

Construction of an Exercise Intervention Program for Patients with Sarcopenic Obesity: A Delphi Method Study

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Purpose: Construct an exercise intervention program for patients with sarcopenic obesity.

Material and Methods: Based on the COM-B theoretical model and evidence-based principles, the program was constructed using qualitative methods of literature analysis and Delphi method. The Delphi panel consisted of 15 experts from the fields of clinical medicine, rehabilitation medicine, medical technology, and nursing.

Results: Fifteen experts were consulted, and the consultation recovery rate was 100%; the authority coefficient of the 1st round was 0.83, with coefficients of variation ranging from 0.00 to 0.27, and importance scores ranging from (4.13±1.13) to (5±0); the authority coefficient of the 2nd round was 0.82, with coefficients of variation ranging from 0.00 to 0.20, and importance scores ranging from (4.53±0.64) to (5±0); Kendall's harmony coefficient was 0.102, 0.115, respectively, and the differences were statistically significant ($P < 0.05$). The constructed exercise intervention program for patients with sarcopenic obesity included 4 primary indicators, 12 secondary indicators, and 28 tertiary indicators.

Conclusion: The constructed exercise intervention program for patients with sarcopenic obesity is scientific, feasible and generalizable, and can provide useful reference for related personnel to develop exercise programs for patients with sarcopenic obesity.

Keywords: sarcopenic obesity, exercise, older adults, COM-B theoretical model, evidence-based nursing, delphi method

Introduction

Sarcopenic Obesity (SO) is a condition characterized by the coexistence of excessive obesity and loss of muscle mass or muscle function, and is prevalent in the elderly population.¹ According to the Health and Nutrition Examination Survey, the prevalence of SO is 12.6% in males and 33.5% in females,² and with the rapid growth of the global elderly population, it is estimated that 100–200 million people will be affected by SO by the year 2051.³ SO reduces the quality of life of the patients, and induces the risk of fall, fracture, disability, or increased mortality.⁴ Currently, there is no cure for SO, and its main treatments include exercise intervention, nutritional intervention, bariatric surgery and drug intervention; among them, the effect of exercise intervention to improve sarcopenic obesity is more certain.^{5,6} Exercise may delay the onset and progression of SO by modulating protein metabolism, inflammatory responses, mitochondrial function, and muscle factors.⁷ Aerobic exercise reduces adipose tissue and helps treat obesity by increasing energy expenditure and improving insulin sensitivity.^{8,9} Resistance exercise promotes the increase of skeletal muscle mass, muscle strength and fat tissue reduction in the elderly.¹⁰ However, there is no clear exercise guideline for patients with sarcopenic obesity, and the existing research focuses on the evaluation of the effect of exercise intervention in patients with sarcopenic obesity,^{11,12} which has not yet formed a systematic and targeted exercise practice program. For this reason, we aimed to systematically search and analyze the literature, collating, conducting, and summarizing previous research results, and constructing an exercise intervention program for patients with sarcopenic obesity. On the

basis of an evidence-based approach, we hope it can provide a useful reference for the relevant personnel to develop the exercise program for patients with sarcopenic obesity.

Materials and Methods

Establishment of Research Group

The team consisted of one nursing faculty member (Ph.D., associate professor), one rehabilitation medicine faculty member (Ph.D., lecturer), one endocrinologist (M.S., attending physician), and two nursing graduate students (M.S. in progress). The graduate nursing students were responsible for literature search, screening, and quality assessment, the rehabilitation medicine faculty member and the endocrinologist were responsible for extracting information and constructing the first draft of the protocol, and the nursing faculty member was responsible for contacting the correspondence experts. The members of the team worked together to organize and analyze the results of the correspondence.

Construction of the First Draft of the Program

Theoretical Foundation

The COM-B theoretical model proposed by Michie et al¹³ scholars elaborate that human behavior change is influenced by ability, opportunity and motivation. Ability refers to the physical and mental abilities required to perform a specific behavior; opportunity refers to the conditions for performing a behavior in a specific environment, including physical and social opportunities; and motivation refers to the desire or intrinsic drive to perform a behavior, including reflective and spontaneous motivation.¹⁴ In developing the exercise intervention program, the COM-B theoretical model was used as a guide, and ability, motivation, opportunity, and behavior were used as first-level indicators. Physical health status and environmental influences were used as ability factors, disease knowledge, health education, and social support as opportunity factors, and self-intentions, etc., as motivational factors to promote the generation and maintenance of patients' exercise behaviors.

Literature Search

In accordance with the “6S” (Systems, Summaries, Synopses of syntheses, Syntheses, Synopses of Studies, Studies) evidence resource pyramid model,¹⁵ the literature related to exercise interventions for patients with sarcopenic obesity was systematically searched in the International Guidelines Collaboration, the website of the Association of Registered Nurses of Ontario (ARNO) in Canada, the websites of the guideline networks and professional associations such as Medline, the database of the Centre for Evidence-Based Health Care of the Joanna Briggs Institute (JBI) in Australia, the Cochrane Library, OVID, Embase, PubMed, China Knowledge Network (CKN), Vip, Wanfang and other databases. Using a combination of Mesh words and free words, “sarcopenic obesity/obese sarcopenic/obese sarcopenic/obese sarcopenic/obese sarcopenic” and “Physical activity/exercise” were the Chinese search terms. “Sarcopenic obesity/sarcopenic obese/obese sarcopenic/sarcopenia obesity/obese sarcopenia” “exercise/exercises/physical Activity/physical Exercise/acute Exercise/isometric Exercise/aerobic Exercise/exercise Training/resistance exercise” were the English search terms. Meanwhile, “sarcopenia/muscle sarcopenia/skeletal muscle loss/muscle wasting syndrome”, “exercise intervention/exercise/training/resistance training/exercise/aerobic exercise/physical activity/exercise” were used as the search terms in Chinese, “sarcopenia” “exercise/exercises/physical Activity/physical Exercise/acute Exercise/ isometric Exercise/aerobic Exercise/exercise Training/resistance exercise” as English search terms, search guidelines, expert consensus and evidence summaries. The search terms are “obesity” in Chinese, “obesity” in English, search guidelines and expert consensus. The search period is from January 2018 to June 7, 2023. Using PubMed as an example, the search form is (“sarcopenic obesity” or “sarcopenic obesity” or “obese sarcopenic” or “sarcopenic obesity” or “obese sarcopenic”) and (“exercise” or “sport” or “physical activity” or “physical activity” or “acute exercise” or “isokinetic exercise” or “aerobic exercise” or “athletic training” or “resistance exercise”).

Literature Inclusion and Exclusion Criteria

Inclusion Criteria: ① The study subjects were patients with sarcopenic obesity; ② The content was exercise intervention or exercise management for patients with sarcopenic obesity; ③ Publicly available guidelines, evidence summaries,

expert consensus, systematic evaluations and Meta-analyses; ④ Inclusion of the latest version of the guidelines; ⑤ The language was Chinese or English.

Exclusion criteria: ① Incomplete information or inaccessible full-text literature; ② Repeatedly published literature; ③ Literature with low quality evaluation.

Literature Screening and Quality Assessment

The methodological quality of all included literature was independently evaluated by 2 researchers who have systematically studied evidence-based nursing, and a third evidence-based nursing researcher arbitrated when there was a disagreement in the evaluation. Guidelines were evaluated for methodological quality using the Appraisal of Guidelines for Research and Evaluation Instrument for Clinical Practice (AGREE II),¹⁶ and expert consensus was evaluated for methodological quality using the JBI Center for Evidence-Based Health Care Expert Consensus Evaluation Criteria,¹⁴ retrospective evidence summarization of original studies, quality evaluation of original literature using quality evaluation tools proposed by the JBI Centre for Evidence-Based Health Care in Australia for different types of studies, and systematic evaluation and Meta-analysis using the Assessment of Multiple Systematic Reviews 2 (AMSTAR2) for methodological quality assessment.¹⁷

Development of the First Draft of the Program

After completing the quality assessment, two researchers trained in evidence-based nursing independently extracted and synthesized evidence from the included literature to form a first draft of the exercise intervention protocol. In case of disagreement during the extraction process, a third evidence-based nursing researcher arbitrated.

Delphi Method

Preparation of the Questionnaire

According to the first draft of the program and the purpose of the Delphi method research group prepared the questionnaire, which consists of three parts: ① Questionnaire description mainly introduces the background of the study, the purpose of the study and instructions for filling out the form. ② The body of the questionnaire refers to the experts evaluation of the exercise intervention program for patients with sarcopenic obesity, the importance of each entry is rated from 1 to 5, with 1 representing very unimportant and 5 representing very important, and an opinion column is set up after each entry for experts to provide suggestions. ③ Questionnaire on basic information of experts.

Expert Selection Criteria

① Endocrinologists, rehabilitation doctors, sports rehabilitation therapists, geriatric specialist nurses, etc.; ② More than 10 years of work experience in the related work field; ③ With undergraduate education or above, intermediate or above titles; ④ Voluntary participation in this study, able to provide timely feedback results, and to provide valuable suggestions for the content of the program.¹⁸

Implementation of Delphi Method

Fifteen experts were selected for questionnaire correspondence, and the questionnaires were distributed by e-mail and returned within 14 days after distribution. According to the results of the first round of expert consultation, the mean value of the importance score >4 and the Coefficient of Variation (CV) <0.25 were taken as the screening criteria, and each specific opinion of the experts was added, modified or deleted accordingly to form the second round of the questionnaire, and the consultation was terminated when the experts' opinions converged.

Statistical Methods

SPSS 26.0 software was used for data analysis. Measurement data were described by $(\bar{X} \pm S)$, and count data were statistically described by frequency and percentage. Expert positivity was expressed by the effective recovery rate of the questionnaire and the rate of expert opinions presented. The degree of expert authority was expressed by the coefficient of expert authority (Cr), which was determined by the degree of familiarity (Cs) and the basis of judgment (Ca) of the

experts. The degree of expert opinion coordination was expressed by the coefficient of variation (CV) and Kendall's coordination coefficient (Kendall's W).

Results

First Draft of the Program

A total of 1306 articles were identified through the initial search. After deleting duplicates, further screening and quality evaluation using Endnote20 software, 12 articles were finally included, including 2 guidelines,^{19,20} 2 expert consensus articles,^{1,21} 1 evidence summary article,²² 5 systematic evaluations,^{7,11,23–25} and 2 Meta-analyses.^{26,27} Through literature reading and evidence extraction, the first draft of the exercise intervention program contains 4 primary indicators, 12 secondary indicators, and 29 tertiary indicators. The quality evaluation of the included literature is showed in [Supplementary Tables 1–3](#).

Results of Delphi Method

General Information of Experts

Fifteen experts in related fields were finally included in this study, and all experts completed 2 rounds of correspondence. Their ages ranged from 38 to 53 (44.53±4.90) years old; their working years ranged from 11 to 35 (20.67±7.61) years; they had 9 PhDs, 2 master's degrees, and 4 bachelors' degrees; they had 4 full-senior titles, 7 vice-senior titles, and 4 intermediate titles; among them, there were 4 experts in clinical medicine, 4 experts in rehabilitation medicine, 2 experts in medical technology, and 5 experts in clinical nursing and geriatric nursing.

The Degree of Motivation and Authority of Experts

Fifteen questionnaires were issued for the 2 rounds of Delphi method, and 15 valid questionnaires were recovered, with a 100% effective recovery rate of the questionnaires. The rate of expert opinions presented was 73% and 60% respectively. The Ca, Cs, and Cr of the experts in the 1st round were 0.97, 0.7, and 0.83, respectively. The Cs, Ca, and Cr of the experts in the 2nd round were 0.97, 0.66, and 0.82, respectively.

Degree of Harmonization of Expert Opinions

The coefficient of variation of the 1st round of Delphi method was 0.00–0.27, and the importance score was (4.13±1.13)~(5±0); the coefficient of variation of the 2nd round was 0.00–0.20, and the importance score was (4.53±0.64)~(5±0); the coefficients of Kendall's harmonization were 0.102, and 0.115, respectively, and the differences were statistically significant ($p<0.05$).

Summary of Expert Opinions and Modifications

The panel made the following adjustments to the program indicators based on expert opinions, screening criteria and statistical results:

The first round of expert consultation: ① Deletion of 2 entries: Deletion of 2 Level 3 indicators with coefficient of variation > 0.25 “1.1.2 Recording aerobic exercise and resistance exercise teaching videos according to Fitness Qigong - Baduanjin” and “Elastic band strength exercise program” recommended by the State General Administration of Sport. “Record aerobic exercise and resistance exercise teaching videos” and “4.5.5 Make exercise score cards, record the number of lectures attended and exercises participated, and set up corresponding reward mechanisms”. ② Modification of 14 entries: the modifications are mainly describing the specialists who conduct the assessment, evaluating the patient's fitness level and refining the contraindications; adding a rehabilitation therapist to conduct the exercise instruction and reorganizing this entry as a social opportunity; combining entries 1.2.1 and 1.2.2 and focusing on improving the patient's psychological competence; adjusting the entries' serial numbers 2.1.2 and 2.1.3; continuing to follow up on the reasons affecting the patient's exercise and concerns; increasing social opportunities such as environmental and fitness resources; expanding social support beyond family and friends; adding rehabilitation physicians to the study team; increasing forms of aerobic exercise; adjusting individualized choices of elastic bands; increasing core muscle training; adjusting the duration of exercise; combining entries 4.5.1 and 4.5.3; and adding observations of exercise injuries.

The 2nd round of Delphi method: ① Modification of 7 entries: the modifications were to add objective indicators of relative contraindications; to interchange level 2 indicators 2.2.1 and 2.2.2; to increase the number of training staff; to merge entries 4.1.4 and 4.1.5; to adjust the descriptions of the duration of the exercise; to supplement the descriptions of the intensity of the exercise; and to modify the descriptions of the adjustment of the intensity of the exercise.

The final result was an exercise intervention program for patients with sarcopenic obesity with 4 indicators at level 1, 12 indicators at level 2, and 28 indicators at level 3, as shown in [Table 1](#), and a thumbnail sketch of an exercise intervention programs is showed in [Supplementary Figure 1](#).

Table 1 Exercise Intervention Program for Patients with Sarcopenic Obesity

Norm	Importance Score ($\bar{X} \pm S$)	Coefficient of Variation (CV)	Perfect Score (%)
1. Ability	4.87±0.52	0.11	93.33
1.1 Physical ability	4.93±0.26	0.05	93.33
1.1.1 Assessment of the patient by a rehabilitation physician for the presence of contraindications to exercise (including absolute and relative contraindications) and fitness level (including body composition, cardiorespiratory fitness, muscular fitness, flexibility fitness and balance fitness)	4.87±0.35	0.07	86.67
1.1.1.1 Absolute contraindications: unstable vital signs (eg, cerebral hemorrhage), serious complications (eg, lower extremity venous thrombosis), serious cardiovascular problems, joint problems (eg, joint pain), fracture risk (eg, low bone mineral density), respiratory problems (eg, asthma), etc.; Relative contraindications: systolic BP ≥180 mm Hg or diastolic BP ≥100 mm Hg or resting heart rate exceeding 120 beats per minute or due to other reasons for contraindication to exercise	4.87±0.35	0.07	86.67
1.2 Mental capacity	4.87±0.52	0.11	93.33
1.2.1 Organize collective sharing and exchange sessions, inviting patients with better exercise behaviors to share their exercise experiences and feelings, while encouraging other patients to express their thoughts and understandings about exercise interventions, etc., once every 4 weeks for a total of 3 times	4.60±0.74	0.16	73.33
2. Motivation	4.60±0.91	0.20	80.00
2.1 Spontaneous motivation	4.80±0.56	0.12	86.67
2.1.1 Organize health talks, 2 times before intervention	4.67±0.62	0.13	73.33
2.1.1.1 Health Lecture 1: Teaching disease-related knowledge, prevention and control strategies for SOs	4.67±0.62	0.13	73.33
2.1.1.2 Health Talk 2: Teaching the role and significance of exercise interventions for SO	4.67±0.49	0.10	66.67
2.2 Reflective Motivation	4.60±0.51	0.11	60.00
2.2.1 Continuous understanding of patients' willingness to exercise and influencing factors during the assessment phase and exercise process, and encouragement of patients' adherence to exercise	4.80±0.41	0.09	80.00
3. Opportunity	4.60±0.63	0.14	66.67
3.1 Physical Opportunities	4.67±0.62	0.13	73.33
3.1.1 Selection of individualized exercise programs and intensities based on patients' fitness levels, health status and preferences	4.80±0.41	0.09	80.00

(Continued)

Table I (Continued).

Norm	Importance Score ($\bar{X} \pm S$)	Coefficient of Variation (CV)	Perfect Score (%)
3.2 Social opportunities	4.53±0.64	0.14	60.00
3.2.1 Effective family and social support for patients from family and friends	4.60±0.63	0.14	66.67
3.2.1.1 Invite all older persons in nursing facilities, their families and staff to attend the first health seminar to raise awareness and understanding of SO among the general public	4.53±0.64	0.14	60.00
3.2.2 Formation of a multidisciplinary team of endocrinologists, rehabilitation physicians, rehabilitation therapists, geriatric specialist nurses, and graduate nursing students for patient exercise programs	4.67±0.62	0.13	73.33
3.2.3 Rehabilitation therapists were invited to provide movement guidance to patients and staff to enable them to perform movement in a correctly standardized and safe manner for a total of 2 times before the intervention. The staff members who had mastered the intervention process instructed and corrected the movements of the patients to ensure the quality of the intervention.	4.80±0.41	0.09	80.00
3.2.4 Provision of fitness equipment and sports field support by intervention teams	4.60±0.74	0.16	73.33
4. Behavior	5.00	0	100.00
4.1 Types of campaigns	5.00	0	100.00
4.1.1 Use of a mixed exercise program including warm-up, aerobic exercise, resistance exercise, relaxation	4.73±0.8	0.17	86.67
4.1.2 Warm-up: neck flexion and extension, shoulder encirclement, elbow flexion and extension, leg opening and closing, alternating leg lifts, ankle encirclement.	4.87±0.52	0.11	93.33
4.1.3 Aerobic exercise: Ba Duan Jin or aerobic fitness exercises or acupoint tapping exercises, personalized according to the patient's fitness level and preferences, etc.	4.87±0.35	0.07	86.67
4.1.4 Resistance Exercise: Perform elastic band bound squats, elastic band reverse grip chest thrusts, elastic band rowing, elastic band single leg standing back kicks, elastic band lifts, elastic band chair sits and stands and elastic band curls, according to the elastic band strength workouts recommended by the General Administration of Sport of China	4.73±0.59	0.13	80.00
4.1.5 Relaxation: Stretching exercises such as neck stretching, shoulder stretching, back stretching, abdominal muscle stretching, lumbar muscle stretching, gluteal stretching, quadriceps stretching, calf stretching, leg stretching, and arm stretching	4.8±0.56	0.12	86.67
4.2 Duration of the campaign	4.93±0.26	0.05	93.33
4.2.1 40–50 minutes per session. Includes: warm-up 5 min, aerobic exercise 15–20 min, resistance exercise 15–20 min, and relaxation exercise 5 min. Note: For patients who are unable to consistently complete a full training regimen, rest for 5–10 min after aerobic exercise and then perform resistance exercise.	4.8±0.56	0.12	93.33
4.3 Frequency of movement	5.00	0	100.00
4.3.1 Group exercise was used, with exercise taking place 3 times a week on Tuesdays, Thursdays and Saturdays for a total of 12 weeks of intervention	4.93±0.26	0.05	93.33
4.4 Exercise intensity	5.00	0	100.00

(Continued)

Table I (Continued).

Norm	Importance Score ($\bar{X} \pm S$)	Coefficient of Variation (CV)	Perfect Score (%)
4.4.1 Warm-up: each movement is performed for 1min, a total of 2 groups; resistance exercise: choose the American Sailor Thera-band elastic band, there are 8 colors such as teal, yellow, red, green, blue, black, silver and gold, etc., according to the patient's own situation to choose the color of the band to start the exercise. Each movement is performed 10–15 times, a total of 2–3 groups, rest 1–2min between groups; relaxation: each movement is performed 30s times, a total of 1–2 groups	4.87±0.35	0.07	86.67
4.4.2 Exercise intensity was moderate. The objective measure is to reach 50% to 80% of the maximum heart rate during exercise; the subjective measure is to reach a fatigue level of 12 to 14 on the RPE scale during exercise	4.93±0.26	0.05	93.33
4.4.3 Resistance Exercise After the last training session every two weeks, the color of the elastic band was personalized and the number of sets was increased according to the RPE score and heart rate	4.87±0.35	0.07	86.67
4.5 In-motion monitoring	4.80±0.56	0.12	86.67
4.5.1 Monitor and record basic vital signs (blood pressure, heart rate, oxygen saturation) and fatigue during exercise, and immediately terminate exercise when systolic blood pressure is ≥ 180 mmHg or decreases in systolic blood pressure accompanied by an accelerated heart rate, with a decrease of ≥ 20 mmHg, or when blood oxygen saturation (SpO ₂) decreases, persistently falling below 85% or when there is significant fatigue or obvious discomfort that is incompatible with exercise	4.87±0.35	0.07	86.67
4.5.2 Observe the occurrence of adverse events (eg, falls) and sports injuries during exercise, and provide emergency treatment on site according to the specifics of the patient's adverse reactions	4.93±0.26	0.05	93.33
4.5.3 Upload weekly exercise diaries to the microblogging group and adjust the specifics of the exercise program in a timely manner based on patient feedback	4.60±0.83	0.18	73.33
4.6 Evaluation of the effectiveness of the campaign	4.87±0.52	0.11	93.33
4.6.1 Assessment of Body Mass Index, Waist Circumference, Muscle Strength, Body Mechanisms in SO Patients Energy (Embodied Fitness Levels) and Skeletal Muscle Mass	5.00	0	100.00
4.6.2 Assessing changes in patients' exercise self-efficacy and quality of life before and after the intervention	4.87±0.52	0.11	93.33

Abbreviations: SO, sarcopenic obesity; "6S", Systems, Summaries, Synopses of synthesis, Syntheses, Synopses of Studies, Studies; ARNO, the website of the Association of Registered Nurses of Ontario; JBI, Centre for Evidence-Based Health Care of the Joanna Briggs Institute; CNKI, China Knowledge Network; AGREE II, Appraisal of Guidelines for Research and Evaluation Instrument for Clinical Practice; AMSTAR2, Assessment of Multiple Systematic Reviews 2; CV, Coefficient of Variation coefficient of expert authority; Cs, degree of familiarity; Ca, basis of judgment; Kendall's VV, Kendall's coordination coefficient.

Discussion

The Exercise Intervention Program for Patients with Sarcopenic Obesity is Scientific and Feasible

Based on the COM-B theoretical model and evidence-based methodology, this study searched the literature layer by layer according to the "6S" evidence resource pyramid model, and after repeated selection and quality evaluation by two people, the high quality literature was included, the evidence was extracted and summarized to form the first draft of the exercise intervention program, and after two rounds of experts' correspondence, the final program was determined, and the methodology of the intervention program was scientifically sound.

The 15 experts who participated in the correspondence were from the fields of clinical medicine, rehabilitation medicine, medical technology, and nursing, all of whom had solid theoretical foundations and rich clinical practice experience. The effective recovery rate of the questionnaires for the 2 rounds of Delphi method was 100%, and the rate of expert opinions presented was 73% and 60%, respectively, indicating that the experts in the two rounds of consultation had a high degree of motivation. In general, an expert's authority coefficient higher than 0.7 is considered acceptable, and ≥ 0.8 indicates a high degree of expert authority.²⁸ In this paper, the expert authority coefficients are 0.83 and 0.82 respectively, indicating that the correspondence results are authoritative and reliable. The smaller the coefficient of variation, the higher the degree of harmonization of experts,²⁹ the coefficient of variation in this paper is 0.00–0.27 and 0.00–0.20, respectively, indicating that the experts' opinions are more consistent. Kendall's harmony coefficient ranges from 0 to 1, the closer to 1 indicates that the better the degree of coordination,³⁰ the Kendall's harmony coefficient of correspondence in this paper were 0.102, 0.115 ($P < 0.05$), although not close to 1, but the value of the second round increased, indicating that the experts have achieved a higher degree of consensus, the degree of coordination of the correspondence is good, and the contents of the program constructed are scientific and feasible.

The Constructed Exercise Intervention Program for Patients with Sarcopenic Obesity is Operable and Applicable

Based on the COM-B theoretical model, this study considers the three dimensions of ability, motivation, and opportunity comprehensively to ensure that patients receive the best support and guidance in exercise. ① Ability: the patients' potential to perform exercise was assessed from both physical and mental ability aspects. In terms of physical ability, the rehabilitation physician assesses whether the patient has absolute and relative contraindications to exercise. The psychological ability of patients is improved through group sharing and exchange sessions. ② Motivation: Through health lectures, patients are taught the basic knowledge of sarcopenic obesity disease and the role and significance of exercise interventions to improve their spontaneous motivation and to improve their reflective motivation by continuously understanding their willingness to exercise and the factors influencing them during the exercise process. ③ Opportunity: provide patients with physical opportunities through the choice of personalized exercise programs, and social opportunities through the support of family and friends and the surrounding environment. ④ Behavior: Under the joint action of ability, motivation and opportunity, it promotes the emergence of patients' exercise behavior. This plan puts forward multi-mode exercise therapy. Aerobic exercise can not only oxidize sugar in the body, burn fat in the body, enhance and improve heart and lung health, but also prevent osteoporosis. Among them, walking, aerobics and cycling are the main aerobic exercise methods.³¹

Resistance exercise is training for different muscle groups, which can enhance muscle quality and strength by stimulating muscle protein synthesis. Elastic belt, dumbbells, barbells and weighted sandbags are often used for resistance exercise.^{32,33} Resistance combined with aerobic exercise is better than single exercise in improving muscle strength, which is consistent with the research results of Hsu et al.²⁶ National and international standards and expert consensus²¹ state that exercise intensity should be moderate to high intensity. In summing up the characteristics of resistance training programs for patients with sarcopenia obesity, Silva pointed out that more than half of the studies chose the exercise intensity range of 40% to 85% of 1 Repetition Maximum (1 Repetition Maximum, 1RM).³⁴ However, in the actual operating environment, it is challenging to achieve accurate measurement and evaluation of 1RM. Because it is difficult to determine the difference of 1RM and each study often uses different measurement tools. Therefore, this protocol recommends that the resistance exercise intensity on Borg's conscious exercise table should be 12 to 14 points, and the aerobic exercise intensity should be 50% to 80% of the limit heart rate. This protocol suggests 40–50 minutes of exercise each time, and the intervention frequency is 2–3 times/week for 12 weeks, which is consistent with the suggestion of the British physical activity guide, that is, all elderly people should do 150 minutes of moderate intensity exercise or 75 minutes of intense intensity exercise twice a week. Eglseer et al believe that two or three times a week of exercise training can effectively reduce the percentage of body fat and improve muscle mass, muscle strength and gait speed.²⁴ This study states that patients' vital signs and the presence of adverse events should be monitored during exercise, providing assurance of patient exercise safety.²¹ It is also recommended to assess the changes in patients' fitness

level and quality of life, etc. at the end of the intervention to evaluate the effectiveness of exercise intervention in patients with sarcopenic obesity.

Limitations and Outlook

This work has two limitations. First, based on the feasibility and applicability of the exercise program, we currently use elastic belt to carry out resistance exercise. Although other types of resistance exercise, such as dumbbells, barbells and tensioners, have a significant impact on the improvement of muscle quality and strength, they require the elderly with SO to have a higher degree of balance and coordination, and we will study this issue in the future. Second, based on the lack of exercise intervention guidelines and expert consensus for sarcopenia obesity, this work systematically analyzes the guidelines and evidence related to sarcopenia and obesity, and constructs a new intervention plan. However, the effectiveness and feasibility of the intervention scheme constructed in this work need to be verified by clinical trials in the future. Therefore, when applying the intervention plan constructed in this work, it is suggested that it should be combined with rehabilitation or exercise intervention, and a professional team should formulate an individualized and feasible exercise intervention plan according to the patient's physical condition and living environment, so as to improve the quality of life of patients.

Conclusion

Based on the COM-B theoretical model and evidence-based principles, this study constructed an exercise intervention program for patients with sarcopenic obesity (including 4 aspects and 28 entries) by adopting the methods of evidence-based nursing and Delphi method, which provides a new path for exercise therapy for patients with sarcopenic obesity and has clinical value.

Ethical/Copyright Corrections

This manuscript is an analysis report of literature and expert opinions, and does not involve personal privacy or sensitive information. Hence, it does not require the approval of ethics committees.

Disclosure

The authors declare no conflicts of interest in this work.

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