve circulation, strength, and flexibility of the legs.

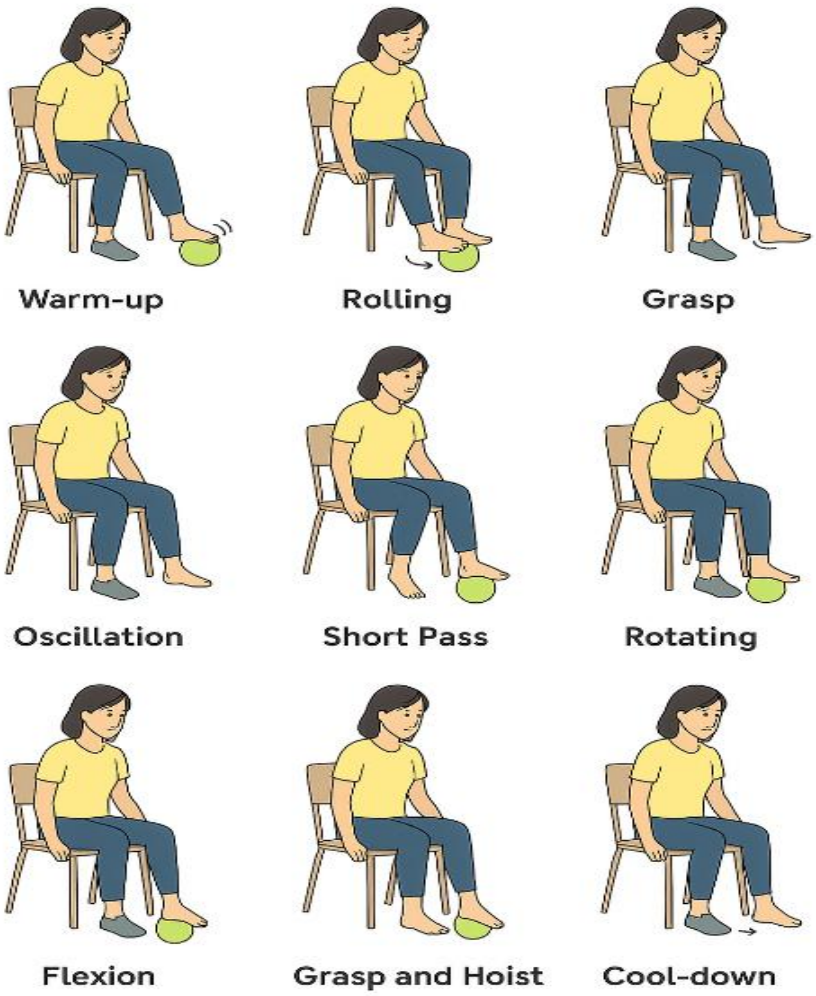

Figure 2. Illustrative Movements in Rubber Ball Foot Exercise for Diabetic Patients.

This study involves twelve individuals living with type 2 diabetes mellitus who regularly participate in foot exercise activities using a baseball in the Posbindu PTM and Prolanis community within the working area of the Kebon Jeruk Subdistrict Health Center. The number of participants was determined not solely based on numbers, but through the principle of data

saturation, which is the point when additional interviews no longer provide meaningful new information. Thus, each participant is regarded as a unique and valuable source of experience.

The participants involved have an age range from 42 to 65 years, have been following the kastin ball foot gymnastics program four times a week for one month, and are active in the Posbindu activities organised by the Duri Kepa Health Center. In terms of age, the participants are within the range of 42 to 65 years, with an average age of around 53.8 years. This age reflects a group of adults and seniors who are striving to maintain their quality of life amidst the challenges of chronic diseases. The age variation presents diverse perspectives, with some just entering middle age with a spirit of adaptation, and others having passed into old age with deep reflections on their long journey with diabetes.

In terms of gender, the participants consisted of 5 men (41.7%) and 7 women (58.3%). The predominance of women in this group aligns with the tendency of mothers to be actively involved in health community activities, while also demonstrating how gender roles can influence the way individuals interpret health interventions.

The duration of diabetes among participants shows significant variation, ranging from 3 years to 15 years, with an average of 8.6 years. For some participants, the experience still feels new and full of adaptation challenges, while for others, the long journey with diabetes has shaped lifestyles, survival strategies, and a deeper meaning for each health intervention undertaken. In terms of education, the participants have diverse backgrounds: 3 people (25%) have basic education, 5 people (41.7%) have secondary education, and 4 people (33.3%) have higher education. This diversity enriches the dynamics of the research, as varying levels of health literacy influence how participants understand, respond to, and assign meaning to the foot exercise activities.

Data analysis in this study was conducted using the Interpretative Phenomenological Analysis (IPA) approach, which enabled the researcher to explore the subjective meanings embedded in participants' experiences of engaging in rubber ball foot exercises as part of their home-based self-care (Figure 3). The analytical process unfolded in stages, beginning with verbatim transcription of in-depth interviews, followed by thematic coding, and culminating in reflective interpretation of the emerging narratives. Through this process, the researcher identified four core themes that represent the dynamic nature of participants' lived experiences. These themes not only reflect the physical aspects of the exercise activity but also reveal the emotional, social, and psychological dimensions that accompany it. Each theme emerged consistently across participants' narratives, indicating recurring and mutually reinforcing patterns of meaning.

Figure 3. Implementation Process in Patients with Type 2 Diabetes Mellitus.

Following the eleventh and twelfth interviews, the researcher noted that no further significant findings or variations in meaning emerged that would deepen the understanding of the phenomenon under study. The previously identified themes continued to appear with high consistency, both through direct expressions and narrative reflections. Accordingly, the number of participants was deemed sufficient based on the principle of data saturation, defined as the

point at which additional data collection no longer yields new or relevant insights to enrich thematic analysis. This principle serves as a critical indicator in qualitative research, particularly within phenomenological approaches, where the emphasis lies not on sample size but on the depth and richness of meaning uncovered. In the context of this study, saturation indicates that the essence of participants' lived experiences has been comprehensively explored and can be scientifically justified. The four main themes identified in this research are as follows:

Table 1. Interpretative Themes Derived from IPA.

No	Core Theme	Narrative Description	Sample Participant Quote
1	Recovery and Renewed Hope	Rubber ball exercises are understood as a recovery experience that gives participants a renewed sense of hope in managing diabetes, especially foot health. This activity influences participants' perceptions of their ability to care for themselves and manage chronic diseases.	*"I feel like my feet have come back to life not stiff and cold like before."* *"Doing this exercise regularly makes me feel like I can control my body better."* *"After a few sessions, I feel lighter and more confident when walking."*
2	Togetherness and Social Support	Training sessions provide a social space that supports motivation, a sense of belonging, and emotional support. This interaction strengthens group identity and gives participants the motivation to consistently attend the training.	*"We cheer each other on it feels like a small family. If I miss a session, they notice."* *"If I am absent, my friends notice and remind me. It feels like I am being noticed."* *"Practicing together makes me more motivated than being alone at home."*
3	Practical Barriers and Adaptation	Participants face daily obstacles, such as limited space or tight schedules, but they develop creative adaptive strategies to continue participating.	*"Sometimes I forget, especially when my grandchild visits. But now I stick the schedule on the fridge."* *"I moved the chair to a brighter spot, it feels more comfortable and reminds me to practice."* *"If the timing clashes with other activities, I do it in the quieter afternoon."*
4	Self-Transformation and Control	This exercise encourages attitude and behavior changes, enhances self-confidence, motivation, and control over health. Participants feel more active, have clear	*"I used to be lazy to move, but now I look forward to the exercise. It feels like I have a purpose."*

	goals, and are able to manage their chronic conditions more independently.	*"I feel like I can do more daily tasks without pain, it feels like regaining independence."* *"This exercise made me realize that I can influence my own health."*

DISCUSSION

Foot Exercise with Rubber Ball: Enhancing Physical Function and Psychosocial Well-being in Diabetic Patients

For many participants, foot exercise using a rubber ball was not merely a routine movement. This activity became a restorative space where the body and emotions converged in quiet harmony. The recurring phrase "my feet feel alive again," voiced throughout the interviews, was more than a metaphor; it reflected a lived experience of improved blood circulation, increased muscle flexibility, and a gentle reawakening of nerve responsiveness. The exercise offered a renewed sense of hope, suggesting that a body once perceived as numb could regain its vitality, agency, and connection to self.

Physiologically, the act of rolling and gripping a rubber ball using the soles and toes provides mechanical stimulation to both sensory and proprioceptive nerves. This targeted activation plays a crucial role in the prevention and management of peripheral neuropathy, particularly among individuals living with type 2 diabetes mellitus. By engaging the lower extremities in repetitive, controlled movements, the exercise promotes neural responsiveness and supports peripheral circulation two key factors in mitigating neuropathic symptoms and enhancing functional recovery. foot exercise program utilizing a tennis ball has been shown to enhance sensory perception and alleviate symptoms of peripheral neuropathy significantly (Abdurrasyid, Sahar, & Widyatuti, 2020; Isma et al., 2024). This finding is further substantiated by existing research, which demonstrates that foot exercise enhances peripheral blood flow and neural sensitivity, and plays a preventive role in the development of diabetic foot ulcers (Win et al., 2020; Cruvinel-Júnior et al., 2025). From a broader perspective, foot exercises involving object manipulation have demonstrated positive effects on postural balance and fine motor coordination, contributing to enhanced functional mobility (Satti et al., 2024).

Foot exercise using a rubber ball also holds relevance within the global health context. Structured training has the potential to slow the progression of diabetic neuropathy, a common and serious complication among individuals with type 2 diabetes mellitus (Boulton et al., 2005; Ren et al., 2025). As one of the most prevalent and costly complications of diabetes worldwide, diabetic foot ulcers constitute a major public health burden. In response, community-based interventions are increasingly recognized as effective and sustainable preventive approaches (Ko et al., 2022). Notably, structured foot exercise interventions have demonstrated the potential to enhance pain tolerance and restore sensory responsiveness in individuals with diabetic neuropathy. These physiological benefits lend strong support to the implementation of community-based strategies, such as rubber ball foot exercises, as accessible and meaningful components of chronic disease management (Win et al., 2020).

From a psychosocial perspective, rubber ball foot exercises contribute meaningfully to the enhancement of participants' emotional and social well-being. The activity fosters a positive space for social interaction, reinforces a sense of belonging, and promotes increased motivation and self-confidence. Group-based exercise programs such as this have been shown to improve quality of life and reduce depressive symptoms, particularly among post-stroke patients (Ren et al., 2025). In addition, participation in structured and pleasurable physical activities can foster a stronger sense of self-regulation and contribute to improved emotional stability, particularly among individuals managing chronic health conditions (Win et al., 2020; Dinh & Bonner, 2023). Within this framework, foot exercises involving a rubber ball evolve beyond routine physical movement, offering a holistic rehabilitative experience that integrates physical, emotional, and psychosocial dimensions of recovery.

Despite its simplicity, rubber ball foot exercise offers a comprehensive approach to recovery. This intervention simultaneously supports physical function, mental well-being, and social connectedness. Within the framework of community-based rehabilitation, the implementation of rubber ball foot exercises deserves consideration as part of an inclusive and sustainable health strategy. More than a series of movements, this practice creates a space where patients can experience a renewed sense of physical, emotional, and social empowerment.

Community-Based Solidarity as a Catalyst for Psychosocial Empowerment

Rubber ball foot exercises offer not only physiological benefits but also serve as a social medium that fosters interpersonal connectedness among participants. Within the framework of community-based programs such as Posbindu PTM and Prolanis, this activity functions as a meaningful space for interaction where individuals encourage one another, share personal experiences, and cultivate a sense of solidarity. The presence of social support within exercise groups has been shown to enhance motivation and adherence to self-management practices for chronic conditions. Empirical studies further underscore the critical role of community support in improving quality of life and therapeutic compliance among individuals living with type 2 diabetes mellitus (Wang et al., 2024). Social engagement emerging from group physical activities contributes to the formation of a supportive environment that facilitates long-term adoption of healthy behaviors.

Furthermore, the social dynamics cultivated through group-based foot exercises have demonstrated significant psychological impact. Participants who were initially passive and reluctant to engage exhibited notable transformations becoming more active, confident, and empowered in managing their health conditions. This shift reflects the principles of patient empowerment advocated by the American Diabetes Association, emphasizing the importance of active patient involvement in decision-making and disease management (American Diabetes Association, 2020). Evidence from recent studies underscores the role of robust social support in strengthening individuals' self-efficacy and facilitating the timely adoption of health-promoting behaviors (Dinh & Bonner, 2023). A supportive social environment fosters a sense of accountability and emotional safety, enabling individuals to adhere more consistently to therapeutic regimens and remain open to ongoing health education initiatives.

Rubber ball foot exercises also function as a catalyst for inclusive social transformation. This activity requires neither specialized skills nor costly equipment, making it accessible to individuals across diverse socioeconomic backgrounds. As a community-based intervention, group exercise has been shown to enhance psychological indicators such as hope, life satisfaction, and social connectedness (Dinh & Bonner, 2023). Moreover, structured foot exercises not only improve sensory function but also contribute to overall enhancements in quality of life (Win et al., 2020). Accordingly, rubber ball foot exercises represent a comprehensive health strategy that bridges promotive and preventive efforts by harmonizing physical rehabilitation with psychological well-being and social engagement.

The integration of physiological and social benefits positions rubber ball foot exercises as a relevant intervention for strengthening community-based health programs. In practice, this activity can serve as a strategic component in enhancing health literacy and fostering community empowerment. When participants are actively engaged and supported by their social environment, they evolve from passive recipients of care into proactive agents of change in managing their health. Therefore, this approach warrants further development within public health policies that emphasize participation and sustainability.

Practical Barriers and Adaptive Strategies

Although participants clearly experience the benefits of rubber ball foot exercises, implementing the activity at home is not without practical challenges. Common obstacles include limited space for movement, competing demands from family members, and the absence of structured reminders for exercise schedules. These barriers reflect the complexity of domestic life, which often hinders the consistent execution of self-managed health interventions. The success of home-based programs is highly influenced by environmental support and the flexibility of activity design (Wang et al., 2024). Accordingly, the design and delivery of interventions like

rubber ball foot exercises should be sensitive to the social dynamics and spatial limitations of participants' home settings, ensuring relevance, accessibility, and sustained engagement.

Interestingly, participants demonstrated remarkable adaptive capacity in responding to these challenges. Several spontaneous strategies emerged, including placing visual reminders at home, involving family members in exercise sessions, and repurposing living rooms or terraces as temporary movement spaces. These responses illustrate that when interventions are designed in a contextual and participatory manner, individuals are capable of developing solutions aligned with their lived realities. Consistent and context-sensitive support for participants underscores the importance of local adaptation in the implementation of health interventions, which plays a critical role in enhancing individual adherence and overall program effectiveness (Dinh & Bonner, 2023). Moreover, the adaptability of home-based interventions contributes to strengthening participants' perceived control and personal investment in their healing journey, fostering greater autonomy and sustained engagement.

In the context of community-based chronic disease management, the economic value of promotive and preventive interventions is becoming increasingly critical particularly in developing countries such as Indonesia, where the prevalence of type 2 diabetes mellitus continues to rise significantly (Indonesia., 2023; International Diabetes Federation, 2025). Rubber ball foot exercise, as a simple and self-directed home-based activity, offers an alternative intervention that is not only clinically effective but also economically efficient. Its affordability, accessibility, and minimal infrastructural requirements make it especially relevant for populations with limited resources. Although the physiological benefits of this exercise are tangibly experienced by participants, its implementation within the home environment is not without practical challenges. Barriers such as limited physical space, complex family dynamics, and the absence of structured reminders reflect the multifaceted nature of domestic life, which often impedes the consistent execution of health interventions. Nevertheless, findings from this study reveal that participants demonstrated notable contextual adaptability. Strategies emerged organically, including the use of visual reminders, engaging family members in exercise sessions, and repurposing living rooms or terraces as temporary movement spaces.

These strategies not only reflect the adaptive capacity of individuals but also underscore the importance of designing interventions that are participatory and contextually aligned with the socio-cultural realities of the target population. When such contextualization is achieved, both the effectiveness and sustainability of health programs can be significantly enhanced. From an economic standpoint, this approach contributes to long-term cost reduction in healthcare services, lowers the risk of complications such as foot ulcers and amputations, and improves individual productivity through enhanced functional independence. The integration of rubber ball foot exercises into national programs such as Prolanis and Posbindu PTM holds considerable potential to strengthen primary healthcare systems in an inclusive and empowerment-oriented manner. Structured implementation of this exercise modality has been shown to improve sensory function and reinforce self-regulatory capacity among patients with diabetic neuropathy (Abdurrasyid, Sahar, & Widyatuti, 2020; Win et al., 2020). Considering its clinical efficacy, social relevance, and cost-efficiency, this intervention merits serious consideration as part of a sustainable, community-based national strategy for non-communicable disease control.

Given the steadily increasing prevalence of type 2 diabetes mellitus in Indonesia, there is a growing need for context-sensitive and community-based interventions to support disease management and prevention (Indonesia., 2023; International Diabetes Federation, 2025), Community-based interventions are becoming increasingly relevant and urgent. Rubber ball foot exercises, as a low-cost, accessible, and self-directed form of physical activity, offer promotive and preventive solutions that align with local needs. Integrating this activity into programs such as Prolanis and Posbindu PTM not only strengthens the primary healthcare system but also enhances community participation in the management of non-communicable diseases. The implementation of structured foot exercise programs has been shown to improve sensory function and reinforce self-perceived control among patients with diabetic neuropathy (Abdurrasyid, Sahar, & Widyatuti, 2020; Win et al., 2020). Accordingly, rubber ball foot exercises may serve as a strategic component within national efforts to address chronic disease through community-based, low-cost, and participatory health interventions.

Phenomenological Insights: The Lived Meaning of Therapeutic Motion

The descriptive interpretative phenomenological approach provides a space for researchers to grasp participants' experiences in their full depth, not merely through their actions, but through the meanings they ascribe to those actions. In this context, a simple movement such as rolling a rubber ball with the sole of the foot transcends its physical function, becoming a symbol of recovery, hope, and the reclaiming of agency over a body altered by chronic illness. For many participants, foot exercise is not a mechanical routine, but a gentle act of reconciliation between a wounded body and a soul yearning to heal. The movement becomes a silent language that conveys determination, acceptance, and self-compassion.

This meaning does not arise solely from instruction or theory, but from lived and contextual experience. When participants touch the ball with their toes, they are not merely exercising muscles they are reconnecting with a sense of confidence that had once faded. In modest spaces such as a front porch or a living room transformed into a training area, individuals with type 2 diabetes rediscover a sense of ownership over their bodies and lives. A phenomenological approach to health interventions allows us to grasp the existential dimensions of recovery how one experiences, interprets, and gives direction to their healing journey (Brijan, 2020). Here, the act of rolling a rubber ball beneath the foot becomes a quiet bridge linking physical motion with an inner longing for restoration, allowing the wounded body and the healing spirit to meet in gentle reconciliation.

Furthermore, participants' experiences reveal that when health interventions engage emotional and spiritual dimensions, their impact becomes deeper and more enduring. Simple movements can serve as meaningful entry points for psychological transformation from a sense of helplessness to a sense of capability, from isolation to connection. Physical activities conducted within socially and emotionally supportive environments have the potential to significantly enhance psychological well-being (Parviniannasab et al., 2024). At the same time, community-based interventions that resonate with participants' lived experiences can foster a deeper sense of agency and enhance their perceived quality of life (Dinh & Bonner, 2023; Parviniannasab et al., 2024). In essence, rubber ball foot exercises transcend their physical function, becoming a gentle pathway through which individuals with type 2 diabetes slowly reclaim hope one movement at a time, imbued with meaning and the quiet strength to heal.

CONCLUSION

This study reveals that rubber ball foot exercises have multidimensional significance for individuals with type 2 diabetes mellitus (T2DM). Through the lens of Interpretative Phenomenological Analysis (IPA), participants described this activity not merely as a physical routine, but as a practice that provides personal meaning, including enhanced self-care, emotional comfort, and a sense of social connection. This exercise also contributes to increased self-efficacy, motivation, and a sense of agency in managing chronic illness, indicating that community-based interventions can support psychosocial aspects in addition to physical benefits. These findings emphasise the importance of designing contextual, participatory interventions that focus on patient experiences, as well as their potential integration into national health programs such as Posbindu PTM and Prolanis to strengthen clinical and psychosocial impacts.

However, this study has several limitations. First, the limited number of participants and the specific research location in Kebon Jeruk District, West Jakarta, restrict the generalisation of the findings to a broader population. Second, the IPA approach emphasises the subjective interpretation of participants, so the experiences of other individuals may differ. Based on these findings, future research could explore the effectiveness of community-based foot exercise interventions in different regions or cultures, combine quantitative methods to measure physiological and psychosocial changes, and evaluate integration strategies into national health programs to ensure sustainability and long-term impact.

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