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ORIGINAL RESEARCH

Resistance band exercise outperforms low-intensity exercise in reducing BMI, body fat, and blood glucose levels in patients with non-communicable diseases

Saroch Kaewmanee[1], Nattika Penglee[2], Natrapee Polyai[3], Geargchai Rutnosot[4], Patranit Sanpoksub[5], Bootsakon S. Guyot[6], Daniel K. Guyot[7], Rungroj Krittayaphong[8], Apichart Vanavichit[9], Naris Thengchaisri[10]

Author information

[1] Department of Animal Science, Kasetsart University, Thailand
[2,3] Department of Physical Education, Kasetsart University, Thailand
[4,5] Department of Sports Science, Chulalongkorn University, Thailand
[6] Department of Nursing, Kasetsart University, Thailand
[7] Health Promotion and Research, Bootsakon Nursing and Midwifery Clinic, Thailand
[8] Department of Medicine, Mahidol University, Thailand
[9] Rice Science Center (RSC), Kasetsart University, Thailand
[10] Department of Companion Animal Clinical Sciences, Kasetsart University, Thailand

fagrsrk@ku.ac.th

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Abstract

Noncommunicable diseases (NCDs) such as diabetes, hypertension, and obesity pose significant global health challenges. While moderate-to-vigorous exercise is known to benefit NCD patients, the effectiveness of low-intensity resistance band exercise (RBE) remains less certain. A 12-month study on obese individuals engaging in RBE demonstrated consistent improvements in body composition, muscle mass, and glycemic control. Similarly, a 9-month study involving 100 patients with diabetes mellitus revealed significant reductions in BMI, body fat percentage, and blood glucose levels, alongside increases in muscle mass and protein content. In another 9-month study on chronic kidney disease (CKD) patients, RBE led to notable reductions in BMI, abdominal fat percentage, blood glucose, and blood pressure, while muscle mass remained stable. The study further evaluated 220 NCD patients recruited from hospitals, who were randomly assigned to groups based on BMI, obesity, diabetes, and CKD status. Outcome measures included body composition changes, daily step counts, blood glucose and lipid levels, and program satisfaction. In conclusion, RBE proves to be an effective intervention for improving body composition, muscle mass, protein content, and glycemic control in both healthy individuals and those with obesity, diabetes mellitus, and CKD. Compared to other low-intensity exercises, RBE consistently yields greater reductions in BMI, body fat, and blood glucose levels, making it a promising strategy for managing NCDs.

Keywords: Health-status outcomes, metabolic disorder, noncommunicable diseases, program satisfaction, resistance band exercise

Introduction

Noncommunicable diseases (NCDs), also known as lifestyle diseases, constitute a significant health issue nationally and globally (Macniven et al., 2023). Among 55 million fatalities worldwide in 2019, NCDs accounted for about 41 million (71%) deaths (Ramesh & Kosalram, 2023). Conditions such as diabetes, hypertension, heart disease, stroke, and cancer are on the rise due to exposure to polluted air and environmental factors influencing unhealthy lifestyle behaviors (Akbaraly et al., 2013; Mozaffarian, 2016; Myers et al., 2002). These behaviors include imbalanced diets (high in sugar, fat, and salt and low in fruits and vegetables), sedentary lifestyles, smoking, excessive alcohol consumption, and stress (Habib et al., 2020). Obesity, one of the crucial NCDs, leads to the development of heart diseases in humans (Min et al., 2021). Failure to address these behaviors leads to increased morbidity, disability, and mortality, along with substantial economic burden. Therefore, promoting healthy eating habits, regular exercise, and adequate rest is crucial for preventing NCDs and cancer more effectively than relying solely on medical treatment (Budreviciute et al., 2020). Integrating nutritional innovations, personalized exercise recommendations, and individual health promotion using user-friendly electronic

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devices can ultimately support sustained health (Church et al, 2010; Thengchaisri et al., 2007). Physical activity contributes to the reduction of NCDs (Pescatello et al., 2019). Regular physical activity decreases the risk of chronic diseases such as cancer, cardiovascular conditions, and type 2 diabetes (Cosentino et al., 2019). Sedentary lifestyles contribute to increased mortality rates globally, with about 3.2 million deaths yearly attributed to physical inactivity (Lavie et al., 2019). Moreover, physical activity aids in energy balance and weight control (Esquivel, 2021). Resistance band exercises (RBE) have been shown to be an effective intervention for managing and preventing NCDs (Bueno-Antequera & Munguía-Izquierdo, 2020). These characteristics align with global and national public health priorities to promote community-based interventions for managing NCDs.

Studies have demonstrated that RBE can improve muscular strength, endurance, and functional capacity in individuals with NCDs such as cardiovascular disease, diabetes, and obesity (Lopes et al.,2019; Ito, 2019). RBE is particularly beneficial for older adults with NCDs **(Figure 1)**, as they provide a safe and low-impact form of strength training (Li et al., 2024). Furthermore, RBE can be easily performed at home which makes it a convenient and accessible option for individuals with limited mobility or access to gym facilities (Efendi et al., 2022). Incorporating RBE into a regular physical activity routine has been associated with improvements in blood pressure, glucose control, and lipid profiles in individuals with NCDs (Choi et al., 2020; McGinley et al., 2015). Moreover, RBE has been shown to enhance balance, flexibility, and overall quality of life in people with chronic conditions (Kwak et al., 2016; Yasuda et al., 2015). Performing RBE offer a practical and effective means of managing and preventing NCDs which makes it a valuable tool in the fight against these prevalent health conditions (Jones et al., 2024). The role of nurses and healthcare professionals is critical in the success of such interventions. Nurses often serve as the primary point of contact for patient education and health promotion making them key facilitators in implementing RBE programs. Their involvement in designing personalized exercise regimens, monitoring progress, and providing ongoing support. Furthermore, incorporating RBE into hospital and community health initiatives can empower nurses to advocate for holistic, preventative care approaches. Governmental support also plays a vital role in the widespread adoption of RBE. Policies promoting physical activity, funding public health campaigns, and collaboration with healthcare providers can significantly enhance program reach and sustainability. In Thailand, integrating RBE into national health strategies aligns with broader goals to reduce the burden of NCDs and improve population health outcomes (Lavie et al., 2019; Bueno-Antequera & Munguía-Izquierdo, 2020).

Figure 1. Illustration of RBE (Documented by authors).

Despite the growing body of research on exercise interventions for individuals with NCDs, significant gaps remain in identifying optimal, scalable, and sustainable exercise modalities that can be effectively integrated into healthcare systems. While traditional low-intensity exercise programs are widely recommended for individuals with conditions such as obesity, diabetes, and CKD, these approaches often yield limited metabolic benefits and may not adequately address the specific physiological and psychological needs of patients. RBE has emerged as a cost-effective, low-risk alternative, yet its comparative effectiveness against low-intensity exercise in improving BMI, body composition, and blood glucose levels has not been thoroughly investigated, particularly in Thailand's healthcare setting. A key gap in the literature is the lack of region-specific research examining the feasibility and efficacy of RBE among Thai patients with NCDs. Most existing studies have been conducted in Western populations, where healthcare infrastructures, dietary habits, and exercise behaviors differ significantly from those in Thailand. Given the unique sociocultural and economic factors influencing health behaviors in Thai communities, it remains unclear whether RBE can be seamlessly adopted as an accessible and sustainable intervention. Additionally, longitudinal data on RBE's impact on chronic disease progression, medication dependency, and overall patient well-being are currently insufficient, leaving a crucial knowledge gap in the long-term management of NCDs. To address the growing burden of NCDs and promote health in Thailand, the present study aimed to evaluate the effectiveness of RBE in individuals with normal health, obesity, diabetes, and CKD. We compared average body mass index (BMI), body composition, and health parameters before and after participation in the

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project. We expected that the RBE integrated into daily routines will be effective in reducing NCD-related issues and can serve as a model that can be incorporated into the national public health development plan.

Method

The study began with a preliminary cohort study aimed at identifying the most suitable exercise program for participants. This phase involved 20 individuals aged 40 to 60 years, who were divided into two groups: one following regular exercise (RE) and another engaging in RBE **(Figure 2)**. Participants in the RE group adhered to standard exercise and dietary guidelines outlined by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDCP). In contrast, the RBE group received personalized exercise regimens using light and medium resistance bands (21 S-Twist®, Thailand), along with weekly nutritional guidance. To maintain engagement and prevent monotony, resistance band exercises were seamlessly integrated into daily activities such as walking, Tai Chi, babysitting, gardening, and house cleaning. Additionally, participants were introduced to a novel training method called pliability, which focuses on improving muscle flexibility and elasticity through varied tension resistance. All participants were provided with smartwatches to monitor daily activity, while only the RBE group received one-on-one guidance via the LINE application (LINE Corporation, Japan). The six-month study assessed key health metrics, including BMI, body fat percentage, muscle mass, total body water, and bone density, using the InBody 720 device (InBody, Australia). Additionally, blood glucose levels were analyzed in a clinical laboratory (Cobas 8000, Roche Diagnostics, Switzerland), and blood pressure was recorded using an automated Oscillo metric device (GE CARESCAPE V100, GE Healthcare, USA).

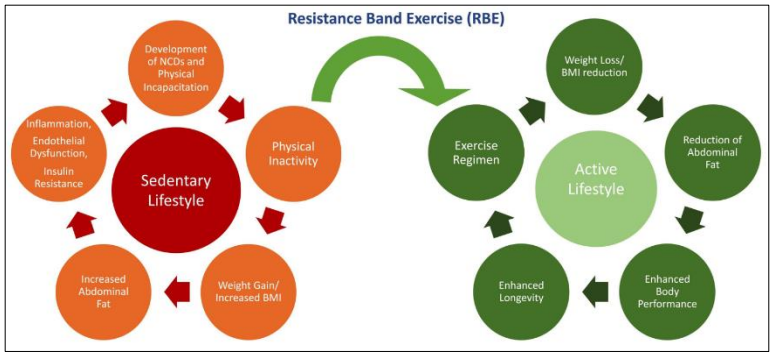

Figure 2. Illustration of impact RBE on health outcomes (Documented by authors).

Figure 3. Data collection process (Documented by authors).

Following the preliminary study, a large-scale randomized clinical trial was conducted to further evaluate the effectiveness of RBE in individuals with and without chronic health conditions **(Figure 3)**. As of 12 March 2023, a total of 260 volunteers had been screened, consisting of 40 regular participants and 220 individuals with specific health conditions. Some volunteers were excluded due to incomplete data (30), personal concerns (5), exercise noncompliance (2), additional medications (10), and contact difficulties (4). Additionally, 13 participants withdrew, and 4 declined participations. Eligible participants were randomly assigned to four different groups based on their health status: a normal BMI group, an obesity group, a diabetes group, and a CKD group. Throughout the study, researchers monitored BMI, body composition, daily step counts, and satisfaction with the exercise program. Blood samples were collected at baseline, 12 weeks, 3 months, 6 months, 9 months, and 12 months to evaluate glucose and lipid levels. All biomedical instruments were rigorously calibrated at regular intervals to maintain accuracy and reliability. Health assessments followed strict procedures to ensure high-quality data collection. Blood samples (10 mL of venous blood) were drawn under sterile conditions by certified medical nurses and processed immediately at -80°C to maintain integrity. Standardized fasting conditions were enforced to minimize variations in blood test results. In addition to blood analysis, fat mass and visceral fat were measured using bioelectrical impedance (InBody 720, Australia) at multiple time points, while MRI scans were performed at baseline and 12 weeks to evaluate changes in visceral fat distribution. Physical activity levels were assessed using smartwatch data and validated questionnaires. The RBE group followed a structured and dynamic resistance band program, targeting major muscle groups such as the arms, shoulders,

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chest, back, abdomen, and thighs. Participants performed 3 sets of 8 to 12 repetitions per exercise, with the regimen adjusted every two weeks to optimize muscle engagement and prevent adaptation.

To enhance adherence and motivation, participants in the RBE group received personalized exercise guidance via the LINE application. Unlike conventional resistance training, RBE integrated flexibility, strength, and endurance components to ensure holistic fitness development. Incorporating functional movements into daily life promotes sustained participation and improved long-term health outcomes. The intervention group benefited from continuous monitoring, allowing healthcare professionals to make real-time adjustments to exercise plans based on individual progress. Statistical analysis was conducted to assess pre- and post-intervention changes in BMI, body fat percentage, muscle composition, and blood glucose levels. Repeated-measures t-tests were applied, with significance set at $p < 0.05$. All data analyses were performed using GraphPad Prism 9 (GraphPad Software, USA). Ethical approval for the study was granted by both the Siriraj Institutional Review Board, Human Research Protection Unit, Faculty of Medicine, Siriraj Hospital, Mahidol University, Thailand (IRB COA No. SI 778/2021) and the National Research Council's Expert Committee on the Prevention and Control of Non-Communicable Diseases in the Thai Population. The research was conducted in accordance with the Declaration of Helsinki, and all participants provided written informed consent before enrollment.

Results

The efficacy of exercise interventions in a pre-cohort was evaluated over a six-month period. Both the RE and RBE groups experienced significant reductions in BMI and body fat percentage following the intervention, with the RBE group demonstrating slightly greater improvements than the RE group **(Table 1)**. Abdominal fat percentage also decreased significantly in both groups, with the RBE group exhibiting greater reductions. Additionally, both groups showed significant increases in muscle mass and protein content, with the RBE group displaying marginally greater gains. However, no significant alterations in bone mass were observed in either group. Although blood glucose levels decreased significantly in both groups, the RBE group showed slightly greater reductions than the RE group. The RBE protocol was implemented in a cohort of volunteers with obesity over a 12-month period **(Table 2)**. A consistent reduction in BMI was observed from baseline (T0) to the final assessment (T12). Body fat percentage declined progressively throughout the study, indicating improved adiposity levels. Notably, total body water percentage increased incrementally over time, suggesting better hydration among participants. Furthermore, abdominal fat percentage significantly decreased from T0 to T12, while muscle mass steadily increased over the study period. Concurrently, protein content showed a progressive rise, indicating improved muscle protein synthesis. Importantly, blood glucose levels decreased significantly from baseline to the final assessment.

Table 1. Health parameters of precohort participants before and after regular exercise (RE) or resistance band exercise (RBE) for 6 months.

Parameters	Regular exercise (RE)		Resistance band exercise (RBE)	
	Before	After	Before	After
Body mass index (kg/m^2)	23.7±1.2^a	22.1±2.2^b	23.4±1.5^a	21.6±1.4^c
Body fat (%)	26.6±2.5^a	24.9±2.2^b	26.3±2.7^a	23.9±1.8^c
Total body water (%)	51.0±1.2^a	51.5±1.4^a	51.4±2.0^a	51.8±1.6^a
Abdominal fat (%)	4.6±1.3^a	4.2±1.4^a	4.6±1.5^a	3.9±1.2^b
Muscle mass (kg)	42.0±2.5^a	43.2±2.5^b	42.5±1.5^a	43.8±1.6^b
Protein content (%)	20.2±2.0^a	22.4±1.5^b	20.4±1.2^a	22.8±1.3^b
Bone mass (kg)	2.7±0.4^a	2.6±0.5^a	2.6±0.3^a	2.6±0.4^a
Blood glucose level (mg/dl)	84.5±1.3^a	82.5±1.6^b	85.6±1.2^a	82.2±1.4^b

Note: Comparison of parameters between volunteers with normal health who exercised regularly as usual (RE) and volunteers who exercised regularly according to the standards designed by the research team (RBE) (n = 20, df = 19). The significance level of the differences was set at α = 0.05. The symbols $^{a, b,}$ and ^{c} are used for post-hoc grouping. Groups that do not share a letter are significantly different, while groups that share a letter are not significantly different.

Additionally, the impact of RBE on health parameters was evaluated among 100 volunteers diagnosed with diabetes over a nine-month period **(Table 3)**. BMI decreased consistently throughout the study, with statistically significant reductions observed at each assessment time point. Body fat percentage also declined significantly from baseline to the final assessment at nine months. The total body water percentage remained relatively stable, showing no

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statistically significant changes. Abdominal fat percentage gradually decreased, with significant reductions from baseline to the nine-month mark. Muscle mass increased steadily, with statistically significant gains observed at each assessment. Similarly, protein content increased over the study period, with significant improvements noted at the final assessment. Notably, blood glucose levels gradually declined from baseline to the nine-month mark, with statistically significant reductions observed at each subsequent time point. The effect of RBE in patients with CKD was assessed over a nine-month period **(Table 4)**. BMI consistently decreased from baseline (T0) to the final assessment at nine months (T9), with statistically significant reductions at each interval. Conversely, body fat percentage exhibited minimal fluctuations throughout the study, with no statistically significant differences. The total body water percentage remained relatively stable over time. Abdominal fat percentage gradually decreased, with statistically significant reductions observed at each assessment time point. Muscle mass remained relatively unchanged, while protein content exhibited minor fluctuations but no statistically significant alterations. Blood glucose levels gradually declined from baseline to the nine-month assessment, with statistically significant reductions at the six- and nine-month intervals. Furthermore, both systolic and diastolic blood pressure decreased gradually, with statistically significant reductions observed at each assessment time point.

Table 2. Health parameters of patients with obesity before and after participating for 3, 6, 9, and 12 months (T3, T6, T9 and T12 respectively) of the cohort exercise intervention with the RBE.

Parameters	T0	T3	T6	T9	T12
Body mass index (kg/m^2)	29.9±2.9^a	27.4±2.4^b	26.3±2.6^c	25.8±2.2^c	25.6±2.3^c
Body fat (%)	37.5±5.7^a	35.1±4.2^b	33.0±4.4^c	32.7±4.1^c	32.5±3.5^c
Total body water (%)	44.2±2.5^a	46.4±2.7^b	47.5±1.8^c	47.8±1.4^c	47.7±2.4^c
Abdominal fat (%)	9.9±2.4^a	7.7±2.5^b	5.9±2.6^c	5.7±2.2^c	5.6±2.7^c
Muscle mass (kg)	40.5±4.8^a	41.7±4.4^b	42.0±4.6^b	42.1±4.5^b	42.2±4.2^b
Protein content (%)	14.3±1.6^a	15.3±1.8^b	15.5±1.4^b	15.7±1.4^b	15.8±1.9^b
Blood glucose level (mg/dl)	114.2±2.7^a	109.5±2.4^b	105.4±2.6^c	105.1±2.2^c	104.7±2.3^c

Note: n = 110, df = 109, α = 0.05. The symbols $^{a, b,}$ and ^{c} are used for post-hoc grouping. Groups that do not share a letter are significantly different, while groups that share a letter are not significantly different.

Table 3. Health parameters of patients with diabetes after participating for 3, 6, and 9 months (T3, T6 and T9 respectively) of the cohort intervention with the RBE.

Parameters	T0	T3	T6	T9
Body mass index (kg/m^2)	26.2±4.7^a	25.7±3.6^a	25.1±3.8^b	24.8±3.4^b
Body fat (%)	32.5±4.7^a	32.0±4.2^a	31.4±4.8^a	30.6±3.6^b
Total body water (%)	45.2±2.6^a	44.8±2.4^a	45.5±2.6^a	45.7±2.2^a
Abdominal fat (%)	8.9±2.4^a	8.5±2.8^a	8.4±2.5^a	7.8±2.6^a
Muscle mass (kg)	41.5±3.8^a	42.0±2.6^a	42.8±2.4^b	43.4±2.2^b
Protein content (%)	15.2±1.4^a	16.0±1.6^a	16.5±1.5^b	17.1±1.4^b
Blood glucose level (mg/dl)	114.2±2.7^a	110.4±2.4^b	111.1±2.8^b	109.5±2.2^b

Note: n = 100, df = 99, α = 0.05. The symbols $^{a, b,}$ and ^{c} are used for post-hoc grouping. Groups that do not share a letter are significantly different, while groups that share a letter are not significantly different.

Discussion

The findings of this study provide valuable insights into the efficacy of exercise interventions across different populations and time durations. The comparison between RE and RBE revealed significant improvements in various health parameters which confirmed the importance of structured exercise protocols for individuals with NCDs (Ekelund et al., 2016). Both groups experienced significant reductions in BMI and body fat percentage after the intervention, with slightly greater improvements in the group following the RBE. This finding highlights the potential benefits of low-intensity exercise using resistance bands in optimizing health outcomes (Ekelund et al., 2016). The study also demonstrated the effectiveness of RBE in individuals with specific health conditions, including obesity-related issues, diabetes, and CKD (Mozaffarian, 2016). In each group, we observed significant improvements in BMI, body composition, and blood glucose levels over different durations. Thus, RBE has the potential to positively affect individuals with diverse health challenges (Cosentino et al., 2020). Volunteers with obesity-related health issues experienced overall improvements in health indicators

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throughout the 12-month research period. Notably, significant enhancements occurred in the first 6 months, which can be attributed to the simplicity of the RBE protocol, increased adherence to the prescribed RBE, as well as improved dietary habits and better rest practices (Swift et al., 2014). Although conventional exercise routines were initially perceived as challenging, they were adapted to be more engaging and flexible (Westcott, 2012).

Table 4. Health parameters of patients with CKD before and after participating for 3, 6, and 9 months (T3, T6 and T9 respectively) of the cohort intervention with the RBE.

Parameters	T0	T3	T6	T9
BMI (kg/m^2)	24.2±3.7^a	23.5±2.4^a	23.2±1.6^b	22.8±1.4^b
Body fat (%)	34.5±4.4^a	34.0±2.8^a	33.7±2.6^a	33.1±2.4^a
Total body water (%)	47.2±2.4^a	46.7±2.6^a	46.6±2.8^a	46.8±2.2^a
Abdominal fat (%)	10.9±2.8^a	10.5±1.6^a	10.1±1.6^a	9.8±1.4^a
Muscle mass (kg)	40.5±3.6^a	40.8±2.6^a	41.1±2.8^a	41.0±2.4^a
Protein content (%)	14.2±1.6^a	14.6±2.2^a	14.8±2.4^a	14.7±2.6^a
Blood glucose level (mg/dl)	134.2±1.7^a	133.1±2.5^a	132.4±1.4^b	132.2±1.6^b
Systolic blood pressure (mmHg)	150.1±3.5^a	143.1±3.4^b	142.8±2.8^b	142.4±2.5^b
Diastolic blood pressure (mmHg)	90.1±2.4^a	89.3±2.6^a	89.1±2.8^a	88.6±2.4^a

Note: n = 100, df = 99, α = 0.05. The symbols $^{a, b,}$ and ^{c} are used for post-hoc grouping. Groups that do not share a letter are significantly different, while groups that share a letter are not significantly different.

Notably, we used caution in increasing exercise intensity, particularly for volunteers aged 20 to 39 years, considering environmental factors and individual circumstances (Wilson et al., 2010). Despite consistent decreases in various health indices over the 12-month period, stability was reached in declines in BMI, body fat percentage, abdominal fat, and blood glucose levels (Wing et al., 2013). Volunteers were encouraged to maintain their healthy habits and consider further adjustments in exercise patterns to achieve optimal health outcomes, along with potentially reducing medication usage (Qiu et al., 2023). The duration and effectiveness of RBE varied depending on individual health conditions and goals. For those with obesity or cardiovascular issues related to lipid disorders, noticeable changes were observed as early as 3 months into the RBE program (Swift et al., 2014). However, for more complex NCDs or cases with multiple health factors, a longer duration of 6-9 months was necessary to see significant improvements (Warburton & Bredin, 2017). This extended timeframe allowed for gradual, sustainable changes, particularly important for individuals with complex health needs. Importantly, the improvements observed in body fat percentage, abdominal fat, blood pressure, and other health parameters are closely related to metabolic syndrome. The reduction in abdominal fat is particularly significant, as visceral adiposity is strongly associated with insulin resistance and cardiovascular risk (Cesaro et al., 2023). The RBE demonstrated effectiveness in reducing fat in various body regions, particularly abdominal fat, likely due to increased muscle activation and energy expenditure associated with resistance training (Westcott, 2012).

When combined with an active lifestyle, RBE created a synergistic effect, building and maintaining lean muscle mass while promoting overall calorie expenditure (Westcott, 2012). Interestingly, while reductions in BMI and body fat percentage were consistent across the groups, other parameters such as muscle mass, protein content, and blood glucose levels varied, shedding light on exercise's role in health promotion and NCDs management (GBD 2016 Mortality Collaborators, 2017). Tailored exercise interventions show promise in improving overall health outcomes and mitigating chronic diseases (Zouhal et al., 2022). However, caution is warranted in exercise interventions for individuals with diabetes because excessive physical exertion or nutritional intensification may impact overall health (Kanaley et al., 2022). Additionally, the efficacy of medication may result in fluctuating weight and insulin resistance which posed challenges to weight reduction and blood glucose management (Greabu et al., 2021). Imbalance of hormones such as cortisol, which is responsive to stress, may lead to weight gain and fat accumulation, further complicating this research (van der Valk et al., 2018). In patients with diabetes, consistent adherence to a healthy diet may lead to fluctuations in blood glucose levels, which differed from those observed in other NCDs (Whiteley et al., 2023). Therefore, during follow-up periods at hospitals, implementing organized activities or alternative interventions may assist volunteers with diabetes in overcoming these challenges, reducing medication dependency, and gradually resuming normal life (Kanaley et al., 2022). However, continuous research in exercise and nutrition specifically designed for patients with diabetes is imperative. Addressing CKD requires time and resources for both patients and healthcare providers. In our study, individuals with CKD had significant reductions in blood glucose levels and blood pressure alongside improvements in

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BMI and body composition which highlighted the multifaceted benefits of exercise in managing chronic conditions (Eglseer et al., 2023) **(Figure 4)**.

Due to delayed recruitment and the limited sample size, the intervention duration was shortened, potentially affecting the study's outcomes. Although improvements were observed in BMI and blood glucose levels at 6 and 9 months, other parameters such as fat mass, muscle mass, and protein levels showed non-statistically significant changes similar to previous findings (Swift et al., 2014; Westcott, 2012). CKD presents challenges in weight and blood glucose management which exacerbated by factors such as edema and hormonal imbalances (Kumar et al., 2023). Dietary interventions (including low-protein diets) aim to mitigate glomerular filtration issues but may affect muscle mass and weight over time (Wing et al., 2013). Collaboration between researchers and medical personnel is essential to optimizing interventions for CKD patients and promoting holistic health management for NCDs (Gatlin et al., 2024). A sedentary lifestyle is a well-documented contributor to early death and numerous non-communicable illnesses. Lack of physical activity often leads to weight gain and an increased BMI, accompanied by the accumulation of abdominal fat (Kazmi et al., 2022). Furthermore, sedentary habits contribute to inflammation within the body and trigger endothelial dysfunction, both of which are key factors in the development of NCDs (Yang et al., 2023). Moreover, physical inactivity exacerbates insulin resistance, further heightening the risk of NCDs (Yaribeygi et al., 2021). Resistance band training has been found to improve muscular strength, endurance, and functional capacity in individuals with various non-communicable diseases, such as cardiovascular disease, diabetes, and obesity (Bueno-Antequera & Munguía-Izquierdo, 2020; Lopes et al., 2019; Ito, 2019). These programs are particularly beneficial for older adults, as they provide a safe and low-impact form of strength training. RBE have been associated with improvements in blood pressure, glucose control, and lipid profiles in individuals with chronic conditions (McGinley et al., 2015). A meta-analysis of randomized controlled trials found that exercise training using resistance bands led to significant improvements in glycemic control and strength in patients with type 2 diabetes mellitus (McGinley et al., 2015). Furthermore, resistance band training has been shown to enhance balance, mobility, gait function, flexibility, and fall efficacy in elderly populations (Kwak et al., 2016; Yasuda et al., 2015).

Figure 4. Outcomes measurement (Documented by authors).

The versatility and portability of resistance bands make them an accessible and convenient option for home-based exercise programs. This is particularly important for individuals with limited mobility or access to gym facilities. Structured resistance band exercise programs can be tailored to meet the specific needs and limitations of patients with chronic conditions (Bueno-Antequera & Munguía-Izquierdo, 2020). Incorporating resistance band training into a comprehensive exercise program, along with aerobic exercise and flexibility training, can provide a well-rounded approach to managing chronic conditions and promoting overall health (American College of Sports Medicine [ACSM], 2018). The American College of Sports Medicine (ACSM) recommends that adults engage in resistance training at least two days per week, targeting all major muscle groups (ACSM, 2018). RBE can effectively target these muscle groups which leading to improvements in muscular strength, endurance, and overall physical function (Lopes et al., 2019). In the present study, through consistent exercise with the resistance bands, individuals achieved weight loss and a reduction of abdominal fat.

Conclusion

Our study highlights the positive impact of RBE on various health parameters in both healthy individuals and patients with NCDs. Among participants who engaged in regular exercise—whether standard routines or those specifically developed by the research team—significant improvements were observed in BMI, body composition, and blood glucose levels. Notably, these benefits extended to individuals with obesity-related conditions, diabetes, and CKD. Across different patient groups and study durations, consistent reductions in BMI, body fat percentage, and blood glucose levels were observed, underscoring the potential of RBE in promoting overall health, ensuring safety, optimizing outcomes, and managing chronic conditions. The management of NCDs is complex, as it involves interactions between medication

efficacy, hormonal balance, and metabolic factors. This necessitates close collaboration among healthcare professionals to achieve the best possible patient outcomes. RBE has emerged as a promising intervention for improving health parameters while maintaining patient safety. Furthermore, this study highlights the critical role of interprofessional collaboration in optimizing exercise-based interventions. Nurses, working alongside physiotherapists, can address both the physical and psychological needs of patients, ensuring a more comprehensive approach to care. Integrating RBE into existing chronic disease management programs fosters a patient-centered approach that aligns with evidence-based practices. As structured exercise programs become increasingly recognized as essential components of disease prevention and treatment, RBE offers a practical and scalable strategy for improving patient outcomes. Future research should explore the long-term effects of RBE, particularly its potential impact on mental health and overall quality of life. Strengthening the integration of RBE into healthcare settings can lead to better patient and reinforce the importance of exercise in comprehensive chronic disease care.

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Authors' insight

Key points

- RBE significantly improves body composition and metabolic health in patients with NCDs both in clinical and community setting.
- Compared to low-intensity exercise, RBE leads to greater reductions in BMI, body fat percentage, and blood glucose levels.
- As a low-cost, accessible, and versatile form of exercise, RBE can be easily integrated into daily routines and provide an efficient strategy for improving overall health outcomes.

Emerging nursing avenues

- How does resistance band exercise compare to other forms of physical activity in improving health outcomes for patients with non-communicable diseases?
- What are the underlying mechanisms by which resistance band exercise reduces BMI, body fat, and blood glucose levels in NCD patients?
- Can resistance band exercise be effectively implemented as a long-term, sustainable intervention for managing non-communicable diseases in diverse patient populations?

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