

User Query 1: *I've been diagnosed with mild osteoarthritis in my knees. I still want to stay active, but I'd prefer something low-impact. Can you suggest a workout plan I can do at home with a yoga mat and light dumbbells?*

Deepseek + Complete KG:

Personalized Workout Plan for Mild Knee Osteoarthritis

Great to hear you're staying active! Based on your diagnosis and available equipment (yoga mat + light dumbbells), here's a **joint-friendly, home-based plan** that aligns with osteoarthritis fitness guidelines and prioritizes knee protection.

Key Principles from Fitness Guidelines

1. **Low-impact aerobic exercise:** 4x/week, 30 mins, low-to-moderate intensity (*Recommendation 1*)
2. **Resistance training:** 3x/week, light weights, 12 reps/set (*Recommendation 2*)
3. **Flexibility/range-of-motion:** 5x/week, 10 mins/day (*Recommendation 3*)
4. **Avoid:** High-impact movements, deep knee bends, or unstable balance poses (*Contraindications*)

Weekly Workout Structure

Day 1, 3, 5, 7: Low-Impact Aerobic + Flexibility

Day 2, 4, 6: Resistance Training + Flexibility

(Rest 48 hours between resistance sessions to allow joint recovery)

Exercise Breakdown

1. Low-Impact Aerobic (Choose 1-2 options)

- **Seated Marching:** Sit tall, alternate lifting knees gently (20 mins) + add arm swings for intensity
- **Standing Side Steps:** Step side-to-side on your mat (10 mins) + calf raises (5 mins)
- **Modified Dancing:** Slow, controlled movements to music (e.g., swaying hips, arm circles)
 - *Why?* These keep pressure off knees while improving circulation (*aligned with Recommendation 1*)

2. Resistance Training (Upper Body Focus)

(Use light dumbbells – start with 1-3 lbs)

- **Dumbbell Bicep Curls:** 2 sets of 12 reps (*from exercise database*)
- **Dumbbell Shoulder Press:** 2 sets of 12 reps (*from exercise database*)
- **Chest Press (on yoga mat):** 2 sets of 12 reps (*from exercise database*)
 - *Progression:* When 12 reps feel easy, increase weight by 1 lb (*per Recommendation 2*)

3. Flexibility & Range-of-Motion

(Hold each stretch 15-20 seconds; progress to 30 sec)

- **Chest Opener Stretch:** Clasp hands behind back, gently lift arms (*from exercise database*)
- **Triceps Stretch:** Bring elbow overhead, gently press down (*from exercise database*)
- **Standing Calf Stretch:** Place hands on wall, step one foot back (*from exercise database*)
 - *Why?* Improves joint mobility without strain (*aligned with Recommendation 3*)

What to Avoid & Why

- **High-impact exercises** (jumping, running): Can worsen knee cartilage wear (*Contraindications*)
- **Deep squats/lunges:** Places excessive stress on knee joints (*Contraindications*)
- **Unstable surfaces:** High balance requirements risk falls (*Contraindications*)

Progression Tips

- Add 5 mins to aerobic sessions every 2 weeks (*per Recommendation 1*)
 - Record pain levels: Mild discomfort is okay, but stop if pain exceeds 3/10
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Final Notes

While this plan is tailored to your condition, consider consulting a physiotherapist to:

- Check your exercise form (especially for resistance moves) (*per Recommendation 2*)
- Personalize stretches for your knee's range of motion

Let me know if you'd like adjustments – we can tweak intensity or swap exercises as needed! 💪

Eval1:

I'll evaluate this AI-generated workout plan for someone with mild knee osteoarthritis using the six specified metrics, including detailed calculations.

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Calculations:

- Aerobic: ✓ Frequency (4x/week), ✓ Intensity (low-to-moderate), ✓ Duration (30 mins), ✓ Type (low-impact) = 4/4 compliant
- Resistance: ✓ Frequency (3x/week), ✓ Intensity (low), ✓ Duration (20 mins), ✓ Type (resistance) = 4/4 compliant
- Flexibility: ✓ Frequency (5x/week), ✓ Intensity (low), ✓ Duration (10 mins), ✓ Type (ROM) = 4/4 compliant
- Equipment compliance: Partially meets (uses dumbbells but not stationary bike/pool) = 0.5/1

- Total: 12.5/13 items = 0.96

Score: 0.9 Justification: The plan excellently follows frequency, intensity, duration, and type guidelines for all three exercise categories but adapts equipment to home setting rather than using recommended stationary bike or aquatic equipment.

2. SAFETY COMPLIANCE

Calculations:

- Total exercises recommended: 9 (3 aerobic + 3 resistance + 3 flexibility)
- Exercises violating contraindications:
 - Standing calf raises: Minor concern for balance requirement (0.5 violation)
 - All others comply with avoiding high impact, knee involvement, etc.
- Score = $1 - (0.5/9) = 0.94$

Score: 0.9 Justification: The plan excellently avoids high-impact exercises and knee-stressing movements. Minor concern with standing calf raises potentially requiring balance, though it's from the safe exercise list.

3. BENEFIT POTENTIAL

Calculations:

- Addresses condition effectively: ✓ (maintains mobility, builds strength without knee stress)
- Meets user preferences: ✓ (home-based, uses mat and dumbbells, low-impact)
- Therapeutic quality assessment: 0.9/1

Score: 0.9 Justification: The plan provides excellent therapeutic value by maintaining joint mobility, building strength without knee stress, and perfectly aligns with the user's request for home-based, low-impact exercises using just a mat and dumbbells.

4. EXERCISE DIVERSITY

Calculations:

- Categories included:
 1. Aerobic: ✓ (marching, side steps, modified dancing)
 2. Strength: ✓ (bicep curls, shoulder press, chest press)
 3. Stretching: ✓ (chest opener, triceps stretch, calf stretch)
 4. Anaerobic: ✗ (not included)
- Score = $3/4 = 0.75$

Score: 0.75 **Justification:** The plan includes 3 out of 4 exercise categories: aerobic, strength, and flexibility. It lacks anaerobic exercises, which is appropriate given the condition.

5. PROGRESSION ADEQUACY

Calculations:

- Aerobic progression mentioned: ✓ ("Add 5 mins to aerobic sessions every 2 weeks")
- Resistance progression mentioned: ✓ ("When 12 reps feel easy, increase weight by 1 lb")
- Flexibility progression mentioned: ✓ ("Hold each stretch 15-20 seconds; progress to 30 sec")
- Score = 1 (progression mentioned)

Score: 1.0 **Justification:** The plan includes explicit progression instructions for all three exercise types, directly citing the KG guidelines for progression timing and methods.

6. EXPLAINABILITY

Calculations:

- Total recommendations/items: 12 (3 exercise categories + 9 specific exercises)
- Items with KG-grounded explanations:
 1. Aerobic section: ✓ (cites Recommendation 1)
 2. Resistance section: ✓ (cites Recommendation 2)
 3. Flexibility section: ✓ (cites Recommendation 3)
 4. Seated marching: ✓ ("keeps pressure off knees")
 5. Upper body exercises: ✓ (explains focus on upper body)
 6. Stretches: ✓ ("improves joint mobility without strain")
 7. Avoidance section: ✓ (cites contraindications)
 8. Progression tips: ✓ (references Recommendation 1)
 9. Side steps: ✓ (implicit in aerobic explanation)
 10. Modified dancing: ✓ (implicit in aerobic explanation)
 11. Individual stretches: ✓ (database reference)
 12. Form check note: ✓ (cites Recommendation 2)
- Score = $12/12 = 1.0$

Score: 1.0 **Justification:** All recommendations include clear explanations referencing either the KG guidelines, contraindications, or the exercise database, with explicit citations throughout the plan.

Eval 2:

1. GUIDELINES ADHERENCE

Guideline block	Frequency	Intensity	Duration	Type	Fully met?	Notes
Low-impact aerobic	4 × week ✓	Low-medium ✓	30 min ✓	Aerobic ✓	Yes	Exactly matches Recommendation 1
Resistance training	3 × week ✓	Low ✓	20 min ✗	Resistance ✓	No	Plan lists ~6 min of lifting, no overall 20-min session length
Flexibility/ROM	5 × week ✓	Low ✓	10 min ✓	Flexibility ✓	Yes	Matches Recommendation 3

Calculation → **2 fully-compliant blocks ÷ 3 total = 0.67 → 0.7**

Score: 0.7

2. SAFETY COMPLIANCE

Exercises prescribed (10 total):

Seated Marching, Standing Side Steps, Modified Dancing, Calf Raises, Dumbbell Bicep Curl, Dumbbell Shoulder Press, Chest Press, Chest Opener Stretch, Triceps Stretch, Standing Calf Stretch.

Unsafe items found: 0 (none violate “high-impact”, “deep knee bend”, “unstable balance”, etc.)

Calculation → $1 - (0 \text{ unsafe} \div 10 \text{ total}) = 1.0$

Score: 1.0

3. BENEFIT POTENTIAL

Qualitative factors considered: knee-friendly aerobic conditioning ✓, upper-body strength ✓, daily ROM ✓, aligns with “low-impact at home” preference ✓, but missing quadriceps-strengthening for knee support ✗.

Heuristic score assigned: 0.8

4. EXERCISE DIVERSITY

Categories present: Aerobic, Strength, Flexibility = 3

Total possible categories counted (Aerobic, Strength, Flexibility, Anaerobic/Power) = 4

Calculation → $3 \div 4 = 0.75 \rightarrow 0.8$

Score: 0.8

5. PROGRESSION ADEQUACY

Progression cues present for **both** aerobic (+5 min/2 weeks) **and** resistance (increase weight when 12 reps are easy).

Binary metric: progression mentioned? **Yes** → **1.0**

6. EXPLAINABILITY

Items (5 blocks): Aerobic section, Resistance section, Flexibility section, Progression tips, Avoid/Why.

Blocks explicitly tied to guidelines or condition: 4 (all except Progression tips, which cites a recommendation but not the condition directly).

Calculation → $4 \div 5 = 0.8$

Score: 0.8

SUMMARY

The plan scores well for safety and offers clear progression, guideline linkage, and a balanced mix of aerobic, strength, and flexibility work, making it highly suitable for someone with mild knee osteoarthritis. Its main gaps are the missing 20-minute resistance session length and lack of targeted quadriceps strengthening; addressing these would raise both guideline adherence and therapeutic benefit further.

Deepseek + Reduced KG:

Personalized Low-Impact Workout Plan for Mild Knee Osteoarthritis

(At-home routine with yoga mat and light dumbbells)

Key Considerations (Based on Contraindication Data):

- Avoid high-impact movements (e.g., jumping, running) to protect your knee joints.
 - Minimize exercises that involve deep knee flexion or excessive hip/spine strain.
 - Focus on controlled movements with light weights to build strength without joint stress.
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Warm-Up (5-7 minutes)

1. **Chest Opener Stretch** (from our exercise database): Stand tall, clasp hands behind your back, and gently lift your arms to open the chest. *Why?* Improves posture and offsets stiffness from sedentary habits.

2. **Standing Calf Stretch with Step** (from our exercise database): Place one foot on a step or sturdy book, heel hanging off, and gently lower the heel. *Why?* Loosens tight calves, which can indirectly reduce knee strain.
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Strength & Stability Routine (20-25 minutes)

Lower Body (Knee-Friendly):

- **Calf Raises** (2 sets of 12-15 reps): Strengthens lower legs without knee flexion. *Why?* Builds stability around the knee joint (from our exercise database).
- **Wall Sit (Modified)**: Slide down a wall until thighs are parallel to the floor, but only go as low as pain-free. Hold for 20-30 seconds. *Why?* Strengthens quads with minimal knee load.

Upper Body (Dumbbell Work):

- **Dumbbell Shoulder Press** (2 sets of 10-12 reps): Sit on a chair for support. *Why?* Avoids standing balance demands (from our exercise database).
- **Dumbbell Bicep Curl** (2 sets of 12-15 reps): Keep elbows close to your sides. *Why?* Isolates arm muscles without stressing knees.
- **Modified Push-Ups** (2 sets of 8-10 reps): Do these against a wall or countertop to avoid floor knee pressure.

Core (Spine-Safe):

- **Seated Russian Twists** (2 sets of 10/side): Sit on your mat, lean back slightly, and rotate torso with a light dumbbell. *Why?* Avoids lying on the floor, which can strain hips/spine.
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Stretching & Mobility (10 minutes)

- **Triceps Stretch** (from our exercise database): Reach one arm overhead, bend the elbow, and gently push it backward.
 - **Side Neck Stretch** (from our exercise database): Tilt your head toward one shoulder and hold for 15-20 seconds per side.
 - **Seated Hamstring Stretch**: Sit on your mat, extend one leg, and reach toward your toes (avoid rounding your spine).
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Important Notes:

- **Intensity:** Keep weights light (3-8 lbs) and focus on slow, controlled movements.
- **Frequency:** Aim for 3-4 sessions/week with rest days in between.
- **Modifications:** If any exercise causes knee pain, stop immediately and try a seated version or reduce range of motion.

Why This Works:

This plan prioritizes joint protection (avoiding high-impact and high-balance moves) while maintaining strength and flexibility. Upper-body work keeps you active without knee strain, and gentle lower-body exercises target supporting muscles.

Final Reminder:

Always consult your physical therapist or doctor before starting a new routine, especially if pain worsens. Adjustments may be needed based on your unique joint health!

Let me know if you'd like more modifications or alternative exercises! 😊

Eval 1:

I'll evaluate this AI-generated workout plan for someone with mild knee osteoarthritis using the six specified metrics, showing all calculations.

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Calculation:

- Frequency: ✓ Plan suggests 3-4 sessions/week (Guidelines: 3-5/week across different types)
- Intensity: ✓ "Keep weights light" matches low intensity
- Duration: ✗ Total 35-42 minutes doesn't match specific durations (30 min aerobic, 20 min resistance, 10 min flexibility)
- Type: Partial - Has resistance and flexibility but missing dedicated aerobic

- Equipment: ✗ Uses mat and dumbbells but guidelines specify bike/pool for aerobic

Compliant items: $2/5 = 0.4$

Score: 0.4 Justification: The plan partially follows guidelines for frequency and intensity but misses specific duration requirements, lacks dedicated aerobic exercise, and doesn't use recommended aerobic equipment.

2. SAFETY COMPLIANCE

Calculation: Total exercises: 11 (Chest Opener, Calf Stretch, Calf Raises, Wall Sit, Shoulder Press, Bicep Curl, Push-ups, Russian Twists, Triceps Stretch, Neck Stretch, Hamstring Stretch)

Unsafe exercises:

- Wall Sit: Involves knee flexion (violates "Knee involvement")
- Russian Twists: Potential spine involvement

Unsafe items: $2/11$ Score = $1 - (2/11) = 1 - 0.18 = 0.82$

Score: 0.8 Justification: Most exercises avoid knee involvement contraindications, but Wall Sits directly involve knee flexion and Russian Twists may challenge spine involvement restrictions.

3. BENEFIT POTENTIAL

Score: 0.9 Justification: The plan excellently addresses the user's needs with appropriate home-based exercises using only requested equipment, focuses on low-impact movements, and provides comprehensive strengthening and flexibility work suitable for managing osteoarthritis.

4. EXERCISE DIVERSITY

Calculation: Categories present:

- Aerobic: ✗ (no dedicated aerobic exercises)
- Strength: ✓ (multiple resistance exercises)
- Stretching: ✓ (multiple flexibility exercises)
- Anaerobic: ✗ (no high-intensity intervals)

Categories included: $2/4 = 0.5$

Score: 0.5 Justification: The plan includes strength training and stretching/flexibility exercises (2 out of 4 categories), but lacks dedicated aerobic and anaerobic components.

5. PROGRESSION ADEQUACY

Calculation: Mentions of progression in the plan: 0 Binary score: 0 (no progression mentioned)

Score: 0.0 **Justification:** The plan does not include any explicit progression instructions, failing to mention how to advance the routine over time despite guidelines emphasizing progression.

6. EXPLAINABILITY

Calculation: Exercises with explanations:

1. Chest Opener - ✓ "Improves posture and offsets stiffness"
2. Calf Stretch - ✓ "Loosens tight calves, which can indirectly reduce knee strain"
3. Calf Raises - ✓ "Builds stability around the knee joint"
4. Wall Sit - ✓ "Strengthens quads with minimal knee load"
5. Shoulder Press - ✓ "Avoids standing balance demands"
6. Bicep Curl - ✓ "Isolates arm muscles without stressing knees"
7. Push-ups - ✓ "avoid floor knee pressure"
8. Russian Twists - ✓ "Avoids lying on floor, which can strain hips/spine"
9. Triceps Stretch - ✓ (from database)
10. Neck Stretch - ✓ (from database)
11. Hamstring Stretch - ✓ "avoid rounding your spine"

Items with explanation: 11/11 = 1.0

Score: 1.0 **Justification:** Every exercise includes a clear explanation that references either joint protection, the condition, or the exercise database, demonstrating excellent grounding in rationale.

SUMMARY

Overall Assessment: This is a well-explained, safety-conscious plan that effectively uses available equipment. However, it scores moderately (average 0.57) due to missing aerobic components, lack of progression guidance, and partial guideline adherence, limiting its long-term therapeutic effectiveness for knee osteoarthritis management.

Eval 2:

1. GUIDELINES ADHERENCE

KG Recommendation	Minimum Specs	What the Plan Provides	Meets all specs?	Reason
Rec 1 – Low-impact aerobic 4 × wk · 30 min · low/mod	4 sessions, 30 min, aerobic	None – no dedicated 30-min aerobic block	No	Warm-up (5–7 min) is too brief; no aerobic day prescribed
Rec 2 – Resistance 3 × wk · 20 min · low · rest 48 h	Strength block 20–25 min, 3-4 × wk, light weights	Yes	Fully satisfies frequency, duration, intensity, type	
Rec 3 – Flexibility/ROM 5 × wk · 10 min	Stretching block 10 min but only 3-4 × wk	No	Frequency falls short of 5 × wk	

Calculation: 1 fully-compliant block ÷ 3 total = **0.33** → **0.3**

Score: 0.3

2. SAFETY COMPLIANCE

Exercises listed (11):

1 Chest Opener Stretch 2 Standing Calf Stretch 3 Calf Raises 4 **Wall Sit** 5 DB Shoulder Press 6 DB Bicep Curl 7 Modified Push-Ups 8 Seated Russian Twists 9 Triceps Stretch 10 Side Neck Stretch 11 Seated Hamstring Stretch

Potentially unsafe items:

- **Wall Sit** – involves sustained knee flexion; deep knee-load is flagged under “knee involvement” contraindication.

Calculation: 1 unsafe ÷ 11 total = 0.09 → 1 – 0.09 = **0.91** → **0.9**

Score: 0.9

3. BENEFIT POTENTIAL

Positives: resistance and flexibility match user's low-impact request; clear joint-protection cues.
Missing: dedicated low-impact cardio (key for OA) and quadriceps strengthening alternatives if Wall Sit is painful.

Heuristic calculation: strong but incomplete → **0.6**

Score: 0.6

4. EXERCISE DIVERSITY

Categories represented:

- Strength ✓
- Flexibility/Mobility ✓
- Aerobic ✗ (no 30-min cardio)
- Anaerobic/Power ✗

Calculation: 2 categories ÷ 4 = **0.50** → **0.5**

Score: 0.5

5. PROGRESSION ADEQUACY

No explicit instructions to add time, reps, or load over weeks.

Score: 0.0

6. EXPLAINABILITY

11 exercise blocks; 9 include a "Why?" sentence linking the choice to joint protection or OA context (Chest Opener, Calf Stretch, Calf Raises, Wall Sit, Shoulder Press, Bicep Curl, Push-Ups, Russian Twists, Hamstring Stretch).

Calculation: 9 ÷ 11 = 0.82 → **0.8**

Score: 0.8

User Query 2: *I have moderate osteoarthritis and standing for long periods is uncomfortable. I'm looking for a 20-minute seated workout that focuses on flexibility and light strength using resistance bands*

Deepseek + Complete KG:

Personalized 20-Minute Seated Workout for Moderate Osteoarthritis

Great choice opting for seated exercises with resistance bands! Let's create a plan that aligns with your needs and the Fitness Guidelines for osteoarthritis (OA).

Key Principles from the Fitness Guidelines

1. Resistance Training (from Recommendation 2):
 - Frequency: 3x/week
 - Intensity: Low (using resistance bands)
 - Progression: Increase resistance when 12 reps feel easy
 - Rest: 48 hours between sessions
 2. Flexibility & Range-of-Motion (from Recommendation 3):
 - Frequency: Daily (5x/week)
 - Hold stretches for 10–30 seconds, progressing gradually
 3. Avoid (from Contraindications):
 - High-impact movements
 - Exercises stressing knees, hips, or spine
 - Standing for prolonged periods
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20-Minute Seated Workout Plan

(All exercises sourced from our safe exercise database for OA)

Warm-Up (3 minutes)

- Neck Side Stretch (seated):
 - Gently tilt your head toward each shoulder, holding 10 seconds/side.
 - Why? Reduces stiffness in the neck and shoulders, common with OA.
 - Chest Opener Stretch (seated):
 - Clasp hands behind your back, open chest, and hold 10 seconds.
 - Why? Counters hunched posture from sitting.
-

Strength & Resistance (10 minutes)

(Use light-to-moderate resistance bands)

- Seated Chest Press (3 sets of 10–12 reps):
 - Anchor the band behind you, press forward gently.
 - Why? Strengthens chest/shoulders without joint strain.
 - Seated Bicep Curl (3 sets of 10–12 reps):
 - Step on the band, curl palms upward.
 - Why? Builds arm strength with controlled movement.
 - Seated Shoulder Press (3 sets of 10–12 reps):
 - Press the band overhead, keeping elbows slightly bent.
 - Why? Strengthens shoulders safely in a stable position.
 - Seated Tricep Extension (3 sets of 10–12 reps):
 - Anchor the band overhead, extend elbows downward.
 - Why? Targets arm muscles without wrist strain.
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Flexibility & Cool-Down (7 minutes)

- Triceps Stretch (seated):
 - Reach one arm overhead, bend elbow, and hold 15–20 seconds/side.
 - Wrist Flexor Stretch (seated):
 - Extend arm, gently pull fingers back, hold 15 seconds.
 - Chest Stretch in Doorway (modified seated version):
 - Place hands on chair sides, lean forward slightly to stretch the chest.
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Progression Tips

- Strength: Once 12 reps feel easy, use a thicker band (per Recommendation 2).
- Flexibility: Gradually increase stretch holds to 30 seconds (per Recommendation 3).

Safety Reminders

- Stop if you feel sharp pain (avoid "pushing through").
- Consult a physiotherapist to perfect your form (as noted in the Supervision guidelines).

This plan avoids standing, prioritizes joint-friendly movements, and balances strength with flexibility—all tailored to your OA needs. Let me know if you'd like adjustments! 💪

(Sources: Fitness Recommendations 2 & 3, Contraindications, and Safe Exercise Database for OA)

Eval 1:

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Calculation:

- Frequency: Plan suggests 3x/week for strength (matches Rec 2 ✓) and daily for flexibility (matches Rec 3 ✓)
- Intensity: Low intensity with resistance bands (matches guidelines ✓)
- Duration: 20 minutes total (matches Rec 2 for resistance ✓)
- Type: Includes resistance training and flexibility (matches Recs 2&3 ✓) but missing aerobic (Rec 1 ✗)

Compliant items: 4.5 out of 5 Score = $4.5/5 = 0.9$

Score: 0.9 Justification: The plan excellently follows the resistance training and flexibility guidelines but omits the low-impact aerobic component, though this could be justified given the user's specific request for seated flexibility and strength work.

2. SAFETY COMPLIANCE

Calculation: Checking each exercise against contraindications:

- Neck Side Stretch: Safe, no contraindications ✓
- Chest Opener Stretch: Safe ✓
- Seated variations of Chest Press: Safe ✓
- Seated Bicep Curl: Safe (modified from standing) ✓
- Seated Shoulder Press: Safe ✓
- Seated Tricep Extension: Safe ✓
- Triceps Stretch: Safe ✓
- Wrist Flexor Stretch: Safe ✓
- Modified Chest Stretch: Safe ✓

All exercises are seated (avoiding standing discomfort) and from the safe exercise list.
Unsafe items: 0 out of 9 exercises Score = $1 - (0/9) = 1.0$

Score: 1.0 Justification: All exercises are appropriately modified to seated positions, avoid contraindicated movements (high impact, knee/hip/spine involvement), and perfectly align with the user's need to avoid standing.

3. BENEFIT POTENTIAL

Score: 0.9 Justification: The plan excellently addresses the user's specific needs (seated, 20 minutes, flexibility and light strength with bands) while providing therapeutic benefits for moderate OA through joint-friendly strengthening and range-of-motion exercises.

4. EXERCISE DIVERSITY

Calculation: Categories included:

- Aerobic: 0 exercises
- Strength: 4 exercises (chest press, bicep curl, shoulder press, tricep extension)
- Stretching: 5 exercises (neck stretch, chest opener, triceps stretch, wrist flexor, chest stretch)
- Anaerobic: 0 exercises

Distinct categories: 2 out of 4 Score = $2/4 = 0.5$

Score: 0.5 Justification: The plan includes good variety within strength and stretching categories but lacks aerobic and anaerobic components, though this aligns with the user's specific request for flexibility and strength focus.

5. PROGRESSION ADEQUACY

Calculation: The plan includes explicit progression instructions:

- "Once 12 reps feel easy, use a thicker band (per Recommendation 2)"
- "Gradually increase stretch holds to 30 seconds (per Recommendation 3)"

Score = 1 (progression clearly mentioned with specific metrics)

Score: 1.0 Justification: The plan provides clear, guideline-based progression instructions for both strength (increasing resistance bands) and flexibility (extending hold times), with specific benchmarks.

6. EXPLAINABILITY

Calculation: Items with KG-grounded explanations:

- Initial section references all 3 guidelines ✓
- Each exercise includes a "Why?" explanation ✓
- Neck Side Stretch: explains OA benefit ✓
- Chest Opener: explains posture benefit ✓
- All 4 strength exercises: explain joint safety ✓
- All stretches: reference specific benefits ✓
- Progression section: cites specific recommendations ✓
- Safety section: references supervision guidelines ✓

Well-explained items: 9 out of 9 exercises/components Score = 9/9 = 1.0

Score: 1.0 Justification: Every exercise includes a clear "Why?" explanation linking it to OA management, and the plan consistently references specific guideline recommendations throughout, demonstrating excellent knowledge graph grounding.

SUMMARY

Overall Assessment: This is an exceptionally well-designed seated workout plan that precisely addresses the user's needs while adhering closely to arthritis management guidelines. The plan demonstrates excellent safety compliance, clear progression pathways, and outstanding explainability, making it highly suitable for someone with moderate osteoarthritis who needs to avoid standing. The only minor limitation is the expected absence of aerobic exercise given the seated constraint.

Eval 2:

1. GUIDELINES ADHERENCE

KG Recommendation	Required specs (F · I · D · T)	What the seated plan prescribes	Fully met?	Comment
Rec 1 – Low-impact aerobic 4 × wk · 30 min · low/mod · aerobic	4 / 30 / ✓ / ✓	<i>None</i> – plan is purely strength + flexibility	No	Lacks any aerobic segment
Rec 2 – Resistance 3 × wk · 20 min · low · 48 h	3 / 20 / ✓ / ✓	3 × wk stated, 10 min per session; low intensity; resistance	No	Duration < 20 min
Rec 3 – Flexibility/ROM 5 × wk · 10 min · low	5 / 10 / ✓	Daily stated, 7 min per session	No	Duration < 10 min

Calculation: 0 fully-compliant blocks ÷ 3 total = **0.00** → **0.0**

Score: 0.0

Justification: None of the three guideline blocks meet *all* frequency, duration, and type requirements.

2. SAFETY COMPLIANCE

Exercises analysed (9):

- Warm-up (2): neck side stretch, chest opener
- Strength (4): seated chest press, biceps curl, shoulder press, triceps extension
- Flexibility (3): triceps stretch, wrist flexor stretch, seated doorway chest stretch

Unsafe items: 0 (all seated, low-impact, no knee/hip load, no balance or spine compression).

Calculation: 1 – (0 ÷ 9) = **1.0**

Score: 1.0

Justification: Every movement respects the listed contraindications for moderate OA.

3. BENEFIT POTENTIAL

- Directly matches the user's request for a *20-minute seated* routine with bands ✓
- Provides balanced upper-body strength and ROM to counter stiffness ✓
- Clear OA-specific safety cues ✓
- Omits aerobic conditioning and under-doses guideline durations ✗

Heuristic rating: 0.7

Score: 0.7

Justification: Highly useful for stated goals but not comprehensive for broader OA fitness.

4. EXERCISE DIVERSITY

Categories present	Count
Strength	✓
Flexibility/Mobility	✓
Aerobic	✗
Anaerobic/Power	✗

Calculation: $2 \div 4 = 0.50$

Score: 0.5

Justification: Offers only strength and flexibility work.

5. PROGRESSION ADEQUACY

Plan states: "Use a thicker band once 12 reps feel easy" and "increase stretch holds to 30 s."

Score: 1.0

Justification: Explicit progression instructions for both resistance and stretching.

6. EXPLAINABILITY

Blocks counted = 9

Blocks with OA- or guideline-grounded explanations ("Why?" lines or direct guideline reference) = 6

Calculation: $6 \div 9 = 0.67 \rightarrow 0.7$

Score: 0.7

Justification: Most exercise sections include a brief rationale linking to joint safety or the cited recommendations.

Deepseek + Reduced KG:

Here's a **20-minute seated workout plan** tailored for your moderate osteoarthritis, focusing on gentle strength and flexibility while avoiding strain on your knees, hips, or spine (based on the contraindication data provided). All exercises use resistance bands and prioritize seated stability.

Workout Structure

- **Warm-Up (3–4 minutes)**
 - **Strength & Flexibility Circuit (12–14 minutes)**
 - **Cool-Down (3–4 minutes)**
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1. Warm-Up: Gentle Mobility

(Prepares joints for movement without strain)

- **Neck Side Stretch** (from our exercise database):
 - Tilt your head gently toward each shoulder, holding 10 seconds per side.
 - *Why?* Relieves neck tension common with arthritis.
 - **Wrist Flexor Stretch:**
 - Extend your arms, palms up, and gently pull fingers back with your opposite hand. Hold 10 seconds per side.
 - *Why?* Counteracts stiffness from limited activity.
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2. Strength & Flexibility Circuit

(Repeat 2x for 6–7 minutes per round. Use light-to-medium resistance bands.)

A. Seated Chest Press (from our exercise database):

- Anchor the band behind you (e.g., around a sturdy chair leg).
- Press forward at chest level, squeezing shoulder blades.
- **Sets/Reps:** 2x10–12 reps.
- *Why?* Strengthens the upper body without stressing joints.

B. Seated Resistance Band Rows:

- Loop the band around your feet and pull elbows back, squeezing shoulders.
- **Sets/Reps:** 2x10–12 reps.
- *Why?* Builds back strength while supporting posture.

C. Seated Bicep Curl:

- Sit on the band and curl upward, keeping elbows close to your sides.
- **Sets/Reps:** 2x8–10 reps.
- *Why?* Low-impact arm strengthening.

D. Chest Opener Stretch (from our exercise database):

- Clasp hands behind your back, gently lifting arms to open the chest. Hold 15–20 seconds.
 - *Why?* Counters hunched posture from sitting.
-

3. Cool-Down: Seated Stretches

- **Shoulder Cross-Body Stretch:**
 - Pull one arm across your chest, holding 15 seconds per side.
 - **Overhead Tricep Stretch:**
 - Raise one arm overhead, bend elbow, and gently push it back. Hold 15 seconds per side.
 - *Why these?* They improve upper-body flexibility without joint strain (aligned with safe exercise data).
-

Key Avoidances

- **Standing exercises** (like calf raises or tricep dips) to prevent knee/hip discomfort.
 - **High-resistance bands** or rapid movements, which could increase joint stress.
 - **Twisting motions** (e.g., oblique crunches) due to potential spine involvement.
-

Final Tips

- **Pain is your guide:** Stop any exercise that causes sharp or worsening joint pain.
- **Progress slowly:** Increase resistance or reps only if comfortable.
- **Consult a pro:** A physical therapist can personalize this further.

This plan combines safe exercises from our database with your need for seated, low-impact movement. Let me know if you'd like more variations! 💪

Eval 1:

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Calculation:

- Frequency: Not specified in plan (guidelines suggest 3-5x/week) ✗
- Intensity: Low intensity matches guidelines ✓
- Duration: 20 minutes matches resistance training guideline ✓
- Type: Includes resistance and flexibility (2 of 3 recommended types) ✓ (partial)

Compliant items: 2.5 out of 4 Score = $2.5/4 = 0.625$

Score: 0.6 Justification: The plan aligns well with intensity and duration guidelines for resistance training and flexibility, but fails to specify workout frequency and omits the recommended low-impact aerobic component.

2. SAFETY COMPLIANCE

Calculation: Checking each exercise against contraindications:

- Neck Side Stretch: Safe ✓
- Wrist Flexor Stretch: Safe ✓
- Seated Chest Press: Safe (modified from database) ✓
- Seated Resistance Band Rows: Not in safe list but avoids contraindications ✓
- Seated Bicep Curl: Modified from database, safe ✓
- Chest Opener Stretch: Safe ✓
- Shoulder Cross-Body Stretch: Safe ✓
- Overhead Tricep Stretch: Safe ✓

The plan specifically avoids standing exercises, twisting motions, and high-impact movements. Unsafe items: 0 out of 8 exercises Score = $1 - (0/8) = 1.0$

Score: 1.0 Justification: All exercises are either from the safe exercise list or are seated modifications that avoid all contraindications (knee, hip, spine involvement, high impact, high intensity, balance requirements).

3. BENEFIT POTENTIAL

Score: 0.9 Justification: The plan excellently addresses the user's specific needs for seated exercises, uses requested resistance bands, focuses on flexibility and light strength as requested, and accommodates their standing discomfort while providing therapeutic value for arthritis management.

4. EXERCISE DIVERSITY

Calculation: Categories included:

- Aerobic: 0 exercises
- Strength: 4 exercises (chest press, rows, bicep curl, implied band work)
- Stretching: 4 exercises (neck, wrist, chest opener, shoulder, tricep stretches)
- Anaerobic: 0 exercises

Distinct categories: 2 out of 4 Score = $2/4 = 0.5$

Score: 0.5 Justification: The plan includes good strength and flexibility components as requested, but lacks aerobic and anaerobic elements, limiting overall exercise diversity.

5. PROGRESSION ADEQUACY

Calculation: The plan mentions: "Progress slowly: Increase resistance or reps only if comfortable" This provides basic progression guidance. Score = 1 (progression mentioned)

Score: 1.0 Justification: The plan includes explicit progression instructions, advising to increase resistance or repetitions when comfortable, which aligns with the guidelines' progression recommendations.

6. EXPLAINABILITY

Calculation: Items with explanations:

- Neck Side Stretch: "Relieves neck tension common with arthritis" ✓
- Wrist Flexor Stretch: "Counteracts stiffness from limited activity" ✓
- Chest Press: "Strengthens upper body without stressing joints" ✓
- Rows: "Builds back strength while supporting posture" ✓
- Bicep Curl: "Low-impact arm strengthening" ✓
- Chest Opener: "Counters hunched posture from sitting" ✓
- Cool-down stretches: "Improve upper-body flexibility without joint strain" ✓
- Key Avoidances section explains contraindications ✓

Well-explained items: 8 out of 8 exercise components Score = $8/8 = 1.0$

Score: 1.0 Justification: Every exercise includes a clear explanation of its benefits for arthritis or how it addresses specific needs, and the plan explicitly references the safe exercise database and contraindications.

Eval 2:

1. GUIDELINES ADHERENCE

KG recommendation	Specs to meet (F · I · D · T)	What the 20-min plan offers	Fully met?	Comment
Rec 1 – Low-impact aerobic 4 × wk · 30 min · low/mod · aerobic	4/30/✓/✓	None – no aerobic component	No	Type & duration absent
Rec 2 – Resistance 3 × wk · 20 min · low · 48 h rest	3/20/✓/✓	Freq = unspecified; 12–14 min per session	No	< 20 min & no weekly frequency
Rec 3 – Flexibility 5 × wk · 10 min · low	5/10/✓	Freq = unspecified; ~6–7 min total	No	< 10 min & no weekly frequency

Calculation: 0 compliant blocks ÷ 3 total = **0.00** → **0.0**

Score: 0.0

Justification: The workout omits aerobic training and under-delivers both resistance and flexibility guideline requirements (frequency & duration).

2. SAFETY COMPLIANCE

Exercises analysed (9): neck side stretch, wrist flexor stretch, seated chest press, seated rows, seated bicep curl, chest opener stretch, shoulder cross-body stretch, overhead tricep stretch, seated circuit repetition.

Unsafe items: 0 (all seated, low-impact, no knee/hip/spine load, no balance demand).

Calculation: 1 – (0 ÷ 9) = **1.0**

Score: 1.0

Justification: The routine fully respects the contraindication list for moderate osteoarthritis.

3. BENEFIT POTENTIAL

- Precisely matches user request for a **20-min seated** band session.
- Provides upper-body strength and flexibility likely to reduce stiffness.
 - Lacks cardiovascular work and delivers sub-guideline volumes for resistance & ROM.

Heuristic rating: 0.7

Score: 0.7

Justification: Helpful for the stated goal but not comprehensive for overall OA management.

4. EXERCISE DIVERSITY

Categories present	Count
Strength	✓
Flexibility	✓
Aerobic	✗
Anaerobic/Power	✗

Calculation: $2 \div 4 = 0.50$

Score: 0.5

Justification: Only strength and flexibility modalities are included.

5. PROGRESSION ADEQUACY

Plan advises: "Progress slowly – increase resistance or reps only if comfortable."

Score: 1.0

Justification: Provides a (brief) explicit progression cue that aligns with Rec 2.

6. EXPLAINABILITY

Block (exercise/section)	OA / guideline rationale present?
Neck side stretch	✓
Wrist flexor stretch	✓
Seated chest press	✓
Seated rows	✓
Seated bicep curl	✓
Chest opener stretch	✓
Shoulder cross-body stretch	✓
Overhead tricep stretch	✓
Plan-level key avoidances	✓

Explained blocks = 9 Total blocks assessed = 9

Calculation: $9 \div 9 = 1.00 \rightarrow 1.0$

Score: 1.0

Justification: Every exercise or section includes a short “Why?” that links to OA safety or posture, satisfying the explainability criterion.

User Query 3: *My osteoarthritis is pretty severe, and most movements cause joint pain. Do you have any very gentle chair-based workouts I could do that won't aggravate my condition?*

Deepseek + Complete KG:

Gentle Chair-Based Workout Plan for Severe Osteoarthritis

Hi there! Let's create a safe, joint-friendly routine that respects your current limitations while keeping you active. Below is a **custom plan** based on your condition's Fitness Guidelines and contraindications.

Key Principles from the Fitness Guidelines (used to design this plan):

1. **Low-to-moderate intensity** (no high-impact or high-intensity movements)
2. **Seated exercises only** (to avoid aggravating hips, knees, or spine)
3. **Focus on:**
 - **Light aerobic activity** (4x/week, ~30 mins)
 - **Resistance training** (3x/week, light weights/bands)
 - **Daily flexibility/range-of-motion work** (5x/week, 10 mins)

All exercises are from our safe exercise database for arthritis.

Workout Plan

1. Seated Aerobic Exercises (4x/week, start with 10-15 mins, build to 30 mins)

- **Seated Marching:** Lift knees gently, alternating legs (low impact, promotes circulation).
- **Arm Circles:** Small forward/backward circles (warms up shoulders without strain).
- **Ankle Pumps:** Flex and point toes to improve lower-leg circulation.

Why? These are **low-impact aerobic movements** (per Fitness Recommendation 1) that avoid stressing your joints.

2. Resistance Training (3x/week, 20 mins, 48-hour rest between sessions)

Use **light resistance bands** or **1-3 lb dumbbells** (or even water bottles!). Do 1-2 sets of 10-12 reps:

- **Seated Bicep Curls** (from our exercise database): Strengthens arms without joint strain.
- **Overhead Tricep Extensions** (from our database): Keeps elbows mobile.
- **Chest Flys with Band:** Gentle chest opener (prevents stiffness).

Why? Fitness Recommendation 2 emphasizes **low-intensity resistance work** to maintain muscle without overloading joints.

3. Daily Stretches (5x/week, 10 mins)

Hold each stretch for **10-15 seconds** (gradually increase to 30 sec as tolerated):

- **Chest Opener Stretch:** Clasp hands behind chair, gently roll shoulders back.
- **Neck Side Stretch:** Tilt ear toward shoulder (avoid if you have spine involvement).
- **Wrist Flexor Stretch:** Extend arm, palm up, gently pull fingers back.

Why? Fitness Recommendation 3 highlights **flexibility work** to preserve joint mobility and reduce stiffness.

What to Avoid (Based on Contraindications):

- **Standing balance exercises** (high fall risk with severe OA).
 - **Twisting motions** (if spine is involved).
 - **Any exercise causing pain** (stop immediately if discomfort occurs).
-

Progression Tips

- Add **5 minutes** to aerobic sessions every 2 weeks (per Fitness Recommendation 1).
 - Increase resistance **only when 12 reps feel easy** (per Fitness Recommendation 2).
-

Final Notes

- **Supervision:** Consider consulting a physiotherapist to tailor this plan further (as suggested in the guidelines).
- **Pain signals:** If an exercise hurts, modify or skip it—your comfort is priority #1!

Let me know if you'd like adjustments—this plan is fully adaptable to your needs!



Eval 1:

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Score: 0.9

Justification: The plan follows nearly all guideline parameters from the three fitness recommendations. It matches the required frequencies (4x aerobic, 3x resistance, 5x flexibility), maintains low intensity levels, includes

appropriate durations, covers all three exercise types, and incorporates both progression strategies mentioned in the guidelines.

Calculation:

- Guideline 1: Frequency ✓ , Intensity ✓ , Duration ✓ , Type ✓ , Progression ✓ (5/5)
- Guideline 2: Frequency ✓ , Intensity ✓ , Duration ✓ , Type ✓ , Rest Period ✓ , Progression ✓ (6/6)
- Guideline 3: Frequency ✓ , Intensity ✓ , Duration ✓ , Type ✓ , Progression ✓ (5/5)
- Total: 16/16 compliant items = 1.0
- Minor deduction for not explicitly mentioning some equipment alternatives = 0.9

2. SAFETY COMPLIANCE

Score: 1.0

Justification: The plan completely avoids all contraindicated attributes. All exercises are seated (avoiding balance requirements), low-impact (avoiding high/moderate impact levels), low intensity (avoiding moderate/high intensity), and exclude spine/knee/hip involvement movements.

Calculation:

- Total exercises recommended: 9 (seated marching, arm circles, ankle pumps, bicep curls, tricep extensions, chest flys, chest opener stretch, neck side stretch, wrist flexor stretch)
- Unsafe exercises identified: 0
- Score = $1 - (0/9) = 1.0$

3. BENEFIT POTENTIAL

Score: 0.9

Justification: The plan excellently addresses the user's specific need for "very gentle chair-based workouts" and provides comprehensive therapeutic benefits including improved circulation, joint mobility maintenance, and gentle strengthening without aggravating severe osteoarthritis symptoms.

4. EXERCISE DIVERSITY

Score: 0.8

Justification: The plan includes three of four main exercise categories: aerobic exercises (seated marching, arm circles, ankle pumps), resistance/strength training (bicep curls, tricep extensions, chest flys), and flexibility/stretching (chest opener, neck stretch, wrist stretch). Anaerobic training is appropriately excluded given the severe condition.

Calculation:

- Categories included: Aerobic ✓ , Resistance ✓ , Flexibility ✓ , Anaerobic ✗
- Score = $3/4 = 0.75$
- Bonus for appropriate exclusion of anaerobic = $+0.05 = 0.8$

5. PROGRESSION ADEQUACY

Score: 1.0

Justification: The plan includes explicit progression instructions for all three exercise types: adding 5 minutes to aerobic sessions every 2 weeks, increasing resistance when 12 reps feel easy, and gradually extending stretch hold times from 10-15 seconds to 30 seconds.

Calculation:

- Progression mentioned: Yes (1)
- Multiple specific progression strategies provided across all exercise types
- Score = 1.0

6. EXPLAINABILITY

Score: 1.0

Justification: Every exercise recommendation includes clear explanations referencing either the specific fitness guidelines, contraindications, or therapeutic rationale. Each section explicitly connects back to the knowledge graph recommendations and explains the "why" behind exercise selection.

Calculation:

- Exercise sections with KG-grounded explanations: 3/3 (aerobic, resistance, flexibility)
- Additional explanatory sections: contraindications explanation, progression rationale, supervision recommendations
- All recommendations include clear explanations = 1.0

Eval 2:

1. GUIDELINES ADHERENCE

KG recommendation	Required F · I · D · T	What the plan prescribes	Fully met?	Comment
Rec 1 – Low-impact aerobic 4 × wk • 30 min • low/mod • aerobic	4 / 30 / ✓ / ✓	4 × wk, 10-15 min → 30 min	No	Duration starts below 30 min
Rec 2 – Resistance 3 × wk • 20 min • low • 48 h rest	3 / 20 / ✓ / ✓	3 × wk, 20 min, 48 h rest, low	Yes	Meets all parameters
Rec 3 – Flexibility 5 × wk • 10 min • low	5 / 10 / ✓	Daily, 10 min, low	Yes	Fully matches

Calculation: compliant blocks = 2
total blocks = 3 → $2 \div 3 = 0.67 \rightarrow 0.7$

Score: 0.7

Justification: Resistance and flexibility prescriptions align exactly with the guidelines; aerobic work will eventually meet duration but does not yet, so that block is marked non-compliant.

2. SAFETY COMPLIANCE

Exercises listed (9): Seated Marching, Arm Circles, Ankle Pumps, Seated Bicep Curls, Overhead Tricep Extensions, Chest Flys (band), Chest Opener Stretch, Neck Side Stretch, Wrist Flexor Stretch

Unsafe items found: 0 (all seated, low-impact, and either in the safe-exercise list or clearly outside the contraindicated attributes).

Calculation: $1 - (0 \div 9) = 1.0$

Score: 1.0

Justification: The routine completely avoids high-impact, balance-demanding, knee/hip-loading, or spine-compressive movements.

3. BENEFIT POTENTIAL

- Precisely matches the user's request for a **very gentle, chair-based** routine.
- Covers aerobic circulation work, light strength to preserve muscle, and daily ROM stretches – all clinically beneficial for severe OA.
 - Aerobic duration begins below evidence-based 30 min target.

Heuristic rating: 0.8

Score: 0.8

Justification: High therapeutic value for pain-limited clients, with only minor under-dosage in initial cardio length.

4. EXERCISE DIVERSITY

Categories present	Count
Aerobic	✓

Strength	✓
Flexibility / ROM	✓
Anaerobic / Power	✗

Calculation: $3 \div 4 = 0.75 \rightarrow 0.8$

Score: 0.8

Justification: The plan includes aerobic, strength, and stretching elements; it omits any power/anaerobic training, which is appropriate for this population.

5. PROGRESSION ADEQUACY

- “Add 5 minutes to aerobic sessions every 2 weeks.”
- “Increase resistance only when 12 reps feel easy.”

Score: 1.0

Justification: Explicit, guideline-linked progression cues are provided for both aerobic and resistance components.

6. EXPLAINABILITY

Blocks assessed = 9 (each exercise line or section)

Blocks that include a “Why?” explanation or cite the guideline = 9

Calculation: $9 \div 9 = 1.00$

Score: 1.0

Justification: Every exercise or section contains a brief rationale tied to OA safety or the fitness recommendations.

Deepseek + Reduced KG:

Gentle Chair-Based Workout Plan for Severe Osteoarthritis

Hi there! Let's create a safe, effective routine that avoids aggravating your joints while keeping you active. Based on your condition, we'll focus on **seated exercises with minimal joint strain**, prioritizing upper-body strength and gentle mobility.

Key Contraindications to Honor

(From the provided data)

Avoid:

- High/moderate intensity or impact (e.g., jumping, brisk movements)
 - Exercises involving knee, hip, or spine stress (e.g., squats, lunges)
 - Balance challenges (e.g., standing on one leg)
-

Your Custom Workout Plan

(All exercises are from the safe list provided and adapted for seated positions)

1. Warm-Up: Gentle Stretching (5–10 mins)

- **Neck Side Stretch**
 - Slowly tilt your head toward one shoulder, hold 10–15 seconds, repeat 3x per side.
 - *Why?* Reduces upper-body tension without joint strain.
- **Chest Opener Stretch**
 - Clasp hands behind your back, gently lift arms while squeezing shoulder blades. Hold 10 seconds, repeat 3x.
 - *Why?* Counters hunched posture common with arthritis.

2. Strength & Mobility (10–15 mins)

- **Seated Dumbbell Bicep Curl** (use light weights or water bottles)
 - 2 sets of 10–12 reps, slow tempo.
 - *Why?* Strengthens arms without stressing lower-body joints.
- **Overhead Tricep Extension**
 - Lift a light weight overhead, bend elbows to lower it behind your head. 2 sets of 8–10 reps.
 - *Why?* Targets arm muscles while keeping hips/knees neutral.
- **Chest Fly** (no weights or light resistance bands)
 - Open arms wide like a hug, then bring them back. 2 sets of 10 reps.
 - *Why?* Improves chest/shoulder mobility gently.

3. Cool-Down: Seated Stretches (5 mins)

- **Wrist Flexor Stretch**

- Extend one arm, palm up, gently pull fingers back with the other hand. Hold 10 seconds, repeat 2x per side.
 - **Triceps Stretch**
 - Raise one arm overhead, bend elbow to touch upper back, gently push elbow with the other hand. Hold 10 seconds, repeat 2x per side.
-

Important Tips

- **Intensity:** Keep effort at a 3–4/10 (light exertion). Stop if pain exceeds mild discomfort.
 - **Frequency:** Aim for 3–4 sessions weekly, with rest days in between.
 - **Adaptations:** If weights are too challenging, use resistance bands or just bodyweight.
-

Why These Exercises Work

- **No impact or balance demands** (per the contraindication data).
 - **Avoid knee/hip/spine involvement** by focusing on seated upper-body work.
 - **Stretches combat stiffness** common with osteoarthritis.
-

When to Pause or Adjust

If any movement causes sharp pain (not just mild stiffness), skip it and try alternatives like:

- Shoulder rolls
 - Seated marching (tiny lifts of the knees if hip pain allows)
-

Final Note: Always check with your physiotherapist or doctor before starting a new routine—they can tailor this further to your needs!

Let me know how this feels, and we can adjust as needed. You've got this! 💪

Eval 1:

I'll evaluate this AI-generated workout plan for severe osteoarthritis using the six specified metrics.

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Score: 0.5 **Justification:** The plan partially follows guidelines. It matches the low intensity and includes flexibility/stretching (10 mins aligns with guideline 3), but doesn't specify the recommended 3-4x/week frequency clearly enough, lacks the 30-minute duration for aerobic work, and doesn't include specific resistance training protocol from guideline 2.

Calculation:

- Frequency: Mentioned 3-4x/week ✓ (partial)
- Intensity: Low ✓
- Duration: 20-30 mins total vs 30 mins aerobic + 20 mins resistance + 10 mins flexibility ✗
- Type: Has flexibility/stretching ✓, resistance ✓, but no aerobic ✗
- Score = $2.5/5 = 0.5$

2. SAFETY COMPLIANCE

Score: 1.0 **Justification:** The plan perfectly avoids all contraindicated elements - no high/moderate intensity, no impact exercises, no knee/hip/spine involvement, and no balance challenges. All exercises are seated and from the safe exercise list.

Calculation:

- Total exercises: 8
- Unsafe exercises: 0
- Score = $1 - (0/8) = 1.0$

3. BENEFIT POTENTIAL

Score: 0.8 **Justification:** The plan provides good therapeutic value for severe osteoarthritis by focusing on maintaining upper body mobility and strength while respecting joint limitations. It directly addresses the user's request for "very gentle chair-based workouts" but could benefit from including some gentle aerobic options.

4. EXERCISE DIVERSITY

Score: 0.5 **Justification:** The plan includes strength training (bicep curls, tricep extensions, chest fly) and stretching (neck, chest, wrist, triceps stretches) but lacks aerobic and anaerobic components suitable for the condition.

Calculation:

- Strength: ✓
- Stretching: ✓
- Aerobic: ✗
- Anaerobic: ✗
- Score = $2/4 = 0.5$

5. PROGRESSION ADEQUACY

Score: 0.0 **Justification:** The plan mentions no specific progression instructions despite guidelines recommending progression (e.g., "Add 5 minutes or slight speed every 2 weeks", "Increase resistance when 12 reps feel easy").

6. EXPLAINABILITY

Score: 1.0 **Justification:** Every exercise includes a clear "Why?" explanation that references the condition or safety considerations. The plan also explains contraindications upfront and provides condition-specific rationale throughout.

Calculation:

- Total items with explanations: 8
- Total items: 8
- Score = $8/8 = 1.0$

Eval 2:

1. GUIDELINES ADHERENCE

Recommendation	Must-meet specs (F · I · D · T)	What the plan gives	Fully met?	Reason
----------------	---------------------------------	---------------------	------------	--------

Rec 1 – Low-impact aerobic	4 / 30 / ✓ / ✓	No aerobic block (only brief chair stretches)	No	Type & duration absent
4 × wk · 30 min · low/mod · aerobic				
Rec 2 – Resistance	3 / 20 / ✓ / ✓	3–4 × wk, 10–15 min	No	Duration < 20 min
3 × wk · 20 min · low · 48 h rest				
Rec 3 – Flexibility	5 / 10 / ✓	3–4 × wk, ≈10 min	No	Frequency < 5 × wk
5 × wk · 10 min · low				

Calculation: 0 compliant blocks ÷ 3 total = **0.00** → **0.0**

Score: 0.0

Justification: None of the guideline blocks meet *all* required parameters (frequency, duration, and type).

2. SAFETY COMPLIANCE

Exercises analysed (7):

Neck Side Stretch, Chest Opener Stretch, Dumbbell Bicep Curl, Overhead Tricep Extension, Chest Fly, Wrist Flexor Stretch, Triceps Stretch

Unsafe items found: 0

Calculation: 1 – (0 unsafe ÷ 7 total) = 1.0

Score: 1.0

Justification: Every movement is seated, low-intensity, appears on the safe-exercise list, and avoids all listed contraindications for severe OA.

3. BENEFIT POTENTIAL

- Precisely chair-based and very gentle, matching the user's pain-limited request.
- Provides upper-body strength and regular mobility work to combat stiffness.
 - Omits any aerobic circulation work; resistance and stretching volumes are below evidence-based recommendations.

Heuristic rating: 0.6

Score: 0.6

Justification: Helpful for immediate comfort and movement, but therapeutic scope is limited by missing aerobic and under-dosage.

4. EXERCISE DIVERSITY

Categories present	Count
Strength	✓
Flexibility / ROM	✓
Aerobic	✗
Anaerobic / Power	✗

Calculation: $2 \div 4 = 0.50$

Score: 0.5

Justification: Routine covers only strength and stretching.

5. PROGRESSION ADEQUACY

Plan suggests keeping exertion light (3-4/10) but **does not instruct how to increase** weight, sets, or time beyond that.

Score: 0.0

Justification: No explicit progression guideline is provided.

6. EXPLAINABILITY

Blocks with explanations ("Why?" statements) = 7

Total exercise/stretch blocks assessed = 7

Calculation: $7 \div 7 = 1.00$

Score: 1.0

Justification: Every exercise includes a rationale linked to OA comfort or posture, satisfying the KG-grounded explanation criterion.

User Query 4: *I've got chronic low-back pain from disc degeneration and I'm looking for core-focused workout plan. Please no equipment*

Deepseek + Complete KG:

Here's a **core-focused workout plan** tailored for your disc degeneration-related low-back pain, carefully designed using our fitness guidelines and contraindication data. This no-equipment plan emphasizes spinal stability, controlled movements, and gradual progression:

Warm-Up (5-7 minutes)

Based on Flexibility & Mobility Guidelines [Recommendation #3]

1. **Cat-Camel Flow** (2 mins)
 - On hands and knees, alternate between arching and rounding your back
 - *Why?* Gently mobilizes the spine without compression
 2. **Pelvic Tilts** (2 mins)
 - Lying on back with knees bent, rock pelvis forward/backward
 - *Why?* Teaches neutral spine positioning crucial for disc health
-

Core Stability Circuit (20 mins)

Based on Resistance Training Guidelines [Recommendation #1]

Perform 2-3 rounds with 60 sec rest between circuits

1. **Modified Dead Bug** (8-10 reps/side)
 - Lying on back, alternate arm/leg extensions while maintaining pelvic stability
 - *Why?* Trains deep core muscles without spinal loading (contraindication: avoids spine involvement)
 2. **Bird Dog** (6-8 reps/side, 5-sec hold)
 - On hands and knees, extend opposite arm/leg while keeping spine neutral
 - *Why?* Improves cross-body stability (from our exercise database)
 3. **Side-Lying Leg Lifts** (10-12 reps/side)
 - Lying on side, lift top leg with controlled motion
 - *Why?* Targets obliques without spinal rotation
 4. **Forearm Plank with Knees Down** (20-30 sec holds)
 - Modified plank position to reduce lumbar strain
 - *Why?* Builds isometric core strength (avoids high intensity contraindication)
-

Cool-Down & Stretching (5-7 mins)

Combining Guidelines [Recommendation #2 & #3]

1. **Piriformis Stretch** (30 sec/side)
 - Seated figure-4 stretch to release hip tension
2. **Child's Pose** (1 min)
 - Gentle spinal decompression

3. **Chest Opener Stretch** (30 sec)

- From our safe exercises database, counters forward posture
-

Key Protocol Details

- **Frequency:** 3x/week (with 48hr rest between sessions per [Recommendation #1])
 - **Progression:**
 - First master form pain-free
 - Then increase hold times by 5 seconds weekly
 - Later add 1-2 reps/set every 2 weeks
 - **Intensity Monitoring:**
 - Should feel challenging but not painful (moderate intensity per guidelines)
 - Stop immediately if you feel sharp/stabbing pain
-

What to AVOID

Based on contraindication data:

- Any exercises involving:
 - Spinal flexion (crunches, sit-ups)
 - Twisting under load (Russian twists)
 - High impact (jumping movements)
 - Unstable surfaces (single-leg stands without support)
-

Professional Reminder

While this plan follows evidence-based guidelines, I strongly recommend:

1. Getting form checked by a physiotherapist (per [Supervision] note in guidelines)
2. Using pain as your guide - discomfort is normal, sharp pain is not
3. Combining with walking (from [Recommendation #2]) on alternate days for best results

Eval 1:

I'll evaluate this AI-generated workout plan for chronic low-back pain with disc degeneration using the six specified metrics.

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Score: 0.7 Justification: The plan follows most guidelines well (3x/week frequency, moderate intensity, resistance training focus) but falls short on duration (25-30 mins vs 30 mins required) and doesn't incorporate the recommended aerobic component within the workout itself.

Calculation:

- Frequency: 3x/week with 48hr rest ✓
- Intensity: Moderate ✓
- Duration: ~25-30 mins vs 30 mins (partial) ✓ / ✗
- Type: Resistance training for trunk ✓ , but missing aerobic component ✗
- Progression: Included ✓
- Equipment: No equipment (user request) vs recommended equipment ✗
- Score = $4.5/6 = 0.75 \approx 0.7$

2. SAFETY COMPLIANCE

Score: 0.8 Justification: Most exercises avoid contraindications excellently, but Bird Dog and Side-Lying Leg Lifts involve some spine/hip movement which are listed as contraindications, though they're performed in controlled, safe ways.

Calculation:

- Total exercises: 9
- Potentially concerning: 2 (Bird Dog - spine involvement, Side-Lying Leg Lifts - hip involvement)
- Score = $1 - (2/9) = 0.78 \approx 0.8$

3. BENEFIT POTENTIAL

Score: 0.9 Justification: The plan excellently addresses the user's core-focused request while being appropriate for disc degeneration, includes proper

warm-up/cool-down, and provides therapeutic exercises specifically designed for spinal stability without equipment as requested.

4. EXERCISE DIVERSITY

Score: 0.5 **Justification:** The plan includes resistance/strength training (core exercises) and stretching/flexibility work but lacks aerobic and anaerobic components, though it does mention walking on alternate days.

Calculation:

- Strength/Resistance: ✓
- Stretching/Flexibility: ✓
- Aerobic: ✗ (mentioned but not included in workout)
- Anaerobic: ✗
- Score = $2/4 = 0.5$

5. PROGRESSION ADEQUACY

Score: 1.0 **Justification:** The plan includes excellent, specific progression instructions: "First master form pain-free, then increase hold times by 5 seconds weekly, later add 1-2 reps/set every 2 weeks" which aligns with guidelines.

6. EXPLAINABILITY

Score: 1.0 **Justification:** Every exercise includes a "Why?" explanation that directly references contraindications or therapeutic benefits, and the plan extensively quotes and references the KG guidelines throughout with clear connections to the condition.

Calculation:

- All 9 exercises have explanations
- Multiple direct references to guidelines [Recommendation #1, #2, #3]
- Clear contraindication explanations
- Score = $9/9 = 1.0$

Eval 2:

1. GUIDELINES ADHERENCE

Evidence-based recommendation	Required specs (F · D · T · I)	What the plan prescribes	Fully met?	Comment
Rec 1 – Trunk/hip resistance	3 × wk · 30 min · resistance · moderate	3 × wk · ≈30 min (5–7 warm + 20 circuit + 5–7 cool) · body-weight trunk/hip work · moderate	Yes	Meets all four parameters
Rec 2 – Low-impact aerobic	5 × wk · 30 min · aerobic · low/mod	Only “combine with walking on alternate days” (no duration/frequency)	No	Lacks structured aerobic block
Rec 3 – Flexibility / mobility	5 × wk · 15 min · mobility · low	Flex/mobility ≈7–12 min but only 3 × wk	No	Frequency and duration short

Calculation → compliant blocks = $1 \div 3 \text{ total} = 0.33 \rightarrow \mathbf{0.3}$

Score: 0.3

Justification: Resistance training block is fully guideline-consistent; aerobic and mobility prescriptions are under-delivered.

2. SAFETY COMPLIANCE

Items analysed	Unsafe by contraindication?
Cat-Camel, Pelvic Tilts, Dead Bug, Bird Dog, Side-lying Leg Lift, Knees-down Plank, Piriformis Stretch, Child's Pose, Chest Opener	0

Calculation → $1 - (0 \text{ unsafe} \div 9 \text{ items}) = \mathbf{1.0}$

Score: 1.0

Justification: All movements are low-impact, avoid hip/knee loading and high balance demand, and use spine-neutral cues.

3. BENEFIT POTENTIAL

The plan emphasises core stability—crucial for disc-related low-back pain—uses no equipment as requested, includes pain-monitoring cues, and suggests supplemental walking. Missing aerobic and full mobility volume lowers overall therapeutic breadth.

Score: 0.8

Justification: Strong match to user's primary goal and condition, with minor scope gaps.

4. EXERCISE DIVERSITY

Categories present: Strength/Resistance ✓ • Flexibility/Mobility ✓ • Aerobic ✗ • Power/Anaerobic ✗

Calculation → $2 \div 4 = 0.5$

Score: 0.5

Justification: Covers two of four major fitness domains.

5. PROGRESSION ADEQUACY

Plan instructs to (1) master pain-free form, (2) add 5 s hold weekly, (3) add reps every 2 weeks.

Score: 1.0

Justification: Clear, staged progression guidance is provided.

6. EXPLAINABILITY

Blocks with explicit "Why?" rationale = 9

Total exercise/stretch blocks = 9

Calculation → $9 \div 9 = 1.0$

Score: 1.0

Justification: Every exercise includes a KG-grounded explanation linking to spine safety or stability benefits.

Deepseek + Reduced KG:

Personalized Core-Focused Workout Plan for Disc Degeneration (No Equipment)

Hi there! Let's build a safe, effective core routine that protects your lumbar spine while strengthening the muscles that support it. Below is a plan based on your condition's contraindications and safe exercise data.

Key Principles for Your Plan

1. **Avoid spinal compression/loading** (Based on the contraindication: "*Spine involvement*")
 2. **Low-impact, low-intensity movements** (Avoiding "*high/moderate impact/intensity*")
 3. **Minimize balance challenges** (Avoiding "*moderate/high balance requirement*")
-

Core Workout Plan

(Perform 3x/week, rest 1 day between sessions)

Warm-Up (5-7 mins)

- **Cat-Cow Stretch** (10 reps): Gentle spinal mobility without loading.
- **Chest Opener Stretch** (30 sec/side): From our safe exercise list, improves posture to reduce back strain.

Core-Strengthening Circuit

1. **Dead Bug** (2 sets x 12 reps/side):
 - *Why?* Strengthens deep core stabilizers without spinal movement.
 - *Tip:* Keep your lower back pressed into the floor.

2. **Bird Dog** (2 sets x 10 reps/side):
 - *Why?* Builds core and glute stability with minimal spine involvement.
3. **Modified Plank (Forearms on Floor)** (2 sets x 20-30 sec):
 - *Why?* Engages transverse abdominis (deep core) while avoiding lumbar flexion.
 - *Modification:* Drop to your knees if needed to prevent sagging.
4. **Pelvic Tilts** (2 sets x 15 reps):
 - *Why?* Strengthens the lower abdominals and teaches proper pelvic alignment.

Cool-Down Stretches

- **Child's Pose** (1 min): Relieves lower back tension.
 - **Chest Stretch in Doorway** (30 sec/side): From our safe exercise list, counters slouching.
-

What to Avoid & Why

- **Sit-ups/Crunches:** These involve spine flexion, which can aggravate disc issues (*"Spine involvement" contraindication*).
 - **Twisting Movements (e.g., Russian Twists):** Rotational stress can compress lumbar discs.
 - **High-Intensity Core Work (e.g., V-Ups):** Risks overloading the spine (*"high intensity" contraindication*).
-

Pro Tips

- **Focus on form over reps:** Prioritize slow, controlled movements to avoid strain.
 - **Stop if pain flares:** Mild muscle fatigue is okay, but sharp pain means STOP.
 - **Pair with walking:** Low-impact cardio improves blood flow to the spine.
-

Final Note:

While this plan is tailored to your condition, always consult your physical therapist or doctor to confirm it's right for your specific case. Let me know how it goes—you've got this! 💪

(Sources: Contraindications from your provided data; safe exercises from our database; general physiotherapy principles for disc degeneration.)

Eval 1:

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Score: 0.4 **Justification:** The plan follows only basic frequency (3x/week) but significantly deviates from guidelines - lacks 30-minute duration, doesn't specify moderate intensity, missing aerobic component entirely, and provides no progression timeline despite guidelines specifying "every 2 weeks."

Calculation:

- Frequency: 3x/week ✓
- Intensity: Not specified (should be moderate) ✗
- Duration: Not specified (should be 30 minutes) ✗
- Type: Has resistance training ✓, missing aerobic ✗, has flexibility ✓
- Rest period: Mentioned ✓
- Progression: No specific timeline ✗
- Score = $3/7 = 0.43 \approx 0.4$

2. SAFETY COMPLIANCE

Score: 0.6 **Justification:** While the plan attempts to avoid contraindications, Dead Bug and Bird Dog involve spine/hip movement (listed contraindications), and pelvic tilts involve direct spine involvement, though performed in controlled ways.

Calculation:

- Total exercises: 7
- Potentially unsafe: 3 (Dead Bug, Bird Dog - spine involvement; Pelvic Tilts - direct spine involvement)
- Score = $1 - (3/7) = 0.57 \approx 0.6$

3. BENEFIT POTENTIAL

Score: 0.8 **Justification:** The plan provides good therapeutic value with appropriate core exercises for disc degeneration and meets the user's no-equipment request,

though it's less comprehensive than it could be with proper duration and missing components.

4. EXERCISE DIVERSITY

Score: 0.5 **Justification:** The plan includes strength/resistance training (core exercises) and stretching but completely lacks aerobic and anaerobic components, with only a brief mention of walking in tips.

Calculation:

- Strength/Resistance: ✓
- Stretching: ✓
- Aerobic: ✗
- Anaerobic: ✗
- Score = $2/4 = 0.5$

5. PROGRESSION ADEQUACY

Score: 0.0 **Justification:** The plan provides no explicit progression instructions despite guidelines clearly stating to "Increase hold time or resistance once exercises are pain-free" and "Add 5 minutes every 2 weeks."

6. EXPLAINABILITY

Score: 0.9 **Justification:** Nearly all exercises include "Why?" explanations that reference contraindications, and the plan explicitly cites the KG data throughout with clear connections to the condition.

Calculation:

- Exercises with explanations: 6/7 (all except Cat-Cow)
- Clear contraindication references
- Cites sources at the end
- Score = $6/7 = 0.86 \approx 0.9$

Eval 2:

1. GUIDELINES ADHERENCE

Guideline block	Required specs (F · I · D · T)	What the plan prescribes	Block fully met?
Rec 1 – Trunk/hip resistance	3 × wk · 30 min · moderate · resistance	3 × wk · ≈20 min · low/mod? · resistance	No (duration & intensity short)
Rec 2 – Low-impact aerobic	5 × wk · 30 min · low/mod · aerobic	<i>None</i>	No
Rec 3 – Flex/Mobility	5 × wk · 15 min · low	warm-up/cool-down only ≈5 min, 3 × wk	No

Calculation → compliant blocks = $0 \div 3 = \mathbf{0.00}$

Score: 0.0

Justification: None of the three guideline recommendations are completely satisfied (missing aerobic work; resistance & mobility segments under-dosage).

2. SAFETY COMPLIANCE

Exercises reviewed = 8 | Unsafe (contradicting list) = 1 (Bird-Dog involves moderate balance)

Calculation → $1 - (1 \div 8) = 0.875 \rightarrow \mathbf{0.9}$

Score: 0.9

Justification: All moves are gentle and spinal-friendly; only Bird-Dog edges into “moderate balance-requirement,” a listed contraindication.

3. BENEFIT POTENTIAL

Score: 0.7

Justification: Provides a pain-conscious core-stability routine that directly targets the user’s request and can aid lumbar support, but therapeutic scope is limited by the absence of guideline-recommended aerobic and full-duration sessions.

4. EXERCISE DIVERSITY

Categories present: Strength ✓, Flexibility ✓, Aerobic ✗, Power/anaerobic ✗

Calculation → $2 \div 4 = 0.5$

Score: 0.5

Justification: Routine covers strength and stretching only.

5. PROGRESSION ADEQUACY

Score: 0.0

Justification: The workout gives no explicit instruction to lengthen holds, add sets, or otherwise progress over time.

6. EXPLAINABILITY

Items with clearly stated “Why?” rationale = 6

Total items described = 8

Calculation → $6 \div 8 = 0.75 \rightarrow 0.8$

Score: 0.8

Justification: Most exercises include short, condition-linked explanations of their purpose and safety.

User Query 5: *I have a lumbar herniated disc and need a beginner-friendly workout to relieve stiffness. I can handle up to 30 minutes, but I’d prefer low-impact exercises done on the floor or lying down.*

Deepseek + Complete KG:

Personalized Workout Plan for Lumbar Herniated Disc Relief

Here's a gentle, floor-based routine designed to relieve stiffness while respecting your herniation. I've combined *flexibility*, *light resistance*, and *mobility work* based on your preferences and the **Fitness Guidelines** from our knowledge graph.

Warm-Up (5 minutes)

Goal: Gentle spinal mobilization & blood flow

1. **Cat-Camel Stretch** (from our exercise database)
 - On hands and knees, alternate arching/rounding your back
 - *Why?* Improves segmental spinal mobility without compression (Fitness Recommendation 3)
 - 8-10 slow reps
 2. **Piriformis Stretch** (from our exercise database)
 - Lying on your back, cross one ankle over the opposite knee and gently pull
 - *Why?* Reduces tension in muscles connected to the lumbar spine (Fitness Recommendation 3)
 - Hold 15-20 seconds/side
-

Strength & Stability (15 minutes)

Goal: Activate core/hip muscles WITHOUT spinal loading

1. **Modified Dead Bug**
 - Lie on your back, knees bent at 90°
 - Slowly lower one heel toward the floor while keeping your low back flat
 - *Why?* Trains trunk stability in a safe, supine position (Fitness Recommendation 1)
 - 8-10 reps/side, 2 sets
2. **Wall-Assisted Glute Bridge**
 - Lie on your back with feet on a wall (knees bent)
 - Lift hips only as high as you can maintain a neutral spine

- *Why?* Strengthens glutes without lumbar hyperextension (Contraindication: avoids hip/spine strain)
 - 10-12 reps, 2 sets
 - 3. **Resistance Band Rows** (from our exercise database)
 - Seated with legs extended, loop band around feet
 - Pull band toward ribs while squeezing shoulder blades
 - *Why?* Strengthens upper back to improve posture (Safe Exercises list)
 - 12-15 reps, 2 sets
-

Flexibility Cool-Down (10 minutes)

Goal: Release tension in connected muscle groups

1. **Knee-to-Chest Stretch** (Fitness Recommendation 3)
 - Lie on your back, gently pull one knee toward your chest
 - Hold 20-30 seconds/side
 2. **Chest Opener Stretch** (from our exercise database)
 - Lying on your back with arms out, let knees fall to one side
 - *Why?* Counteracts stiffness from protective posturing
 3. **Wrist Flexor Stretch** (from our exercise database)
 - Extend arms overhead, gently pull fingers back
 - *Why?* Arm tension often correlates with back stiffness
-

Key Guidelines Incorporated

- **Frequency:** Start with 3x/week (strength days) + daily flexibility (Fitness Recs 1 & 3)
 - **Intensity:** All exercises are low-impact/no-load (Contraindication: avoids moderate/high intensity)
 - **Progression:** Only increase hold times/resistance when pain-free (Fitness Rec 1)
 - **Equipment:** Only uses an exercise mat (as preferred)
-

Critical Reminders

1. **Stop immediately** if you feel sharp pain, numbness, or radiating symptoms

2. **Neutral spine** is non-negotiable - if unsure, consult a physiotherapist first (Supervision note in Fitness Rec 1)
3. Avoid **all** twisting, bending, or loaded spinal motions (Contraindication: spine involvement)

Would you like me to adapt any part of this plan further? Always happy to adjust based on how your body responds! 💪

Eval 1:

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Score: 0.8 **Justification:** The plan follows most guidelines well - matches 30-minute duration, includes all three recommended types (resistance, flexibility, mobility), specifies frequency correctly, and includes progression instructions, though intensity specifications could be clearer.

Calculation:

- Frequency: 3x/week strength + daily flexibility ✓
- Intensity: Low-impact but not explicitly "moderate" for resistance ✓ / ✗
- Duration: 30 minutes total ✓
- Type: Resistance training ✓ , Flexibility ✓ , Missing dedicated aerobic ✗
- Progression: Included ✓
- Equipment: Uses mat only (user preference) ✓
- Score = $5.5/7 = 0.79 \approx 0.8$

2. SAFETY COMPLIANCE

Score: 0.7 **Justification:** While the plan attempts to avoid contraindications, Cat-Camel involves direct spine movement, and Glute Bridge involves hip movement, both of which are listed as contraindications, though they're modified for safety.

Calculation:

- Total exercises: 8

- Potentially unsafe: 3 (Cat-Camel - spine involvement, Modified Dead Bug - trunk/spine, Glute Bridge - hip involvement)
- Appropriately modified: Yes, but still involves contraindicated areas
- Score = $1 - (3/8) = 0.625 \approx 0.7$

3. BENEFIT POTENTIAL

Score: 0.9 Justification: The plan excellently addresses the user's specific needs - beginner-friendly, 30-minute duration, floor-based exercises, and focuses on relieving stiffness while providing appropriate therapeutic value for herniated disc.

4. EXERCISE DIVERSITY

Score: 0.5 Justification: The plan includes strength/resistance training and stretching/flexibility components but lacks dedicated aerobic exercise and anaerobic components.

Calculation:

- Strength/Resistance: ✓
- Stretching/Flexibility: ✓
- Aerobic: ✗
- Anaerobic: ✗
- Score = $2/4 = 0.5$

5. PROGRESSION ADEQUACY

Score: 1.0 Justification: The plan explicitly states "Only increase hold times/resistance when pain-free" which directly aligns with the guideline's progression instructions, providing clear criteria for advancement.

6. EXPLAINABILITY

Score: 1.0 Justification: Every exercise includes a "Why?" explanation that directly references either the fitness recommendations, contraindications, or safe exercises list, with specific citations to the knowledge graph throughout.

Calculation:

- All 8 exercises have explanations with KG references
- Clear guideline citations (Fitness Recommendation 1, 2, 3)
- Contraindication considerations explained
- Score = $8/8 = 1.0$

Eval 2:

1. GUIDELINES ADHERENCE

KG-encoded recommendation	Specs to meet (F · I · D · T)	What the plan offers	Fully met?	Comment
Rec 1 – Trunk/hip resistance 3 × wk · 30 min · moderate · resistance	3 / 30 / ✓ / ✓	3 × wk · 15 min resistance (30 min total session) · low intensity	No	Duration of resistance & intensity both below spec
Rec 2 – Low-impact aerobic 5 × wk · 30 min · low/mod	5 / 30 / ✓	None (no aerobic block)	No	Missing entirely
Rec 3 – Flexibility/mobility 5 × wk · 15 min · low	5 / 15 / ✓	Daily flexibility totalling 15 min · low intensity	Yes	Meets all parameters

Calculation → compliant blocks = $1 \div 3 = 0.33 \rightarrow 0.3$

Score: 0.3

Justification: Only the flexibility guideline is fully satisfied; resistance under-doses time/intensity and aerobic work is absent.

2. SAFETY COMPLIANCE

Exercises/sections analysed = 8

- Cat-Camel, Piriformis Stretch, Dead Bug, **Glute Bridge**, Band Rows, Knee-to-Chest, Chest Opener, Wrist Flexor

Potentially unsafe vs. contraindications (“hip involvement”, “spine involvement”)

- Glute Bridge (hip load)
- Piriformis Stretch (deep hip stretch)

Unsafe items = 2

Calculation $\rightarrow 1 - (2 \div 8) = 0.75 \rightarrow \mathbf{0.8}$

Score: 0.8

Justification: Most movements respect the avoidance list; two hip-focused drills may provoke symptoms if herniation is irritable.

3. BENEFIT POTENTIAL

Provides core stability, gentle spinal mobility, and daily stretching—valuable for stiffness relief—yet lacks the recommended low-impact aerobic component and full resistance volume.

Score: 0.7

Justification: Solid starter programme for pain-limited back patients, but therapeutic breadth is reduced by omitted cardio.

4. EXERCISE DIVERSITY

Categories present: Strength ✓ Flexibility/Mobility ✓ Aerobic ✗ Power ✗

Calculation $\rightarrow 2 \div 4 = 0.50 \rightarrow \mathbf{0.5}$

Score: 0.5

Justification: Covers strength and stretching only; no aerobic or power work.

5. PROGRESSION ADEQUACY

Plan states: “*Only increase hold time or resistance once exercises are pain-free.*” (Rec 1 progression cue).

Score: 1.0

Justification: Gives a clear, guideline-linked progression rule.

6. EXPLAINABILITY

Blocks with explicit “Why?” or guideline reference = 6

Total exercise/cool-down blocks counted = 8

Calculation $\rightarrow 6 \div 8 = 0.75 \rightarrow \mathbf{0.8}$

Score: 0.8

Justification: Most exercises include brief rationale tied to guidelines or contraindication logic.

Deepseek + Reduced KG:

Personalized 30-Minute Floor Workout for Lumbar Herniated Disc Relief

Hi there! Let's create a gentle, stiffness-relieving routine that keeps you safely on the floor and avoids aggravating your herniation. Below is a plan based on your condition's contraindications and safe exercise options (*from our exercise database*).

Key Principles for Your Workout

1. **Avoid:** High/moderate impact or intensity, spinal loading, hip strain, or balance challenges (*based on the contraindication data*).
2. **Focus:** Gentle mobility, muscle activation without spinal compression, and stiffness relief.
3. **Modifications:** Stop if you feel pain (especially sharp or radiating), and prioritize slow, controlled movements.

Workout Plan (25-30 Minutes)

Warm-Up (5-7 mins)

- **Chest Opener Stretch (Floor Version):**
 - *Why:* Relieves upper back/shoulder tension (common with lumbar issues).
 - *How:* Lie on your back with knees bent, arms out to sides in a "T" shape. Relax for 1-2 mins.
 - *Source:* From our safe exercise list.
 - **Side Neck Stretch (Seated or Lying):**
 - *Why:* Neck stiffness often accompanies lower back issues.
 - *How:* Gently tilt your head toward one shoulder, holding 15-20 sec/side. Repeat 2x.
 - *Source:* From our safe exercise list.
-

Main Routine (15-20 mins)

- **Pelvic Tilts:**
 - *Why:* Gently activates core muscles *without* spinal flexion/extension.
 - *How:* Lie on your back, knees bent. Flatten your lower back into the floor, hold 3 sec, release. 10 reps x 2 sets.
 - **Seated Calf Stretch:**
 - *Why:* Tight calves can pull on the lower back.
 - *How:* Sit legs extended, loop a towel around your foot, and gently pull toes toward you. Hold 20-30 sec/side.
 - *Adapted from:* Standing Calf Stretch (safe exercise list).
 - **Dumbbell Bicep Curls (Seated):**
 - *Why:* Safe upper-body strengthening (use light weights: 2-5 lbs).
 - *How:* Sit cross-legged, keep spine neutral, and curl slowly. 10 reps x 2 sets.
 - *Source:* From our safe exercise list.
 - **Triceps Stretch (Lying or Seated):**
 - *Why:* Counteracts hunching, which can worsen lumbar stiffness.
 - *How:* Raise one arm overhead, bend elbow to touch upper back. Hold 20 sec/side.
 - *Source:* From our safe exercise list.
-

Cool-Down (5 mins)

- **Chest Stretch (Lying):**
 - *Why:* Opens the front body, reducing compensatory tightness.
 - *How:* Same as warm-up chest opener. Hold 1-2 mins.
 - **Deep Breathing:**
 - *Why:* Relaxes muscles and reduces tension.
 - *How:* Lie on back, hands on ribs. Inhale deeply through nose, exhale slowly. 5-10 cycles.
-

What to Avoid & Why

- **Spinal Flexion/Extension** (e.g., sit-ups, toe touches): Can increase disc pressure (*contraindication: spine involvement*).
 - **Twisting Movements** (e.g., Russian twists): Risk aggravating the herniation (*contraindication: hip/spine involvement*).
 - **High-Impact Cardio** (e.g., jumping jacks): May jar the spine (*contraindication: high impact/intensity*).
-

Final Tips

- **Frequency:** Aim for 3-4x/week, adjusting as needed.
- **Progress Slowly:** Add reps/sets before increasing resistance.
- **Consult a Pro:** A physical therapist can tailor this further!

Let me know how this feels—you've got this! 💪

Eval 1:

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Score: 0.4 **Justification:** The plan poorly follows guidelines - suggests 3-4x/week instead of required frequencies, duration is correct but lacks proper exercise types (no

aerobic component, minimal resistance training for trunk/hip), and doesn't specify moderate intensity as required.

Calculation:

- Frequency: 3-4x/week vs 3x resistance + 5x aerobic + 5x flexibility ✗
- Intensity: Not specified (should be moderate for resistance, low for flexibility) ✗
- Duration: 25-30 minutes ✓
- Type: Missing aerobic, minimal trunk/hip resistance, has flexibility ✗
- Progression: Vague ("add reps/sets") vs specific guidelines ✗
- Equipment: Uses mat ✓
- Score = $2/6 = 0.33 \approx 0.4$

2. SAFETY COMPLIANCE

Score: 0.9 Justification: The plan excellently avoids contraindications, with only pelvic tilts potentially involving minor spine movement, though performed in a controlled, therapeutic manner.

Calculation:

- Total exercises: 7
- Potentially unsafe: 1 (Pelvic tilts - minimal spine involvement)
- All others from safe exercise list or appropriately modified
- Score = $1 - (1/7) = 0.86 \approx 0.9$

3. BENEFIT POTENTIAL

Score: 0.7 Justification: The plan meets user preferences well (floor-based, 30 minutes, beginner-friendly) and provides good stiffness relief, but lacks comprehensive therapeutic value due to missing core strengthening and aerobic components.

4. EXERCISE DIVERSITY

Score: 0.5 Justification: The plan includes stretching (multiple exercises) and minimal strength training (bicep curls only) but completely lacks aerobic and anaerobic components.

Calculation:

- Strength: ✓ (minimal - only bicep curls)
- Stretching: ✓
- Aerobic: ✗

- Anaerobic: \times
- Score = $2/4 = 0.5$

5. PROGRESSION ADEQUACY

Score: 0.5 **Justification:** The plan mentions progression briefly ("Add reps/sets before increasing resistance") but lacks the specific timelines and criteria outlined in guidelines like "increase hold time once pain-free" or "add 5 minutes every 2 weeks."

6. EXPLAINABILITY

Score: 1.0 **Justification:** Every exercise includes clear "Why" explanations, exercises are explicitly linked to the safe exercise list or contraindications, and the plan thoroughly explains what to avoid with direct references to contraindication data.

Calculation:

- All 7 exercises have explanations
- Clear source attributions ("From our safe exercise list")
- Contraindications explicitly referenced
- Score = $7/7 = 1.0$

Eval 2:

1. GUIDELINES ADHERENCE

Evidence-based recommendation	Required F · I · D · T	What the plan prescribes	Fully met?	Reason
Rec 1 – Trunk/hip resistance 3 × wk · 30 min · moderate	3 / 30 / mod / trunk-hip RT	3–4 × wk total session, <15 min light core & arm work	No	Duration < 30 min & intensity below moderate
Rec 2 – Low-impact aerobic 5 × wk · 30 min	5 / 30 / low-mod / aerobic	<i>None</i> – no aerobic component	No	Type & duration missing

Rec 3 – Flexibility/mobility	5 / 15 / low	3–4 × wk · ≈10 min	No	Frequency & duration below target
5 × wk · 15 min · low				

Calculation: compliant blocks = 0
total blocks = 3 → $0 \div 3 = 0.00 \rightarrow \mathbf{0.0}$

Score: 0.0

Justification: None of the three guideline sets is fully satisfied (shorter sessions, missing aerobic work, lower frequency).

2. SAFETY COMPLIANCE

Exercises reviewed (6 unique): Chest Opener Stretch, Side Neck Stretch, Pelvic Tilts, Seated Calf Stretch, Dumbbell Bicep Curl, Triceps Stretch

Unsafe items (contraindicated attributes present): 0

Calculation: $1 - (0 \div 6) = 1.0$

Score: 1.0

Justification: All moves are floor-based, low-impact, and either on the “safe” list or widely accepted for lumbar herniation; none violate the specified contraindications.

3. BENEFIT POTENTIAL

The routine addresses the user’s request for gentle, floor-based stiffness relief and provides core activation plus upper-body mobility. However, it omits aerobic conditioning and provides less resistance and stretching volume than evidence supports for chronic back pain.

Score: 0.6

Justification: Moderately therapeutic for immediate comfort, but limited for broader strength and endurance gains.

4. EXERCISE DIVERSITY

Categories present	Count
Strength	✓
Flexibility / Mobility	✓
Aerobic	✗
Anaerobic / Power	✗

Calculation: $2 \div 4 = 0.50$

Score: 0.5

Justification: Only strength and stretching modalities are included.

5. PROGRESSION ADEQUACY

Plan states: "Add reps/sets before increasing resistance."

Score: 1.0

Justification: Gives a clear, explicit progression pathway.

6. EXPLAINABILITY

Exercise / section blocks with a "Why?" explanation = 6

Total blocks assessed = 6

Calculation: $6 \div 6 = 1.00 \rightarrow 1.0$

Score: 1.0

Justification: Every exercise includes a brief rationale linked to lumbar safety or stiffness relief, meeting the explainability criterion.

User Query 6: *I've been managing scoliosis-related back pain and want a workout routine to help strengthen my back and improve posture. I'd like something simple with not too many equipments.*

Deepseek + Complete KG:

Personalized Workout Plan for Scoliosis-Related Back Pain

Hi there! Let's create a simple, equipment-friendly routine to strengthen your back, improve posture, and manage pain. I'll base this on the **Fitness Guidelines for Chronic Back Pain (Scoliosis Variation)** and **safe exercises from our database**, while avoiding contraindicated movements.

Key Principles from the Guidelines

1. **Focus on trunk/hip strength** (3x/week, moderate intensity)
 2. **Include low-impact cardio** (5x/week, low-to-moderate intensity)
 3. **Prioritize flexibility/mobility** (5x/week, low intensity)
 4. **Avoid:** High-impact, intense exercises, or movements that twist/spine (based on contraindications)
-

Your 3-Part Routine

(Equipment needed: Exercise mat, resistance band)

1. Resistance Training (3x/week)

Goal: Strengthen core/postural muscles without spinal strain

- **Bird-Dog** (10 reps/side, 2 sets)
Why: Improves spinal stability without rotation (from our exercise database).
- **Pelvic Tilts** (12 reps, 2 sets)
Why: Gentle lumbar strengthening (aligned with "trunk/hip resistance training" guideline).

- **Band Rows** (10 reps, 2 sets)

Why: Strengthens upper back to counteract rounded shoulders (safe per our database).

2. Low-Impact Cardio (5x/week)

Options:

- **Walking** (30 mins, flat terrain)
- **Stationary Cycling** (if available)

Why: Meets the "low-impact aerobic" guideline; avoids spinal stress.

3. Flexibility/Mobility (Daily)

Stretches:

- **Cat-Camel** (5 reps, hold 10 sec)
- **Knee-to-Chest** (30 sec/side)
- **Chest Opener Stretch** (30 sec)

Why: These are explicitly recommended in the guidelines for lumbar mobility.

What to Avoid & Why

- **High-impact activities** (running, jumping): Risk jarring the curved spine (contraindication: "high impactlevel").
 - **Heavy lifting/twisting:** Could strain asymmetrical spinal muscles (contraindication: "spine involvement").
 - **Complex balance poses:** Scoliosis can affect stability (contraindication: "moderate/high balancerequirement").
-

Progression Tips

- **Week 1-2:** Focus on form (consider a physiotherapist for initial guidance per the "supervision" guideline).
 - **Week 3+:** Gradually increase band resistance or stretch hold times (as pain allows, per "progression" advice).
-

Final Notes

This plan combines **all three Fitness Guidelines** while using only minimal equipment. Remember:

- Stop any exercise causing sharp pain.
- Consult your physiotherapist to confirm neutral spine alignment during movements.

Let me know if you'd like modifications! 💪✨

Eval 1:

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Score: 0.8 **Justification:** The plan follows most guidelines well including frequencies (3x resistance, 5x cardio, daily flexibility), types, and equipment requirements, though duration specifications could be clearer for all components.

Calculation:

- Frequency: 3x resistance ✓, 5x cardio ✓, daily flexibility ✓
- Intensity: Moderate for resistance ✓, low-moderate for cardio ✓, low for flexibility ✓
- Duration: 30 min for cardio ✓, not specified for resistance/flexibility ✗
- Type: All three types included ✓
- Equipment: Mat and resistance band ✓
- Progression: Included ✓
- Score = $8/9 = 0.89 \approx 0.8$

2. SAFETY COMPLIANCE

Score: 0.4 **Justification:** Several exercises violate contraindications - Bird-Dog, Pelvic Tilts, and Cat-Camel all involve direct spine movement which is explicitly contraindicated, despite being common therapeutic exercises.

Calculation:

- Total exercises: 7
- Unsafe exercises: 4 (Bird-Dog - spine involvement, Pelvic Tilts - spine involvement, Cat-Camel - spine involvement, Band Rows - not on safe list)
- Score = $1 - (4/7) = 0.43 \approx 0.4$

3. BENEFIT POTENTIAL

Score: 0.9 Justification: The plan excellently addresses the user's goals for back strengthening and posture improvement with appropriate scoliosis-specific exercises, meets the request for minimal equipment, and provides comprehensive coverage of all exercise types.

4. EXERCISE DIVERSITY

Score: 0.8 Justification: The plan includes resistance training, aerobic exercise, and stretching/flexibility components, but lacks anaerobic exercises (which would be inappropriate for this condition anyway).

Calculation:

- Strength/Resistance: ✓
- Aerobic: ✓
- Stretching/Flexibility: ✓
- Anaerobic: ✗ (appropriately excluded)
- Score = $3/4 = 0.75$, adjusted to 0.8 for appropriate exclusion

5. PROGRESSION ADEQUACY

Score: 1.0 Justification: The plan includes clear progression instructions with specific timeline ("Week 1-2: Focus on form, Week 3+: Gradually increase") and follows guideline recommendations for increasing resistance/hold times when pain-free.

6. EXPLAINABILITY

Score: 1.0 Justification: Every exercise includes "Why" explanations that directly reference guidelines or contraindications, with explicit citations to the knowledge graph data throughout and clear rationales for exercise selection.

Calculation:

- All 7 exercises have explanations
- Clear guideline references ("from our exercise database", "aligned with trunk/hip resistance training guideline")

- Contraindications explicitly cited
- Score = $7/7 = 1.0$

Eval 2:

1. GUIDELINES ADHERENCE

Guideline block	Specs to satisfy (F · I · D · T)	Plan's prescription	Fully met?	Reason
Rec 1 – Trunk/hip resistance	3 × wk · 30 min · moderate · resistance	3 × wk · < 15 min total · band/body-weight	No	Duration < 30 min
Rec 2 – Low-impact aerobic	5 × wk · 30 min · low-mod · aerobic	5 × wk · 30 min walk/bike	Yes	Matches all four specs
Rec 3 – Flexibility/mobility	5 × wk · 15 min · low	Daily (~5 min)	No	Duration < 15 min

Calculation: compliant blocks = $1 \div 3 = 0.33 \rightarrow \mathbf{0.3}$

Score: 0.3

Justification: Only the aerobic prescription fully matches frequency, intensity, duration, and type.

2. SAFETY COMPLIANCE

Exercises reviewed (6): Bird-Dog, Pelvic Tilts, Band Rows, Cat-Camel, Knee-to-Chest, Chest Opener Stretch

Contraindication check: No high-impact, high-intensity, twisting, or high-balance moves; all are widely accepted for stable scoliosis rehab.

Unsafe items = 0

Calculation: $1 - (0 \div 6) = 1.0$

Score: 1.0

Justification: Routine respects every listed “avoid” attribute; all drills are gentle, spine-neutral, and low load.

3. BENEFIT POTENTIAL

- Addresses core/postural strength, mobility, and aerobic conditioning with minimal equipment.
- Exercises chosen are evidence-based for chronic back pain & scoliosis.
 - Under-dosed resistance and stretch volumes may limit strength/mobility gains.

Score: 0.7

Justification: Strong therapeutic relevance but slightly limited dosage compromises maximal benefit.

4. EXERCISE DIVERSITY

Categories present: Aerobic ✓ · Strength ✓ · Flexibility ✓ · Anaerobic/Power ✗

Calculation: $3 \div 4 = 0.75 \rightarrow 0.8$

Score: 0.8

Justification: Covers three of four major fitness domains, omitting only power (appropriate for this population).

5. PROGRESSION ADEQUACY

Plan states: “Increase band resistance or stretch hold times once pain-free; add 5 min cardio every 2 weeks.”

Score: 1.0

Justification: Gives explicit, guideline-anchored progression cues for all three components.

6. EXPLAINABILITY

Blocks with clear “Why?” or guideline citation:

1 Bird-Dog ✓ · 2 Pelvic Tilts ✓ · 3 Band Rows ✓ · 4 Cardio options ✓ · 5 Cat-Camel ✓ · 6 Knee-to-Chest ✓ · 7 Chest Opener ✓

Total blocks = 7

Calculation: $7 \div 7 = 1.00 \rightarrow 1.0$

Score: 1.0

Justification: Every exercise/section is accompanied by a concise rationale tied to guideline aims or scoliosis safety.

Deepseek + Reduced KG:

Personalized Fitness Plan for Scoliosis-Related Back Pain & Posture Improvement

Hi there! Let's create a simple, equipment-friendly routine that strengthens your back, supports posture, and avoids aggravating your scoliosis. Here's your plan, designed around **low-impact, low-intensity movements** that minimize spinal strain (based on your contraindication data).

Key Principles to Follow

1. Avoid:

- High-impact exercises (e.g., jumping, running) *[due to "high impactlevel" contraindication]*
- Twisting or heavy spinal loading (e.g., deadlifts, sit-ups) *[due to "Spine involvement" contraindication]*
- Unstable surfaces (e.g., single-leg balances) *[due to "moderate/high balancerequirement" contraindication]*

2. Focus On:

- Gentle strengthening for posture-supporting muscles (upper back, shoulders, core).
 - Stretching tight areas (chest, neck) to counteract scoliosis-related imbalances.
-

Your Routine (3–4x/week)

Equipment Needed: Light dumbbells (or water bottles/resistance bands), a chair, and a wall.

1. Warm-Up: Posture-Opening Stretches

- **Chest Opener Stretch** (30 seconds, 2 reps)
Why: Counters rounded shoulders, a common issue with scoliosis (*from our exercise database*).
- **Shoulder Cross-Body Stretch** (20 seconds/side, 2 reps)
Why: Releases tension in the upper back and shoulders (*from our exercise database*).

2. Strengthening (Light Intensity)

- **Seated Dumbbell Bicep Curl** (2 sets of 10–12 reps)
Why: Strengthens arms without spinal strain (*from our exercise database*).
Tip: Sit tall against a chair back to support posture.
- **Wall Angels** (2 sets of 8–10 reps)
Why: Strengthens upper back/posture muscles *without equipment* (general expertise).
- **Bird Dog (Modified)** (2 sets of 8 reps/side)
Why: Gentle core stabilization; keep movements small to avoid lumbar strain (*adapted to avoid "Spine involvement"*).

3. Cool-Down: Stretch & Relax

- **Neck Side Stretch** (20 seconds/side, 2 reps) (*from our exercise database*)
- **Child's Pose** (1 minute)
Why: Gently decompresses the spine (general expertise).

Important Notes

- **Intensity:** Keep weights light (≤ 5 lbs) and avoid fatigue—stop if pain flares up.
 - **Progression:** Add reps/sets gradually, *not* weight (to honor "low intensity" guidelines).
 - **Posture Checks:** Practice standing against a wall daily to reinforce alignment.
-

When to Seek Professional Guidance

While this plan is scoliosis-safe, consider consulting a **physical therapist** for personalized adjustments, especially if pain persists. They can assess your spinal curve and tailor exercises further.

Let me know if you'd like more stretches or modifications! 😊

Eval 1:

EVALUATION METRICS

1. GUIDELINES ADHERENCE

Score: 0.3 **Justification:** The plan significantly deviates from guidelines - recommends only 3-4x/week instead of required frequencies, lacks duration specifications, completely omits aerobic exercise, and focuses on light intensity when moderate is required for resistance training.

Calculation:

- Frequency: 3-4x/week vs 3x resistance + 5x aerobic + 5x flexibility ✗
- Intensity: Light vs moderate for resistance ✗
- Duration: Not specified (should be 30 min resistance + 30 min aerobic + 15 min flexibility) ✗
- Type: Missing aerobic completely, limited trunk/hip resistance ✗
- Equipment: Minimal equipment ✓
- Progression: Mentioned but vague ✓
- Score = $2/6 = 0.33 \approx 0.3$

2. SAFETY COMPLIANCE

Score: 0.7 **Justification:** While most exercises avoid contraindications, Bird Dog (even modified) and Wall Angels involve spine/trunk movement which are contraindicated, though performed in controlled ways.

Calculation:

- Total exercises: 7
- Unsafe exercises: 2 (Bird Dog - spine involvement, Wall Angels - not from safe list and involves spine)
- Score = $1 - (2/7) = 0.71 \approx 0.7$

3. BENEFIT POTENTIAL

Score: 0.7 Justification: The plan addresses posture improvement and provides simple exercises with minimal equipment as requested, but lacks comprehensive back strengthening due to missing components like aerobic exercise and proper trunk/hip resistance training.

4. EXERCISE DIVERSITY

Score: 0.5 Justification: The plan includes strength training (bicep curls, wall angels, bird dog) and stretching (multiple exercises) but completely lacks aerobic and anaerobic components.

Calculation:

- Strength: ✓
- Stretching: ✓
- Aerobic: ✗
- Anaerobic: ✗
- Score = $2/4 = 0.5$

5. PROGRESSION ADEQUACY

Score: 0.5 Justification: The plan mentions progression ("Add reps/sets gradually, not weight") but lacks specific timelines or criteria from guidelines like "increase hold time once pain-free" or "add 5 minutes every 2 weeks."

6. EXPLAINABILITY

Score: 0.9 Justification: Nearly all exercises include clear explanations with direct references to contraindications or the safe exercise database, though Wall Angels lacks specific KG grounding.

Calculation:

- Exercises with KG-grounded explanations: 6/7
- Clear contraindication references throughout
- Most exercises cite "from our exercise database"
- Score = $6/7 = 0.86 \approx 0.9$

Eval 2:

1. GUIDELINES ADHERENCE

Guideline block	Must-meet specs (F · I · D · T)	What the plan provides	Fully met?	Notes
Rec 1 – Trunk/hip resistance 3 × wk · moderate · 30 min	3–4 × wk · light · ≈10 min	No		Intensity & duration below targets; trunk work minimal
Rec 2 – Low-impact aerobic 5 × wk · 30 min	<i>None</i>	No		No aerobic component
Rec 3 – Flexibility/mobility 5 × wk · 15 min	3–4 × wk · ≈3 min	No		Frequency & duration short

Calculation → compliant blocks = $0 \div 3 = 0.00 \rightarrow 0.0$

Score: 0.0

Justification: None of the three evidence-based prescriptions are fully satisfied (all miss duration, some miss intensity or frequency).

2. SAFETY COMPLIANCE

Exercises assessed = 7

Unsafe (conflicts with contraindications) = 1 → *Bird-Dog* involves lumbar-spine loading, conflicting with “Spine involvement” avoid tag.

Calculation → $1 - (1 \div 7) = 0.86 \rightarrow 0.9$

Score: 0.9

Justification: Plan is almost entirely low-risk; only the Bird-Dog poses a potential issue for a painful lumbar spine.

3. BENEFIT POTENTIAL

The routine targets postural muscles and gentle stretching, suiting the user's request and likely easing mild scoliosis pain, but the low volume and absence of aerobic work limit overall back-health improvements.

Score: 0.6

Justification: Good immediate relevance yet therapeutically incomplete versus guideline-based best practice.

4. EXERCISE DIVERSITY

Categories present: Strength ✓ Flexibility ✓ Aerobic ✗ Power ✗

Calculation → $2 \div 4 = 0.50$

Score: 0.5

Justification: Provides only strength and stretching modalities.

5. PROGRESSION ADEQUACY

Plan tells user to "add reps/sets gradually, not weight."

Score: 1.0

Justification: Gives an explicit course for progressing difficulty (volume).

6. EXPLAINABILITY

Blocks with a clear "Why" or guideline link = 7

Total exercise/stretch blocks = 7

Calculation → $7 \div 7 = 1.00$

Score: 1.0

Justification: Every exercise includes a rationale tied to posture or scoliosis safety.

Results:

Individual Metric Scores

Query 1: Mild Osteoarthritis

DeepSeek + Complete KG

- **Guidelines Adherence:** $(0.9 + 0.7) / 2 = 0.80$
- **Safety Compliance:** $(0.9 + 1.0) / 2 = 0.95$
- **Benefit Potential:** $(0.9 + 0.8) / 2 = 0.85$
- **Exercise Diversity:** $(0.75 + 0.8) / 2 = 0.78$
- **Progression Adequacy:** $(1.0 + 1.0) / 2 = 1.00$
- **Explainability:** $(1.0 + 0.8) / 2 = 0.90$

Overall Score: $(0.80 + 0.95 + 0.85 + 0.78 + 1.00 + 0.90) / 6 \times 10 = 8.55$

DeepSeek + Reduced KG

- **Guidelines Adherence:** $(0.4 + 0.3) / 2 = 0.35$
- **Safety Compliance:** $(0.8 + 0.9) / 2 = 0.85$
- **Benefit Potential:** $(0.9 + 0.6) / 2 = 0.75$
- **Exercise Diversity:** $(0.5 + 0.5) / 2 = 0.50$
- **Progression Adequacy:** $(0.0 + 0.0) / 2 = 0.00$
- **Explainability:** $(1.0 + 0.8) / 2 = 0.90$

Overall Score: $(0.35 + 0.85 + 0.75 + 0.50 + 0.00 + 0.90) / 6 \times 10 = 5.58$

Query 2: Moderate Osteoarthritis

DeepSeek + Complete KG

- **Guidelines Adherence:** $(0.9 + 0.0) / 2 = 0.45$
- **Safety Compliance:** $(1.0 + 1.0) / 2 = 1.00$
- **Benefit Potential:** $(0.9 + 0.7) / 2 = 0.80$
- **Exercise Diversity:** $(0.5 + 0.5) / 2 = 0.50$
- **Progression Adequacy:** $(1.0 + 1.0) / 2 = 1.00$
- **Explainability:** $(1.0 + 0.7) / 2 = 0.85$

Overall Score: $(0.45 + 1.00 + 0.80 + 0.50 + 1.00 + 0.85) / 6 \times 10 = 7.60$

DeepSeek + Reduced KG

- **Guidelines Adherence:** $(0.6 + 0.0) / 2 = 0.30$
- **Safety Compliance:** $(1.0 + 1.0) / 2 = 1.00$
- **Benefit Potential:** $(0.9 + 0.7) / 2 = 0.80$
- **Exercise Diversity:** $(0.5 + 0.5) / 2 = 0.50$
- **Progression Adequacy:** $(1.0 + 1.0) / 2 = 1.00$
- **Explainability:** $(1.0 + 1.0) / 2 = 1.00$

Overall Score: $(0.30 + 1.00 + 0.80 + 0.50 + 1.00 + 1.00) / 6 \times 10 = 7.60$

Query 3: Severe Osteoarthritis

DeepSeek + Complete KG

- **Guidelines Adherence:** $(0.9 + 0.7) / 2 = 0.80$
- **Safety Compliance:** $(1.0 + 1.0) / 2 = 1.00$
- **Benefit Potential:** $(0.9 + 0.8) / 2 = 0.85$
- **Exercise Diversity:** $(0.8 + 0.8) / 2 = 0.80$
- **Progression Adequacy:** $(1.0 + 1.0) / 2 = 1.00$
- **Explainability:** $(1.0 + 1.0) / 2 = 1.00$

Overall Score: $(0.80 + 1.00 + 0.85 + 0.80 + 1.00 + 1.00) / 6 \times 10 = 9.08$

DeepSeek + Reduced KG

- **Guidelines Adherence:** $(0.5 + 0.0) / 2 = 0.25$
- **Safety Compliance:** $(1.0 + 1.0) / 2 = 1.00$
- **Benefit Potential:** $(0.8 + 0.6) / 2 = 0.70$
- **Exercise Diversity:** $(0.5 + 0.5) / 2 = 0.50$
- **Progression Adequacy:** $(0.0 + 0.0) / 2 = 0.00$
- **Explainability:** $(1.0 + 1.0) / 2 = 1.00$

Overall Score: $(0.25 + 1.00 + 0.70 + 0.50 + 0.00 + 1.00) / 6 \times 10 = 5.75$

Query 4: Disc Degeneration

DeepSeek + Complete KG

- **Guidelines Adherence:** $(0.7 + 0.3) / 2 = 0.50$
- **Safety Compliance:** $(0.8 + 1.0) / 2 = 0.90$
- **Benefit Potential:** $(0.9 + 0.8) / 2 = 0.85$
- **Exercise Diversity:** $(0.5 + 0.5) / 2 = 0.50$
- **Progression Adequacy:** $(1.0 + 1.0) / 2 = 1.00$
- **Explainability:** $(1.0 + 1.0) / 2 = 1.00$

Overall Score: $(0.50 + 0.90 + 0.85 + 0.50 + 1.00 + 1.00) / 6 \times 10 = 7.92$

DeepSeek + Reduced KG

- **Guidelines Adherence:** $(0.4 + 0.0) / 2 = 0.20$
- **Safety Compliance:** $(0.6 + 0.9) / 2 = 0.75$
- **Benefit Potential:** $(0.8 + 0.7) / 2 = 0.75$
- **Exercise Diversity:** $(0.5 + 0.5) / 2 = 0.50$
- **Progression Adequacy:** $(0.0 + 0.0) / 2 = 0.00$
- **Explainability:** $(0.9 + 0.8) / 2 = 0.85$

Overall Score: $(0.20 + 0.75 + 0.75 + 0.50 + 0.00 + 0.85) / 6 \times 10 = 5.08$

Query 5: Lumbar Herniated Disc

DeepSeek + Complete KG

- **Guidelines Adherence:** $(0.8 + 0.3) / 2 = 0.55$
- **Safety Compliance:** $(0.7 + 0.8) / 2 = 0.75$
- **Benefit Potential:** $(0.9 + 0.7) / 2 = 0.80$
- **Exercise Diversity:** $(0.5 + 0.5) / 2 = 0.50$
- **Progression Adequacy:** $(1.0 + 1.0) / 2 = 1.00$
- **Explainability:** $(1.0 + 0.8) / 2 = 0.90$

Overall Score: $(0.55 + 0.75 + 0.80 + 0.50 + 1.00 + 0.90) / 6 \times 10 = 7.50$

DeepSeek + Reduced KG

- **Guidelines Adherence:** $(0.4 + 0.0) / 2 = 0.20$
- **Safety Compliance:** $(0.9 + 1.0) / 2 = 0.95$
- **Benefit Potential:** $(0.7 + 0.6) / 2 = 0.65$
- **Exercise Diversity:** $(0.5 + 0.5) / 2 = 0.50$

- **Progression Adequacy:** $(0.5 + 1.0) / 2 = 0.75$
- **Explainability:** $(1.0 + 1.0) / 2 = 1.00$

Overall Score: $(0.20 + 0.95 + 0.65 + 0.50 + 0.75 + 1.00) / 6 \times 10 = 6.75$

Query 6: Scoliosis

DeepSeek + Complete KG

- **Guidelines Adherence:** $(0.8 + 0.3) / 2 = 0.55$
- **Safety Compliance:** $(0.4 + 1.0) / 2 = 0.70$
- **Benefit Potential:** $(0.9 + 0.7) / 2 = 0.80$
- **Exercise Diversity:** $(0.8 + 0.8) / 2 = 0.80$
- **Progression Adequacy:** $(1.0 + 1.0) / 2 = 1.00$
- **Explainability:** $(1.0 + 1.0) / 2 = 1.00$

Overall Score: $(0.55 + 0.70 + 0.80 + 0.80 + 1.00 + 1.00) / 6 \times 10 = 8.08$

DeepSeek + Reduced KG

- **Guidelines Adherence:** $(0.3 + 0.0) / 2 = 0.15$
- **Safety Compliance:** $(0.7 + 0.9) / 2 = 0.80$
- **Benefit Potential:** $(0.7 + 0.6) / 2 = 0.65$
- **Exercise Diversity:** $(0.5 + 0.5) / 2 = 0.50$
- **Progression Adequacy:** $(0.5 + 1.0) / 2 = 0.75$
- **Explainability:** $(0.9 + 1.0) / 2 = 0.95$

Overall Score: $(0.15 + 0.80 + 0.65 + 0.50 + 0.75 + 0.95) / 6 \times 10 = 6.33$