

ORIGINAL RESEARCH

Examining the ability of artificial intelligence with ChatGPT-4.0 to create an exercise program: Case scenario examples "lumbar disc herniation, chronic migraine, and urge urinary incontinence"

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Abstract

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Artificial Intelligence (AI) is increasingly utilized in healthcare as wearable technology, virtual assistants, or to aid decision-making. This study evaluates the feasibility, effectiveness, and limitations of AI-based ChatGPT-4.0 in developing 8-week exercise programs for cases with lumbar disc herniation (LDH), chronic migraine (CM), and urge urinary incontinence (UUI). ChatGPT-4.0 was questioned about exercise frequency, intensity, type, duration, targeted muscles, repetitions, theraband strengths, perceived difficulty, and aerobic exercise recommendations. The answers given were evaluated by experts. Expert evaluations determined that ChatGPT-4.0 successfully created literature-based programs for LDH, CM, and UUI, including cervical, lumbar stabilization, and pelvic floor exercises. However, issues arose: theraband resistances and plank-like challenging exercises for LDH were introduced too early, potentially causing rapid progression. In CM, isometric exercises risk triggering attacks, and progression rates were accelerated in all cases. These findings highlight ChatGPT-4.0's inability to fully adapt programs to patient medical conditions, emphasizing the critical role of physical therapists in designing individualized exercise programs.

Introduction

Artificial Intelligence (AI) typically refers to computational technologies that mimic the mechanisms underlying human intelligence, such as reasoning, deep learning, adaptation, interaction, and sensory perception (Tagliaferri et al., 2020; Tran et al., 2019).

AI is increasingly transforming medical practices. Various AI applications in medicine can be used across various areas, including clinical, diagnostic, rehabilitation, surgical, and predictive applications. Another critical area where AI significantly impacts is clinical decision-making and disease diagnosis. AI technologies can ingest, analyze, and report large

volumes of data from different modalities to detect diseases and guide clinical decisions (Cho et al., 2020; Hamid, 2016). The potential of AI is indeed exciting; however, further studies will be necessary to determine the effectiveness and applications of AI in the field of medicine (Shortliffe & Sepúlveda, 2018).

Where healthcare professionals will position themselves in this development, how they will use AI-based technologies, and how AI-driven approaches will contribute to their clinical expertise are still new topics. The extent to which AI can be achieved and used in the clinic by diversifying exercise programs and aligning them with the literature is a matter of curiosity (Rowe, 2019). We are curious about the practical implications of using AI in physiotherapy to

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explore the potential benefits and limitations of AI in physiotherapy clinics. Therefore, this study aims to evaluate the feasibility, effectiveness, and limitations of AI-based ChatGPT-4.0 in developing tailored 8-week exercise programs for patients with chronic migraine (CM), lumbar disc herniation (LDH), and urge urinary incontinence (UUI) conditions.

Methods

Between October 1-11, 2024, two Ph.D. physiotherapists created exercise programs with ChatGPT-4.0 for three cases diagnosed by neurologist, orthopedist, and urologist. The AI-generated programs were reviewed by experts (D. O., H. A., Ş. G., L. I., A. Ö.) to meet patients' specific medical needs. Three patients were not evaluated or intervened in terms of physiotherapy and rehabilitation, and a consent form was obtained so that their clinical information could be interpreted as an article.

In addition to the studies conducted in the literature with arterial hypertension, osteoarthritis, anxiety & stress, T2DM and asthma & decreased pulmonary function cases, we wanted to address the previously unconsidered cases of lumbar disc herniation, chronic migraine and urge urinary incontinence in our study. This is the first reason for choosing these three areas. The second reason is that lumbar disc herniation, chronic migraine and urinary incontinence are actually examples of cases that we frequently encounter where patients research exercises on their own from the internet or artificial intelligence. Therefore, it is undesirable for exercises learned incorrectly with internet or artificial intelligence information to lead to negative clinical results.

Stages

The exercise program creation process with ChatGPT-4.0 included these steps:

1. Neurologists (A.Ö.), orthopedists (Ş. G.), and urologists (L.I.) provided patient cases scenario (CM, UUI, and LDH) from their clinics.
2. Cases were presented to ChatGPT-4.0, and six questions were asked to create an exercise program.
3. ChatGPT-4.0 generated the exercises and unanswered questions were repeated.
4. Programs were tabulated and evaluated by researchers.

Cases

Lumbar disc herniation

A 45-year-old female patient applied to the orthopedic clinic with complaints of low back pain (LBP) and numbness in the right leg (L5 dermatome) for the last 3 months. Her pain increases with coughing and sneezing and decreases with rest. She also states that she has been feeling weakness in her feet lately. The patient's BMI is 28.08 kg/m². When the patient's posture was evaluated, it was understood that she had a slight forward bend in the waist and an antalgic gait. In the palpation evaluation, tenderness in the lumbar region and trigger points at the L4-L5 level were found. In the lumbar joint ROM: Flexion: 60 degrees, Extension: 10 degrees, Rotation: Normal were found. In the strength evaluation, the right big toe dorsiflexion is weak (3/5), and the left foot is normal. Her reflexes are normal. Hypoesthesia (decreased sensation) in the L5 dermatome of the right leg. There is pain on the outer side of the leg, dorsum of the foot and the big toe, and numbness on the outer side of the leg and the big toe. MRI showed central extruded disc herniation in the L4-5 intervertebral disc, prominent L5 nerve root compression on the right, and spinal flattening and degenerative changes. Oswestry Disability Index assessment showed 40% (moderate disability) and pain intensity assessment was made on the VAS out of 10 (10=very severe pain): 7/10 for LBP, 6/10 for leg pain. The patient was diagnosed with L5 disc herniation based on examination and radiological findings. The patient was recommended for pharmacological treatment: Rantudil 60 mg tb 2x1, Panto 40 mg tb 1x1, and epidural steroid injection. An exercise program was recommended after the patient's pain complaints decreased.

Chronic migraine

A 34-year-old female patient working in a hotel applied to the neurology clinic because she had been experiencing recurrent headache attacks that had become more frequent in the last year. The patient stated that the frequency of her throbbing, squeezing headaches was 10 times a month and that the duration of an attack was 12 hours. The patient had photophobia, phonophobia, dizziness, and visual aura, and sometimes NP. In addition, the patient, who has anxiety, has headaches triggered by stress, menses, fatigue, insomnia, seasonal conditions, and sleeping too much. The patient's headache intensity was 8 out of 10 (10=very severe pain) on the VAS. The patient was diagnosed with CM as a result of the examination. Pharmacological treatment was recommended to the

patient, Ecopirin Pro: 1 dose in the morning, Folbiol tb: 1 dose in the morning, Topamax 25 mg: 1 dose in the evening, 1 dose after 1 week in the morning and evening, Selectra 25 mg: 1 dose in the morning. The patient stated that her headache was relieved at the end of 1.5 months. An exercise program was recommended to the patient.

Urge urinary incontinence

A 56-year-old female patient applied to the urology clinic due to UUI that had been going on for 2 years. No pathology such as cystocele, stress incontinence, stress test, prolapse, or urethral mobility was detected in the physical examination. No residual urine was observed in the uroflowmetry test, Qmax 15 ml/s voided volume 180 ml Qort 7 ml/sn. The patient was administered the International Incontinence Counseling Questionnaire (ICIQ-SF) and the ICIQ-SF questionnaire score was calculated as 19. Therefore, the patient had very severe urinary incontinence. The patient was started on 5 mg Oxybutynin hydrochloride. After using Oxybutynin hydrochloride for 2 months, the patient reapplied to the clinic because her current complaints did not improve. Since the patient did not benefit from Oxybutynin hydrochloride, 30 and 45 mg Propiverine

hydrochloride were administered, respectively. However, since she did not respond to this treatment, it was decided to switch to combined treatment. 50 mg Mirabegron was added to his current treatment. The urodynamic examination was performed due to continuing complaints of UUI during his check-ups. The results of the urodynamic examination were interpreted as detrusor overactivity and 15 mg Darifenas was started. The patient stated that she benefited from Darifenas during her follow-ups and that her urinary incontinence decreased. The patient does not have any pain. Proven additional diseases: Hypertension, Diabetes mellitus. Prescribed medications: Oral antidiabetic, oral antihypertensive. Operations: 2 cesarean births.

Questions for the exercise program

Exercise is a planned, voluntary physical activity aimed at enhancing fitness. Programs are tailored to patients' diagnoses and medical conditions, focusing on exercise type, frequency, intensity, duration, and progression (Pescatello, 2014). We asked questions about these aspects for three physician-diagnosed patients (Pescatello, 2014) (Table 1). When ChatGPT-4.0 could not answer, questions were repeated.

Table 1

Questions of cases to ChatGPT-4.0.

Questions

- 1 Can you create an exercise program that will increase cervical stabilization (lumbar stabilization (for lumbar disc herniation case)/pelvic floor muscle (for urge urinary incontinence case) strength and tissue flexibility separately every week?/Can you create an exercise program for migraine headache that will include the cervical region for 8 weeks and will increase strength and tissue flexibility, separately each week? (for chronic migraine case). This program should be one that structures the exercise type, exercise frequency (how many days a week you will exercise and take into account rest days), exercise intensity (difficulty), exercise duration (each exercise repetition and duration), and exercise progression (progression).
- 2 In this exercise program that you address separately each week, specify the muscles to be targeted for lumbar stabilization exercises/pelvic floor exercises/cervical and head exercises. Ensure program progression by specifying the control of these muscles with breathing, how many seconds the muscles should be stabilized, and the number of repetitions.
- 3 Ensure program progression by specifying the repetition numbers according to the theraband forces for strengthening exercises.
- 4 Specify the target muscles for stretching exercises. Ensure program progression by specifying the repetition numbers according to the duration of stretching.
- 5 Which assessment method do you use to evaluate the difficulty perceived by the person in determining exercise intensity?
- 6 Can you recommend aerobic exercise to this patient?

Results

The exercise programs included targeted muscles, frequency, intensity, progression, and duration. Questions on targeted muscles, intensity/progression, theraband resistance, and perceived difficulty were not fully answered by ChatGPT-4.0 initially, so they were repeated (Appendix 1). Answers were reported by case.

Lumbar Disc Herniation

The exercise program focused on diaphragmatic breathing, abdominal bracing, and pelvic tilt, targeting the transversus abdominis and multifidus. Side planks were introduced in week 3, modified planks in week 4,

and theraband resistance increased weekly from yellow in week 2 (Figure 1). Full exercises are in Appendix 2.

Chronic Migraine

The exercises given for the CM case started with neck isometric flexion exercise and ChatGPT-4.0 stated that this exercise targeted the deep neck flexor muscles, longus capitis and colli muscles. It recommended stretching exercises for the upper trapezius and sternocleidomastoid muscles. In the 2nd week, it gave chin-tuck exercises, which again targeted the deep neck flexor muscles. In week 3, it introduced isometric flexor/extensor exercises with a yellow theraband, progressively increasing resistance and including weekly diaphragmatic breathing (Figure 2). Details are in Appendix 2.

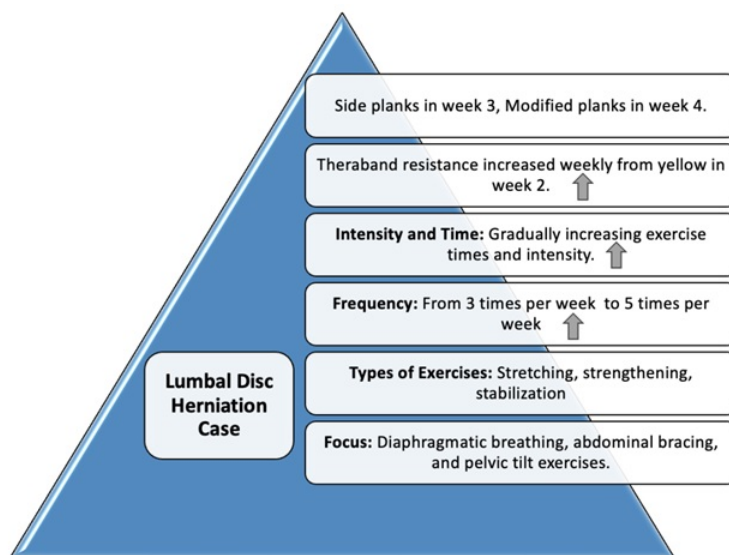


Figure 1. Focus points for Lumbar Disc Herniation case.

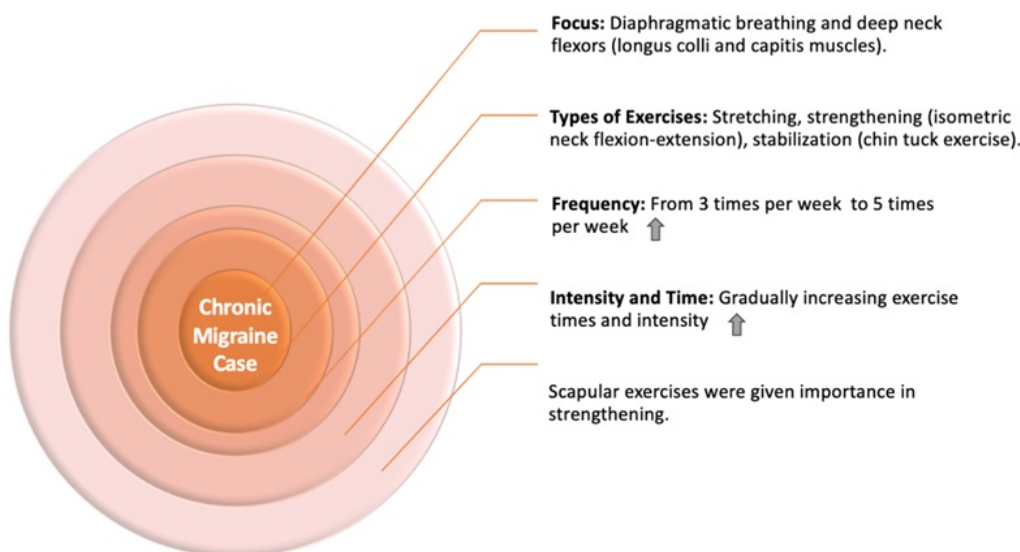


Figure 2. Focus points for Chronic Migraine case.

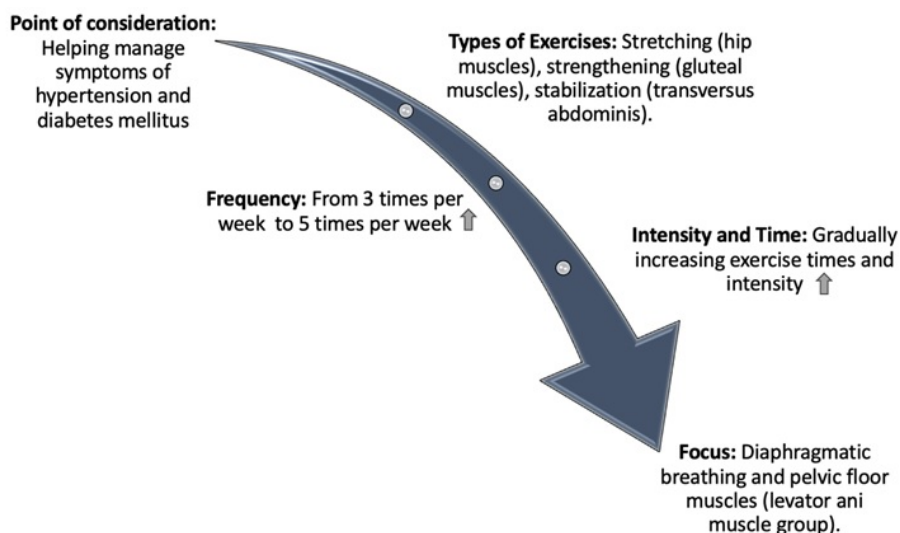


Figure 3. Focus points for Urge Urinary Incontinence case.

Urge Urinary Incontinence

This program, focused on pelvic floor activation and diaphragmatic breathing, targeted the levator ani muscles. Gluteal strengthening and hip muscles stretching were included, with progress through increased theraband resistance and longer contraction times weekly. Transversus abdominis contraction was also recommended (Figure 3). The exercise program are in Appendix 2.

Discussion

This study evaluated the comprehensiveness and accuracy of AI-generated information when physiotherapists or physicians sought help for patients with similar diagnoses, focusing on medical conditions in exercise programs. While the programs were generally promising and based on exercise parameters, the AI initially struggled with questions on intensity, progression, targeted muscles, and perceived difficulty. Expert researchers evaluated the programs after questions were repeated for three cases.

There were different reasons for choosing these three areas in this study. First, in addition to the studies conducted in the literature with arterial hypertension, osteoarthritis, anxiety & stress, T2DM and asthma & decreased pulmonary function cases (Dergaa et al., 2024), we wanted to address the previously unconsidered cases of lumbar disc herniation, chronic migraine and urge urinary incontinence in our study. Second, lumbar disc herniation, chronic migraine, and urge urinary incontinence are actually examples of cases that we frequently encounter where patients research exercises

on their own from the internet or artificial intelligence. Therefore, it is undesirable for exercises learned incorrectly with internet or artificial intelligence information to lead to negative clinical results. Finally, we saw that ChatGPT gave us quite long text and unfortunately, we had to limit the articles to 3 cases because of the word limit.

Lumbar Disc Herniation

The program that ChatGPT-4.0 created by considering the patient's medical condition, warm-up-cool-down, pain management, posture correction, and stabilization exercises targeting deep trunk muscles, shows that AI makes positive suggestions, especially in terms of LBP. When the exercise components that should be considered in the planning of the exercise program, such as exercise type, intensity, frequency and exercise type are arranged correctly, it increases the participation in exercise in individuals with LBP (Aboagye et al., 2017). Exercise frequency, intensity, duration, and repetitions are given according to the patient's level of difficulty and can be an example of a program that can be tried in practice. In addition, it is a correct approach to progress the stabilization exercises that we base on in LBP from a gentle level. The fact that the AE recommendation is also low-impact, that dorsiflexor strength is emphasized and that it cares about weight management are good points of focus. However, in this program, the fact that the patient's BMI is in the overweight category, especially the leg press exercises starting from the 2nd week, child's pose exercises and plank exercises in different positions continuing in the following weeks are thought-provoking in terms of the patient adapting to

the exercises and completing the program without any problems. In the clinic, it is recommended that the stabilization exercises supported by diaphragmatic breathing exercises focusing primarily on the deep trunk muscles, transversus abdominis and multifidus, be done gently until the patient learns (Aboagye et al., 2017; Sannasi et al., 2023). Since the patient's right dorsiflexor strength is 3/5, plank exercises may be challenging. Strengthening exercises for dorsiflexors should be prioritized, yet no recommendations were provided. While the program shows promise in stabilization, its intensity from the 2nd week may hinder compliance, given the patient's symptoms (Aboagye et al., 2017). We think that this program is a program that requires physiotherapist adjustments for its clinical applicability. For future studies, large data sets containing clinical features for low back pain should be examined (Tagliaferri et al., 2020).

Chronic Migraine

Physical activity is one of the triggers of migraine, but regular exercise is known to reduce the frequency and severity of migraine attacks (Amin et al., 2018; Reina-Varona et al., 2024). Patients may think that they will experience an attack when they exercise, so they may be reluctant to exercise (Amin et al., 2018). AE recommended by ChatGPT-4.0 are also recommended in the literature for CM patients to reduce migraine frequency, severity, duration, and disability (Reina-Varona et al., 2024). In this study, we focused on a program that targets strength, flexibility and stabilization of the general cervical and head region rather than AE. Craniocervical flexion exercises are more effective in improving deep neck muscle endurance, neck joint range of motion, cervical lordosis, deep neck flexor cross-sectional area, pain, and disability compared to neck isometric exercises (Bala & Kumar, 2014; Chung & Jeong, 2018; Chung et al., 2012). Isometric neck flexion-extension exercises performed by the individual against his/her resistance can further activate the already active superficial muscles, placing extra load on the neck, head and cardiovascular system (Chung & Jeong, 2018; Hackett & Chow, 2013; Önal et al., 2009). They may even trigger an attack. Therefore, giving these exercises from the first week may not be appropriate for the patient. It was stated that although ChatGPT-4.0 provides comprehensive information, it can analyze and present common and traditional information on the internet, but it may not always provide us with the latest information and information approved by health professionals (Dergaa et al., 2024). Therefore, the

information quality reached by ChatGPT-4.0 may be limited (Dergaa et al., 2024). Chin tuck exercises are given in the 3rd week in this program, but we think it is more appropriate to target chin tuck exercises with breath control from the 1st week. This also indicates that although traditional exercises are presented here, current information should be checked by a health professional. In addition, it is stated that the targeted muscles in the isometric neck flexion exercise given in the first week are longus capitis and colli, that is, deep neck flexors. The information here is not correct when considering the execution of the exercise. However, it is stated that deep neck flexors are also among the targeted muscles of chin tuck exercises. Therefore, physiotherapists should be careful at this point in the exercise given for the targeted muscle. It is important to include rest days in the program so that it does not trigger attacks with fatigue (Dergaa et al., 2024; Sebastianelli et al., 2024). ChatGPT-4.0 has comprehensively addressed the exercise program for CM cases in terms of frequency, intensity, progression and duration, but we believe that in this case, treatment programs should be carried out together with a physiotherapist and physician in order not to trigger an attack. Exercises that start with breath-controlled chin tuck exercises, especially instead of isometric exercises, can be rearranged according to the program.

Urge Urinary Incontinence

Urge incontinence is a very common problem that has risk factors such as diabetes, childbirth and postmenopause and negatively affects the quality of life (Gamble et al., 2010; Palmer, 2020). ChatGPT-4.0 suggested that the AE recommended to the patient could improve symptom management and general fitness in terms of hypertension and diabetes. Pelvic floor activation and transversus abdominis activation applied with breath control, stretching exercises for the muscles around the hips and strengthening exercises with therapeutics seem to be given at reasonable intensity, frequency and duration in terms of the progress of the program. The targeted muscles were addressed correctly in the given exercises. Pelvic floor exercises for UUI are Level 1 evidence level and A recommendation level (McAuley et al., 2024). The Norwegian pelvic floor muscle training model includes warm-up, body awareness, walking, stretching exercises, breathing exercises, stretching exercises and pelvic floor muscle training in different positions combined (Bø et al., 1990). It is emphasized that the aim of this combined program is to strengthen the

muscles in the surrounding support structure area along with the pelvic floor muscles and to provide support and balance between intra-abdominal pressure and ground reaction forces (Bø et al., 1990). Literature studies recommend exercises that patients can do within safer limits and that focus on the pelvic floor (Celenay et al., 2022; Rapp et al., 2024). On the other hand, in the study by Barbosa-Silva et al., ChatGPT-4.0 was asked questions about urinary incontinence and a more incorrect than correct consensus was reached regarding one of the questions, ChatGPT-4.0, regarding pelvic floor muscle training (Barbosa-Silva et al., 2024). Researchers noted inconsistencies when comparing ChatGPT-4.0 answers with scientific information (Barbosa-Silva et al., 2024). It seems that ChatGPT-4.0 can create a program with exercises suggested in the literature, but although reasonable parameters seem to be in terms of progression, the program may not draw a realistic line in terms of patient progression. For this reason, we think that the patient's strain feedback should be taken into consideration. Therefore, we think that ChatGPT-4.0 offers a different perspective to us researchers in terms of exercise suggestions and may lead to programs that can be tried in the clinic.

General Comments

When we look at the general comments, we chose 8-week exercise programs as this period allows for measurable symptom improvement, with muscle hypertrophy and neurophysiological adaptations typically seen after 6-8 weeks of regular exercise (Weakley et al., 2023; Zouita et al., 2023). In addition, since it may take time for individuals to gain motivation in shorter programs and may get bored in longer programs, 8 weeks is preferred as an average period of psychological adaptation to ensure compliance with the exercise program (Fischetti et al., 2019; Weakley et al., 2023).

In today's fast-paced world, physicians and physiotherapists successfully manage sessions effectively via tele-interviews (Deodato et al., 2024; Gali et al., 2022; Martínez de la Cal et al., 2021; Onan et al., 2024; Rabinovitch et al., 2024; Shah et al., 2024; Shi et al., 2024; van der Arend et al., 2024). It is quite possible for a patient or a physiotherapist to receive recommendations for exercise programs from ChatGPT-4.0 during remote session management, and ChatGPT-4.0 must be able to show the necessary sensitivity to patient profiles (Dergaa et al., 2024). We found ChatGPT-4.0 insufficient in addressing some questions, as exercise components must be considered

individually for success. The previous study emphasized that this AI model has limitations and areas for development in creating exercise programs (Dergaa et al., 2024).

One response noted that the Borg Scale and theraband resistances, used to assess exercise strain, vary in meaning across cases. Due to these differences and the potential for ChatGPT-4.0 to misinterpret them, physiotherapists should closely monitor patients and control exercise strain. This study emphasizes AI tools like ChatGPT-4.0 as helpful in rehabilitation planning but highlights their limitations in accurately measuring exercise intensity and progression without human oversight.

Limitations

Although the creation of exercise programs for cases in our study seemed positive and promising, our study had limitations. Therefore, our limitations should be taken into consideration when interpreting the information in our study. First of all, although AE suggestions were included in the questions, they were not specifically asked within the programs. Since the answers given by ChatGPT-4.0 are quite long, discussing the program it will create for AE here would be too long in terms of page count. On the other hand, our main purpose in this study was to measure the ability of ChatGPT-4.0 to create special exercise programs for symptoms. Therefore, we could not include the AE program. Secondly, these patients could not be evaluated by physiotherapists. Perhaps if physiotherapists evaluate these patients and provide additional information about the patient's history after their examinations, the exercise programs could provide clearer patient-specific information. Finally, ChatGPT-4.0 allowed us to access correct information in many commands. Many different exercises can appear in many commands, and there may be confusion in the exercise program.

Conclusion

ChatGPT-4.0 can create exercise programs for common diagnoses that patients often seek online. However, AI alone cannot fully address the complexities of real patients. Therefore, observing patients' emotional states, facial expressions, and physiological responses highlights the critical role of healthcare professionals. In future studies, real patients and recommended exercises can be taught to artificial intelligence and learning methods can be used. Our study can shed light on future studies with these findings.

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We used Open Artificial Intelligence ChatGPT-4.0 to create exercise programs.

Author contribution

Conceptualization: DO; Methodology: DO, HA, İC, ŞG, AÖ, LI; Formal analysis: DO, HA; Writing—original draft: DO, HA; Writing—review and editing: DO, HA, AÖ, LI.

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Disclosure Statement

The authors declare that they have no conflict of interest. We used the paid version of ChatGPT-4.0 and the authors paid for it themselves. In this study, we wanted to evaluate the ability of the most advanced version of ChatGPT-4.0 to create exercise programs and present the results to the literature to provide an idea to researchers working in this field. Therefore, we did not receive any financial support, advertising, incentives or sponsorship from the developers of ChatGPT-4.0. After using this tool/service, the authors reviewed and edited the content as needed and takes full responsibility for the content of the published article.

Ethical Approval

This study does not involve any assessment or intervention on individuals, therefore ethical approval is not required.

Data Sharing Statement

Data sharing will be provided when requested from the authors.

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Appendix 1

The requested information, questions and responses.

1. Lumbar Disc Herniation

• **Can you explain targeted muscles for each exercise in this exercise program?**

This targeted muscle approach ensures that the patient progressively strengthens and stabilizes key muscle groups to support their recovery from L5 disc herniation while maintaining flexibility and reducing pain.

-Stabilization: Focuses on **core muscles** like the **transverse abdominis, multifidus, obliques, and erector spinae** to stabilize the spine and pelvis.

-Strengthening: Includes muscles of the **lower body** (quadriceps, gluteals, hamstrings) and **upper body** (latissimus dorsi, rhomboids, biceps, trapezius) for improving overall strength. **Flexibility/Stretches:** Aims to stretch key muscles such as the **hamstrings, piriformis, hip flexors, and quadriceps** to maintain mobility and reduce tightness.

• **Can you add the patient's perceived effort and guide the exercise intensity week by week to this exercise program again (between 0-20 use Borg Rating of Perceived Exertion (RPE))?**

-8-10 (Very Light to Light): Focus on initial stabilization, gentle mobility, and flexibility exercises.

-10-13 (Light to Somewhat Hard): Introduction of moderate strengthening with light resistance, building core stability and strength.

-RPE 12-15 (Somewhat Hard to Hard): Progression in intensity, focus on advanced stabilization, and strength with medium resistance.

-RPE 14-17 (Hard to Very Hard): High-intensity stabilization and strengthening with heavy resistance, emphasizing functional mobility and strength.

• **Can you explain the intensity and progress of exercises in this program week by week?**

-ChatGPT-4.0 responded by recreating the same program and adding the intensity and progress of exercises to the program week by week.

• **Please explain theraband resistances.**

Therabands (resistance bands) are typically color-coded to represent different levels of resistance. Here is a general breakdown of the most common Theraband color-resistance levels, which can be used to guide progression in your program:

-Yellow (Light Resistance): Suitable for beginners or those recovering from injury. Provides light resistance, ideal for early stages of rehabilitation and when focusing on stabilization or initial strength work.

-Red (Medium-Light Resistance): Offers moderate resistance and is often used for those progressing from the beginner stage. It's suitable for exercises that require a bit more effort but are still in the early strengthening phase.

-Green (Medium Resistance): A step up from red, providing more resistance for people who have built some strength. This level is ideal for moderate strengthening exercises.

-Blue (Medium-Heavy Resistance): Provides more significant resistance, used for building strength and power. Suitable for advanced strengthening, as it requires more effort during exercise.

-Black (Heavy Resistance): Offers the highest level of resistance, typically used by athletes or individuals in advanced stages of rehabilitation or strength training.

2. Chronic Migraine

• **Can you add the patient's perceived effort and guide the exercise intensity week by week to this exercise program again (between 0-20 use Borg Rating of Perceived Exertion (RPE))?**

This program ensures a gradual increase in exercise intensity and complexity, progressing from light isometric exercises to advanced resistance training while incorporating daily stretching and flexibility work. The Borg Rating of Perceived Exertion (RPE) is used to assess perceived difficulty and adjust intensity as needed.

-RPE 6-9 (Very Light to Light): For the early weeks, where the goal is to build endurance and flexibility. Focus on maintaining good posture and controlled movements.

-RPE 10-12 (Moderate to Hard): For mid-program resistance exercises, the patient should feel some exertion but still able to complete the exercises without pain or severe discomfort.

-RPE 12-13 (Somewhat Hard to Hard): For the final weeks, where the goal is to increase strength and coordination. Slight muscle fatigue is expected, but ensure the patient avoids overexertion.

3. Urge Urinary Incontinence

• **Please explain theraband resistances.**

Therabands, also known as resistance bands, come in different levels of resistance, which are typically color-coded. The resistance levels allow for progressive resistance training, helping you increase strength over time. The colors and their corresponding resistance levels can vary slightly depending on the manufacturer, but the general resistance levels are as follows:

-Yellow (Extra Light): This level provides minimal resistance and is ideal for beginners, those recovering from injury, or for targeting small, weak muscles. It's also suitable for mobility and stretching exercises.

-Red (Light): This level offers light resistance and is often used for moderate strength exercises. It is suitable for people who want to build strength gradually or are focusing on endurance.

-Green (Medium): Medium resistance is the most common starting point for individuals with average fitness levels. It provides a moderate challenge for most muscle groups.

-Blue (Heavy): This resistance level is intended for advanced users or people who are stronger. It's commonly

used for exercises requiring more force, like lower body movements.

-Black (Extra Heavy): The highest level of resistance, black therabands are for people with significant strength or those working on very demanding strength exercises. It provides a great challenge for well-trained muscles.

-Silver (Super Heavy) and Gold (Ultra Heavy): These are even heavier resistance bands and are typically used by advanced athletes or for intense rehabilitation exercises.

Choosing the Right Theraband:

-Beginners or those with limited strength: Start with yellow or red.

-Intermediate users: Green or blue bands are recommended.

-Advanced users: Black, silver, or gold can be used depending on the exercise and muscle group.

-Progression in Training: Start with a lighter band and gradually progress to a heavier band as your strength improves. If an exercise becomes too easy with your current band, it's a sign to increase resistance by switching to a stronger band. Therabands allow for smooth, controlled movements and can target various muscle groups, making them versatile for exercises aimed at rehabilitation, muscle toning, and strength building.

• ***Could you please specify the progression and intensity of the exercises?***

-To specify the progression and intensity of the exercises in the 8-week pelvic floor exercise program using therabands, we'll follow a progressive resistance model. This will gradually increase the difficulty by adjusting the theraband resistance level and the number of repetitions or hold times each week. Pelvic floor activation does not directly use therabands but progresses in hold times and repetitions to build endurance and control.

Progression and Intensity Considerations:

1. **Theraband Resistance:** Starting with light resistance (yellow or red) for the first 2-3 weeks, progressing to medium (green) and then heavy (blue/black) resistance as strength increases.

2. **Repetitions:** Begin with fewer reps (8-10) in the first couple of weeks and gradually increase reps as the muscles strengthen (up to 16-18 by week 8).

3. **Hold Times:** For pelvic floor activation exercises, the hold times start at 3 seconds in the first week and progress up to 20 seconds by the eighth week.

4. **Rest Days:** Adequate rest (1-2 days between sessions) is provided early in the program (3 days per week), progressing to more frequent exercise sessions (up to 5 days per week) as endurance builds.

This progression allows a gradual increase in strength, endurance, and flexibility, avoiding strain or injury, and ensures consistent improvement over the 8-week period.

• ***Can you add the patient's perceived effort and guide the exercise intensity week by week to this exercise program again (between 0-20 use Borg Rating of Perceived Exertion (RPE))?***

-10-12 (Light to Moderate): Focus on form, learning movements, and building initial endurance. Start slow, with low resistance, allowing muscles to adapt without overexertion.

-12-13 (Somewhat Hard): Exercises should feel moderately challenging. You can feel your muscles working, but you're not fully fatigued. This is where most of the work happens to build strength.

-13-14 (Moderate to Somewhat Hard): As intensity increases, exercises require more effort. You should feel challenged but able to maintain good form and control.

• ***Can you explain targeted muscles for each exercise in this exercise program?***

-ChatGPT-4.0 answered this question by re-creating the same program and adding the targeted muscles to the program week by week.

Appendix 2

Exercise programs which are prepared by ChatGPT-4.0 for three cases.

1. Lumbar Disc Herniation Case

“This program is tailored for a patient with L5 disc herniation, focusing on lumbar stabilization, muscle strengthening, and tissue flexibility. Each week, we will progressively increase the intensity and duration of the exercises. For a patient with L5 disc herniation, it is important to recommend low-impact AE that avoid putting

excessive pressure on the spine while promoting cardiovascular fitness, overall body endurance, and weight management (since the patient's BMI is slightly elevated). Each aerobic session should start with a gentle 5-10 minute warm-up to prepare the muscles and end with a cool-down, including light stretching. Ensure good posture during exercises, especially for walking and cycling, to avoid aggravating the back. The patient should monitor any signs of increased back or leg pain. If symptoms worsen, adjustments should be made to reduce intensity or change the activity.”

Table 2

The 8-week exercise program for lumbar disc herniation case.

Week	Exercise	Description	Muscles Targeted	Frequency	Intensity/Progression	Duration/Repetitions	RPE
1	Stabilization	Pelvic Tilt (Supine)	Transverse Abdominis, Pelvic Floor Muscles, Rectus Abdominis (mild activation)	3 times per week	Low: Focus on gentle core stabilization without much resistance.	10 reps × 2 sets, hold for 5 seconds 15-20 minutes	8-10 (Very Light)
		Abdominal Bracing with Breathing Control:	Transverse Abdominis, Multifidus			10 reps × 2 sets, hold for 5 seconds, 15-20 minutes	
	Flexibility/ Stretches	Hamstring Stretch (Supine with Towel)	Hamstring		Low: with short holds to avoid overstretching or pain	Hold 20 seconds × 3 sets 15-20 minutes	
		Piriformis Stretch	Piriformis			Hold 20 seconds × 3 sets 15-20 minutes	
2	Stabilization	Pelvic Tilt with Abdominal Control	Transverse Abdominis, Pelvic Floor Muscles, Rectus Abdominis (mild activation)	3-4 times per week	Low to Moderate: slightly increasing holdings	12 reps × 2 sets, hold for 5-8 seconds, 20-25 minutes	9-11 (Fairly Light)
		Bridge Exercise	Gluteus Maximus, Hamstrings, Erector Spinae		Low: Focus on gentle bridge	10 reps × 2 sets, hold for 5 seconds 20-25 minutes	
	Strengthening	Heel Raises (Standing)	Gastrocnemius and Soleus		Low: Focus on gentle exercise	10 reps × 2 sets 20-25 minutes	
		Theraband Leg Press	Quadriceps, Gluteus Maximus, Hamstrings		Yellow theraband (Light Resistance)	10 reps × 2 sets 20-25 minutes	
	Flexibility	Child's Pose	Erector Spinae, Latissimus Dorsi and Shoulder Muscles		Low: Focus on gentle stretch	Hold 20 seconds × 3 sets 20-25 minutes	
		Hamstring Stretch	Hamstring		Increased stretch duration to 30 seconds	Hold 30 seconds × 3 sets 20-25 minutes	
3	Stabilization	Side Plank (on knees)	Obliques (Internal and External), Transverse Abdominis, Quadratus Lumborum	3-4 times per week	NA	Hold for 8 seconds × 2 sets 25 minutes	10-12 (Light to Somewhat Hard)
		Bridge with Abdominal Bracing	Gluteus Maximus, Hamstrings, Erector Spinae, Transversus Abdominis, Multifidus		Increased repetitions for bridges.	12 reps × 2 sets, hold for 5-8 seconds, 25 minutes	
	Strengthening	Theraband Squats	Quadriceps, Gluteus Maximus, Hamstrings, Transverse abdominis and obliques		Red theraband (Light-Medium Resistance)	10 reps × 2 sets 25 minutes	
		Theraband Row	Rhomboids, Latissimus Dorsi, Trapezius, Biceps Brachii		Red theraband (Light-Medium Resistance)	10 reps × 2 sets 25 minutes	
	Flexibility	Quadriceps Stretch: Standing or Side-Lying	Quadriceps		Low: Focus on gentle stretch	Hold 20 seconds × 3 sets 25 minutes	

RPE: Borg Rating of Perceived Exertion; sec: Seconds; rep: Repetitions.

Table 2 (continued)

Week	Exercise	Description	Muscles Targeted	Frequency	Intensity/ Progression	Duration/ Repetitions	RPE
4	Stabilization	Modified Plank (on knees)	Transverse Abdominis, Rectus Abdominis, Gluteus Maximus and Shoulder Stabilizers (Deltoids, Serratus Anterior)	4 times per week	Increased duration	Hold for 10-12 seconds × 2 sets 25-30 minutes	11-13 (Somewhat Hard)
		Superman (Opposite Arm/Leg Lift)	Erector Spinae, Gluteus Maximus, Deltoids and Trapezius		NA	10 reps × 2 sets 25-30 minutes	
	Strengthening	Theraband Squats	Quadriceps, Gluteus Maximus, Hamstrings, Transverse abdominis and obliques		Green theraband (Medium Resistance)	12 reps × 2 sets 25-30 minutes	
		Theraband Rows			Green theraband (Medium Resistance)	12 reps × 2 sets 25-30 minutes	
	Flexibility	Piriformis Stretch	Piriformis		Increased duration	Hold 30 seconds × 3 sets 25-30 minutes	
5	Stabilization	Side Plank Progression (on knees)	Obliques (Internal and External), Transverse Abdominis, Quadratus Lumborum	4-5 times per week	Increased duration	Hold for 15 seconds × 2 sets 30 minutes	12-14 (Somewhat Hard)
		Bridge with Theraband Resistance	Gluteus Maximus, Hamstrings, Erector Spinae		Green theraband (Medium Resistance)	12 reps × 2 sets, hold for 8 seconds, 30 minutes	
	Strengthening	Theraband Deadlift	Hamstrings, Gluteus Maximus, Erector Spinae, Transverse abdominis and obliques		Yellow theraband (Light Resistance)	12 reps × 2 sets 30 minutes	
		Single-Leg Theraband Press	Quadriceps, Gluteus Maximus, Hamstrings, Core Stabilizers		Green theraband (Medium Resistance)	10 reps × 2 sets 30 minutes	
	Flexibility	Piriformis Stretch	Piriformis		Same as week 4	Hold 30 seconds × 3 sets 30 minutes	
6	Stabilization	Full Plank (on toes)	Obliques (Internal and External), Transverse Abdominis, Quadratus Lumborum	4-5 times per week	Increased duration	Hold for 20 seconds × 2 sets 30-35 minutes	13-15 (Somewhat Hard to Hard)
		Bird Dog	Multifidus, Gluteus Maximus, Shoulder Muscles (Deltoids), Transverse Abdominis, Obliques)		NA	12 reps × 2 sets 30-35 minutes	
	Strengthening	Theraband Squats	Quadriceps, Gluteus Maximus, Hamstrings, Transverse abdominis and obliques		Green theraband (Medium Resistance)	12 reps × 3 sets 30-35 minutes	
		Theraband Rows	Rhomboids, Latissimus Dorsi, Trapezius, Biceps Brachii		Green theraband (Medium Resistance)	12 reps × 3 sets 30-35 minutes	
	Flexibility	Hamstring Stretch	Hamstring		Increased duration	Hold 40 seconds × 3 sets 30-35 minutes	
7	Stabilization	Side Plank (Full version on feet)	Obliques (Internal and External), Transverse Abdominis, Quadratus Lumborum	4-5 times per week	Increased duration	Hold for 20-25 seconds × 2 sets 35 minutes	14-16 (Hard)
		Bridge with Advanced Resistance	Gluteus Maximus, Hamstrings, Erector Spinae		Increased duration	15 reps × 3 sets, hold for 10 seconds, 35 minutes	
	Strengthening	Theraband Deadlift	Hamstrings, Gluteus Maximus, Erector Spinae, Transverse abdominis and obliques		Green theraband (Medium Resistance)	12 reps × 3 sets 35 minutes	
		Single-Leg Squats with Theraband			Green theraband (Medium Resistance)	12 reps × 3 sets 35 minutes	
	Flexibility	Hip Flexor Stretch	Psoas Major and Iliacus, Rectus Femoris		NA	Hold 40 seconds × 3 sets	
8	Stabilization	Full Plank (Advanced Hold)		5 times per week	Increased duration	Hold for 30 seconds × 3 sets 35-40 minutes	15-17 (Hard to Very Hard)
		Bird Dog	Multifidus, Gluteus Maximus, Shoulder Muscles (Deltoids), Transverse Abdominis, Obliques)		Increased repetitions	15 reps × 3 sets 35-40 minutes	
	Strengthening	Theraband Deadlift	Hamstrings, Gluteus Maximus, Erector Spinae, Transverse abdominis and obliques		Blue theraband (Medium-Heavy Resistance)	12 reps × 3 sets 35-40 minutes	
		Theraband Squats	Quadriceps, Gluteus Maximus, Hamstrings, Transverse abdominis and obliques		Blue theraband (Medium-Heavy Resistance)	12 reps × 3 sets 35-40 minutes	
	Flexibility	Hamstring Stretch	Hamstring		Same as week 7	Hold 40 seconds × 3 sets 35-40 minutes	
		Piriformis Stretch	Piriformis		Increased duration	Hold 40 seconds × 3 sets 35-40 minutes	

RPE: Borg Rating of Perceived Exertion; sec: Seconds; rep: Repetitions.

2. Chronic Migraine Case

“This program is designed to suit the needs of the patient by planning the exercise types, frequency, intensity, duration and progression in detail each week. The effectiveness of the program is increased by specifying breath control, muscle stabilization times,

and repetition numbers. For a patient with CM, AE can be an excellent addition to their treatment plan. AE help improve circulation, reduce stress, and can aid in reducing the frequency, and intensity of migraine attacks.”

Table 3

The 8-week exercise program for chronic migraine case.

Week	Exercise	Description	Muscles Targeted	Frequency	Intensity/Progression	Duration/Repetitions	RPE
1	Isometric Neck Flexion	Press your forehead gently into your hands while resisting motion	Deep neck flexors (longus colli, capitis)	3 times per week	No resistance	Hold 5 sec, 8 reps	6-7 (Very Light)
	Isometric Neck Extension	Push the back of your head gently into your hands	Cervical extensors (semispinalis, splenius)		No resistance	Hold 5 sec, 8 reps	
	Neck Lateral Flexion Stretch	Gently tilt your head to one side to stretch	Upper trapezius, sternocleidomastoid	Daily	Gentle stretch	Hold 20 sec, 3 reps/side	
	Scapular Squeezes	Squeeze shoulder blades together.	Rhomboids, middle trapezius	3 times per week	Body weight	Hold 5 sec, 10 reps	
	Breathing Control	Focus on deep diaphragmatic breathing while performing each exercise, stabilizing the muscles during isometric holds.	Diaphragm	During exercises	Focus on deep breathing		6 (No Exertion)
2	Isometric Neck Flexion and Extension	Push the back of your head gently into your hands	Deep neck flexors (longus colli, capitis) Cervical extensors (semispinalis, splenius)	3 times per week	Increase hold time to 8 sec	8 reps	7-8 (Light)
	Neck Lateral Flexion Stretch	Gently tilt your head to one side to stretch	Upper trapezius, sternocleidomastoid	Daily	Increase stretch to 30 sec	3 reps/side	
	Scapular Squeezes	Squeeze shoulder blades together.	Rhomboids, middle trapezius	3 times per week	Increase to 12 reps		
	Chin Tucks	Gently tuck chin in, holding neutral posture.	Deep neck flexors		Gentle tuck	Hold 5 sec, 8 reps	
	Breathing Control	Continue focusing on diaphragmatic breathing during exercises.	Diaphragm	During exercises	Focus on deep breathing		6 (No Exertion)
3	Theraband Isometric Neck Flexion	Press your forehead gently into your hands while resisting motion	Deep neck flexors	4 times per week	Yellow Theraband (light)	Hold 8 sec, 10 reps	8-9 (Somewhat Hard)
	Theraband Isometric Neck Extension	Push the back of your head gently into your hands	Cervical extensors		Yellow Theraband	Hold 8 sec, 10 reps	
	Neck Rotational Stretch	Gently rotate head to the side.	Sternocleidomastoid	Daily	Gentle rotation	Hold 30 sec, 3 reps/side	7-8 (Light)
	Scapular Retraction with Theraband	Rowing motion using yellow Theraband.	Rhomboids, middle trapezius	4 times per week	Yellow Theraband	Hold 5 sec, 10 reps	8-9 (Somewhat Hard)
	Breathing Control	Ensure deep breaths with each repetition to stabilize the neck and shoulder muscles.	Diaphragm	During exercises	Focus on deep breathing		6 (No Exertion)
4	Theraband Neck Flexion and Extension		Deep neck flexors, extensors	4 times per week	Red Theraband (moderate)	Hold 10 sec, 12 reps	9-10 (Moderate)
	Theraband Rowing		Rhomboids, middle trapezius		Red Theraband	Hold 5 sec, 12 reps	
	Chin Tucks with Theraband	Place Theraband behind the head, gently press into the band.	Deep neck flexors		Press into band	Hold 5 sec, 10 reps	
	Upper Trapezius Stretch	Gentle neck tilts.	Upper trapezius	Daily	Gentle stretch	Hold 40 sec, 3 reps/side	7-8 (Light)
	Breathing Control	Continue to synchronize breathing with muscle engagement during exercises.	Diaphragm	During exercises	Focus on deep breathing		6 (No Exertion)

RPE: Borg Rating of Perceived Exertion; sec: Seconds; rep: Repetitions.

Table 3 (continued)

Week	Exercise	Description	Muscles Targeted	Frequency	Intensity/Progression	Duration/Repetitions	RPE
5	Theraband Neck Flexion and Extension		Deep neck flexors, extensors	5 times per week	Red Theraband	Hold 12 sec, 12 reps	10-11 (Moderate to Hard)
	Theraband Rows		Rhomboids, middle trapezius		Red Theraband	Hold 5 sec, 15 reps	
	Dynamic Neck Rotations	Controlled rotations.	Sternocleidomastoid, upper trapezius		Controlled rotation	12 reps/side	9-10 (Moderate)
	Upper Trapezius & Levator Scapula Stretch		Upper trapezius, levator scapula	Daily	Stretch	Hold 50 sec, 3 reps/side	8-9 (Somewhat Hard)
	Breathing Control	Reinforce deep, slow breathing during each stretch and hold.	Diaphragm	During exercises	Focus on deep breathing		6 (No Exertion)
6	Theraband Neck Strengthening		Deep neck flexors, extensors	5 times per week	Blue Theraband (increased)	Hold 15 sec, 15 reps	11-12 (Hard)
	Prone Y-T Raises	Lying on stomach, lift arms in a Y or T shape.	Lower trapezius, rhomboids		Body weight	12 reps	10-11 (Moderate)
	Theraband Rows		Rhomboids, middle trapezius		Blue Theraband	15 reps	11-12 (Hard)
	Full Neck & Shoulder Stretch		Upper trapezius, levator scapula	Daily	Stretch	Hold 50-60 sec, 3 reps	8-9 (Somewhat Hard)
	Breathing Control	Focus on maintaining proper breathing throughout the exercise, especially during the increased load.	Diaphragm	During exercises	Focus on deep breathing		6 (No Exertion)
7	Theraband Neck Flexion and Extension		Deep neck flexors, extensors	5 times per week	Blue Theraband	Hold 15 sec, 15 reps	12-13 (Somewhat Hard to Hard)
	Prone Y-T Raises with Weights	Lying on stomach, lift arms in a Y or T shape.	Lower trapezius, rhomboids		Add 0.5-1 kg	3 sets of 12 reps	
	Theraband Rows		Rhomboids, middle trapezius		3 sets	15 reps	
	Dynamic Cervical Rotation Stretch		Sternocleidomastoid, upper trapezius	Daily	Gentle rotation	Hold 60 sec, 3 reps/side	8-9 (Somewhat Hard)
	Breathing Control	Focus on deep diaphragmatic breathing while performing each exercise, stabilizing the muscles during isometric holds.	Diaphragm	During exercises	Focus on deep breathing		6 (No Exertion)
8	Theraband Neck & Scapular Strengthening		Deep neck flexors, extensors, rhomboids	5 times per week	Maintain resistance	3 sets of 15 reps	12-13 (Somewhat Hard to Hard)
	Advanced Stretching Routine		Upper trapezius, levator scapula	Daily	Hold stretch	Hold 60 sec, 3 reps/side	8-9 (Somewhat Hard)

RPE: Borg Rating of Perceived Exertion; sec: Seconds; rep: Repetitions.

3. Urinary Incontinence Case

“Here is a week-by-week exercise program to increase pelvic floor muscle strength and endurance for 8 weeks. This program focuses on strengthening the pelvic floor muscles, improving control with breathing, and includes both strengthening and

stretching exercises for the targeted muscle groups. For this patient, integrating **AE** into the 8-week program can complement pelvic floor and strength training by enhancing overall fitness, improving cardiovascular health, and helping to manage symptoms of hypertension and diabetes mellitus.”

Table 4

The 8-week exercise program for urge urinary incontinence case.

Week	Exercise	Description	Muscles Targeted	Frequency	Intensity/Progression	Duration/Repetitions	RPE
1	Pelvic Floor Activation with Breathing	Lie down, knees bent. Focus on inhaling, and while exhaling, gently contract pelvic floor muscles.	Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis)	3 times per week	Low: Focus on learning the correct movement	Hold contraction for 3 sec, release for 5 sec. 10 reps contractions per session 20 minutes per session	10-12 (light)
	Transversus Abdominis Activation	While lying on your back, focus on tightening the lower abdomen as you breathe.	Transversus Abdominis		Low: Focus on learning the correct movement	Hold for 5 sec, relax for 10 sec. 10 reps. 20 minutes per session	
	Strengthening: Gluteal Bridge		Gluteus maximus, Hamstrings, Transversus abdominis		Theraband Resistance Level: None this week (bodyweight only).	8-10 reps, hold for 5 seconds at the top. 20 minutes per session	
	Stretching		Hip Flexors and Adductors		Low: Focus on learning the correct movement	Hold stretches for 15-20 sec. 2 reps sets of each stretch. 20 minutes per session	
2	Pelvic Floor Activation with Progressed Breathing Control	Hold pelvic contraction for 5 seconds, relax for 5 seconds.	Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis)	3 times per week	Increased duration	12 reps contractions per session. 25 minutes per session	11-12 (light-moderate)
	Transversus Abdominis and Gluteal Activation with a March	Lift one leg at a time while maintaining contraction in the core.	Transversus Abdominis and Gluteal muscles		Marching is added	8-10 reps on each leg. 25 minutes per session	
	Gluteal Bridge with Marching	As you hold the bridge, alternate lifting each foot 2-3 inches off the ground.	Gluteus maximus and medius, iliopsoas, Transversus abdominis		Marching is added	8-10 reps total steps. 25 minutes per session	
	Stretching		Hamstrings and Hip Abductors		Low: Focus on learning the correct movement	Hold stretches for 20-25 sec. 2 reps. sets of each stretch. 25 minutes per session	
3	Pelvic Floor Activation with Longer Holds	Lie down, knees bent. Focus on inhaling, and while exhaling, contract pelvic floor muscles.	Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis)	3 times per week	Increased duration	Hold for 7 sec, relax for 5 sec. 15 reps contractions. 30 minutes per session	12 (somewhat hard)
	Side-Lying Hip Abduction with Theraband		Gluteus medius and minimus, tensor fasciae latae		Use a Red (light) theraband for added resistance.	10-12 reps on each side. 30 minutes per session	
	Gluteal Bridge with Theraband	Place a theraband around thighs, just above knees.	Gluteus maximus and medius,		Use a Red (light) theraband for added resistance.	10-12 reps, hold for 5 sec. 30 minutes per session	
	Stretching		Quadriceps and Hip Adductors		Increased duration	Hold stretches for 25-30 sec. 2 reps sets of each stretch. 30 minutes per session	
4	Pelvic Floor with Longer Holds	Lie down, knees bent. Focus on inhaling, and while exhaling, contract pelvic floor muscles.	Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis)	3-4 times per week	Increased duration	Hold for 10 sec, relax for 5 sec. 18-20 reps contractions. 35 minutes per session	12-13 (somewhat hard)
	Standing Hip Extension with Theraband	Attach theraband to a fixed point for resistance.	Gluteus maximus, Hamstrings, Erector spinae (lower back muscles)		Use a Red (light) theraband for added resistance.	10 reps on each leg. 35 minutes per session	
	Squats with Theraband: Glute and Pelvic Strength	Theraband around thighs, squat down to 90 degrees.	Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis), Quadriceps, Gluteus maximus, Hamstrings		Use a Red (light) theraband for added resistance.	10-12 reps 35 minutes per session	
	Stretching		Hip Rotators		Low: Focus on learning the correct movement	Hold stretches for 30 sec. 3 reps sets. 35 minutes per session	

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Table 4 (continued)

Week	Exercise	Description	Muscles Targeted	Frequency	Intensity/ Progression	Duration/ Repetitions	RPE
5	Pelvic Floor Activation with Full Control	Lie down, knees bent. Focus on inhaling, and while exhaling, contract pelvic floor muscles.	Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis)	4 times per week	Increased repetitions	Hold for 10 sec, relax for 3 sec. 20 reps contractions. 40 minutes per session	13 (moderate)
	Targeting Core and Pelvic Stability: Side Planks		Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis)		Bodyweight	Hold for 10 sec. per side. 8-10 reps. 40 minutes per session	
	Gluteal Bridge with Theraband and Marching		Gluteus maximus and medius,		Use Green (medium) resistance theraband.	12-14 reps steps in march. 40 minutes per session	
	Stretching		Hamstrings, Adductors, and Hip Flexors		Increased duration	Hold stretches for 35 sec. 3 reps sets. 40 minutes per session	
6	Pelvic Floor Endurance	Lie down, knees bent. Focus on inhaling, and while exhaling, contract pelvic floor muscles.	Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis)	4 times per week	Increased duration and repetitions	Hold contraction for 12 sec, relax for 3 sec. 22 reps contractions. 45 minutes per session	13 (moderate)
	Side-Lying Leg Raise with Theraband (Medium Resistance)		Gluteus medius and minimus, tensor fasciae latae		Use Green (medium) resistance theraband.	12-14 reps per side. 45 minutes per session	
	Squat and Glute Bridge Progression		Gluteus maximus and medius,		Use Green-Blue (medium-heavy) theraband	14 reps per set. 45 minutes per session	
	Stretching		Iliopsoas and Hip Rotators		Increased duration	Hold stretches for 40 sec. 3 reps sets. 45 minutes per session	
7	Pelvic Floor Contraction with Core Control	Lie down, knees bent. Focus on inhaling, and while exhaling, contract pelvic floor muscles.	Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis)	5 times per week	Increased duration and repetitions	Hold contraction for 15 sec, relax for 3 sec. 24 reps contractions. 50 minutes per session.	14 (moderate-somewhat hard)
	Standing Theraband Hip Extension (Heavy Resistance)		Gluteus maximus		Use Blue (heavy) resistance theraband.	14-16 reps per side. 50 minutes per session.	
	Bridge with Theraband and Leg Extension		Gluteus maximus and medius, Hamstrings, transversus abdominis		Use Blue (heavy) resistance theraband.	14-16 reps steps. 50 minutes per session.	
	Stretching (Full Lower Body)				Increased duration	Hold stretches for 45 sec. 3 reps sets. 50 minutes per session.	
8	Pelvic Floor Maximum Hold	Lie down, knees bent. Focus on inhaling, and while exhaling, contract pelvic floor muscles.	Pelvic floor muscles (levator ani group: pubococcygeus, iliococcygeus, and puborectalis)	5 times per week	Increased duration and repetitions	Hold for 20 sec, relax for 5 sec. 25 reps contractions. 55 minutes per session.	14 (moderate-somewhat hard)
	Side Planks with Leg Lift		Obliques (internal and external), Transversus abdominis, Gluteus medius		Bodyweight	Hold for 15 sec, lift top leg 10-12 times. 12 reps per side. 55 minutes per session.	
	Squat with Theraband (Heavy Resistance)					16-18 reps. 55 minutes per session.	
	Stretching		Hip Flexors, Rotators, and Adductors		Increased duration	Hold stretches for 50 sec. 3 reps sets. 55 minutes per session.	

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