**Supplementary Materials**

**Appendix 1**

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**Appendix 2**

***Exercise program***

In the beginning, the enrollees would receive at least once an hour of group class, to give them adequate knowledge about nutrition and exercise, to understanding the benefits of exercise on diabetes control, and to tutor them to correct perform exercise program by themselves at home. Following, the enrollees must carry out a 12-week, home-based, self-help exercise program with 2 parts: elastic bands (Thera-Band®, the Hygenic Corporation, Akron, OH, USA) resistance exercise part, and smart bracelet pedometer monitored daily ten-thousand-steps walking aerobic exercise part.

In the elastic band resistance exercise part, the selection of degree of resistance load with different color was based on the initial grip strength presentation of the enrollees. Most of the enrollees adopted red color elastic band for the resistance training because of mild to moderate frailty. And also, for the practice convenience of home-based program, we did-not change the elastic band color in a progressive manner like the traditional models. 1,2 Instead, we tutored the enrollees to shortened the holding length of the elastic bands to increase the resistance difficulty to enhance the training effect in a tolerable manner. The program was performed at a frequency of 2 times per week over 12 weeks for a total of 24 sessions at home. Each session lasted 30 minutes and consisted of 10 minutes of general warm-up followed by 30 minutes of elastic band resistance exercise and finally 10 minutes of cooling down. For the elastic band resistance exercise, we designed 1 or 2 types of exercises for training each muscle group, namely the shoulder horizontal abduction, elbow extension, hip abduction, knee extension, trunk extension and trunk side bending. For each type of exercise, 3 sets of 10 repetitions of gentle concentric and eccentric contractions through the full range of motion were performed slowly, and an intensity of level 11 of Rate of Perceived Exertion Scale (RPE) was expected to achieve. 3 Each enrollee would be given an exercise record booklet, which contained sports safety precautions and movement illustrations. They were ordered to record the subjective intensity of the resistance exercise each set in 3 levels: laughing face representing easy going, smiling face representing tolerable, and crying face representing hard doing. The clinically experienced physical therapist would guide the enrollees in the group exercise class monthly to execute self-aided home program correctly and safely.4

In the aerobic exercise part, a smart bracelet pedometer monitored daily ten-thousand-steps walking program was launched. The smart bracelet could connect private cell phone to upload daily steps record to the cloud data bank through which investigators could monitor the aerobic exercise performance of the enrollees. The physical therapist would guide the enrollees to handle pedometer correctly at the first and ongoing monthly group classes, and to encourage them to practice daily ten-thousand-steps walking.

***Nutrition consultation and education***

Nutrition intervention schedule was designed to accommodate monthly group classes schedule. The content of the first visit included: (1) Evaluate daily protein intake of the enrollees through 24-hour diet recall; (2) Calculate the daily protein requirement together with any restrictions, e.g., severe renal impairment; (3) Knowledge about the protein food types; (4) How to modify diet to achieve 1.2g protein per kg body weight; (5) How to achieve the best utility of the ingested protein. The contents of the mid-term visit included emphasizing the importance of proper protein intake in cooperated with muscle strength training. Final visit would confirm daily protein intake to reach 1.2g per kg body weight through 24-hour diet recall, and emphasize the importance of maintaining new diet habit.

**Appendix 3**

A detailed *P*-value of the Kolmogorov-Smirnov or Shapiro-Wilk test of every continuous variable in Table 1.

|  |  |  |
| --- | --- | --- |
|  | Before | After |
| Body Mass Index (kg/m2) | 0.200 | 0.200 |
| Fried Frailty Phenotype | <0.001 | <0.001 |
| Walking speed (m/s) | 0.200 | 0.200 |
| Handgrip strength (kg) |  |  |
| Male | 0.298 | 0.600 |
| Female | 0.200 | 0.200 |
| Relative appendicular muscle mass (kg/m2) |  |  |
| Male | 0.329 | 0.272 |
| Female | 0.099 | 0.121 |
| Muscle quality (kg/kg/m2) | 0.200 | 0.200 |
| Sarcopenia (%) |  |  |
| Mini-Mental State Examination | <0.001 | <0.001 |
| Geriatric Depression Scale-5 | <0.001 | <0.001 |
| Barthel score |  |  |
| Instrumental Activities of Daily Living | <0.001 | <0.001 |
| Fasting blood sugar (mg/dl) | 0.031 | 0.035 |
| HbA1c (%) | 0.039 | 0.200 |
| Symptomatic hypoglycemic episodes (times/month) | <0.001 | <0.001 |
| Daily protein intake per kg body weight (g/kg/day) | 0.200 | 0.200 |

**Appendix 4**

A detailed *P*-value of the Kolmogorov-Smirnov or Shapiro-Wilk test of every continuous variable in Table 3.

|  |  |
| --- | --- |
| Age (years-old) | 0.005 |
| Male gender (%) | NA |
| Group class attendance (times) | 0.004 |
| Program adherence (times/week) | 0.004 |
| Body Mass Index (kg/m2) | 0.200 |
| Fried Frailty Phenotype | <0.001 |
| Walking speed (m/s) | 0.200 |
| Muscle quality (kg/kg/m2) | 0.200 |
| Sarcopenia (%) | NA |
| Mini-Mental State Examination | <0.001 |
| Geriatric Depression Scale-5 | <0.001 |
| Barthel score | NA |
| Instrumental Activities of Daily Living | <0.001 |
| Fasting blood sugar (mg/dl) | 0.031 |
| HbA1c (%) | 0.039 |
| Symptomatic hypoglycemic episodes (times/month) | <0.001 |
| Daily protein intake per kg body weight (g/kg/day) | 0.200 |

**Supplementary references:**

1. Huang SW, Ku JW, Lin LF, et al. Body composition influenced by progressive elastic band resistance exercise of sarcopenic obesity elderly women: a pilot randomized controlled trial. *Eur J Phys Rehabil Med.* 2017;53(4):556-563.

2. Park BS, Khamoui AV, Brown LE, et al. Effects of Elastic Band Resistance Training on Glucose Control, Body Composition, and Physical Function in Women With Short- vs. Long-Duration Type-2 Diabetes. *J Strength Cond Res.* 2016;30(6):1688-1699.

3. Borg GA. Psychophysical bases of perceived exertion. *Med Sci Sports Exerc.* 1982;14(5):377-381.

4. Tsekoura M, Billis E, Tsepis E, et al. The Effects of Group and Home-Based Exercise Programs in Elderly with Sarcopenia: A Randomized Controlled Trial. *J Clin Med.* 2018;7(12):480.