

The “Indahl” Exercises for Low Back Pain

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The National Musculoskeletal Medicine Initiative tested the efficacy, safety, and cost-effectiveness of evidence-based management of acute musculoskeletal pain problems. The outcomes for the management of acute low back pain were reported by McGuirk et al.¹

The guidelines for managing acute low back pain emphasized explanation, allaying fears, encouraging patients to maintain or resume activity, and empowering them to do so. One of the components was a set of simple exercises, which patients could use both as maintenance therapy and as a first-aid measure to cope with threatened or actual flares of their pain. These exercises were based on the principles and protocol espoused by Indahl et al.,² in their ground-breaking study that, for the first time, emphasized not tampering with back pain, that is, not applying passive therapy.

In their publication, Indahl et al.² described exercises to empower patients by giving them a treatment that they could administer to themselves, by themselves. Such exercises were also cited by McGuirk et al.³ However, there is an enigma, in that there is no citable description of these exercises. McGuirk et al.¹ could find no publication that described the exercises accurately. Instead they referred to McKenzie's manual,³ which happened, fortuitously, to illustrate certain exercises that closely resembled those which were used in the Initiative. Yet, those illustrations are not accompanied by an explanation of how these exercises were used

Consequently, the present article has been prepared for several reasons. It outlines how the exercises were developed, as a matter of historical anecdote. It describes the exercises themselves. And most importantly, it explains how patients should be instructed to use them and why.

History

Some time in 1996, or thereabouts, Aage Indahl was visiting Newcastle. Several members of the Australian Association of Musculoskeletal Medicine went to lunch with him. During a break, Nik challenged Aage with the observation that his paper² referred to exercises that he prescribed to his patients, but nowhere did he describe these exercises; nor did he provide a citation for those exercises. Nik continued by asking: “so, what were the exercises?”. Sitting *al fresco* at the riverside restaurant, Aage proceeded to demonstrate his exercises.

This historical anecdote is not without hidden significance. The nature of the exercises that Indahl had used so successfully was such that they could be demonstrated in a restaurant. *Ipsa facto*, they are exercises that patients

can do in a restaurant. The point is that they were of a nature that they not only could be used but also that should be used in normal activities of daily living. Unlike traditional exercises, they did not require going to a therapist's rooms, or to a gymnasium. They could be done anywhere: at home, at work, waiting at a bus stop. That facility is what renders them empowering.

The exercises

The exercises number three, and come in two grades. In the first grade is the exercise that Indahl described. The exercises of the second grade are additions, and might be regarded as advanced. They are less amenable to public execution.

In the following sections, we describe the exercises by providing a set of instructions that should be used to get the patient to execute them. The figures illustrate the exercises, and later we discuss their biomechanical meaning and how they should be taught.

Grade I

Sit comfortably upright in a chair, preferably one with no arms, lest these interfere with the movements to be undertaken (Figure 1).

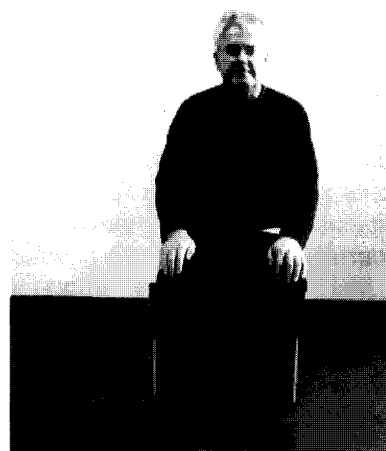


Figure 1. The sitting position stretch exercise.

Spread your knees such that your thighs form a right angle at the groin (Figure 2).

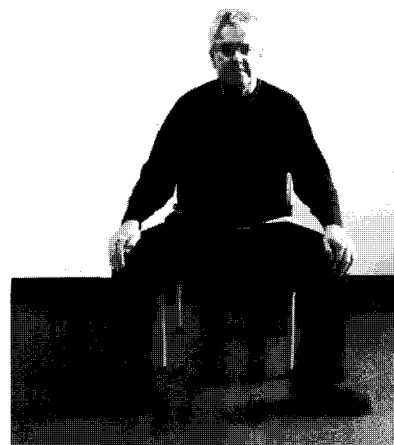


Figure 2. Spreading the thighs to form a right angle at the groin.

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In the manner of a Roman salute, place your right hand on your left shoulder, leaving your right elbow to dangle freely over the right anterior chest wall (Figure 3).

Figure 3. The Roman salute for positioning the elbow.



Raise and lower the right elbow several times, to appreciate how it moves not unlike a bucket handle (Figure 4). Realise that the olecranon (tip of the elbow) serves as a pointer.

Figure 4. Raising the elbow, to be used as a pointer.



See that the elbow points across the length of the thigh, towards the knee.

At this stage it is important to check that the thighs remain at right angles. This exercise is not going to work if the thighs drift together.

The objective is to have the elbow reach the knee and beyond, but that objective is not to be instantly attained. An objective is something to work towards, progressively. At no time, hereafter, should the patient hurt themselves. Each manoeuvre is executed slowly and carefully, not out of fear-avoidance but with the dignity and purpose of a Tai Chi ritual.

The patient should slowly attempt to get their pointer elbow to their knee. A patient with pain, and ostensibly with muscle tightness, will not be able to do this (Figure 5). The onset of either muscle tightness or pain, or both, will pre-



Figure 5. Aiming for the knee, but being unable to reach it for pain or tightness in the back.

vent their doing so. The patient should lean in the correct direction until their symptom impedes progress. At this point, they should gauge how far short of reaching the knee they are. Having registered the onset of symptoms, and having gauged their available range of movement, they should relax back to the upright position.

The patient should now repeat the manoeuvre with an adaptation. Being unable to reach the knee with their pointer, they should calmly place the tip of the elbow on the thigh, as far distally along the thigh as they can reach without feeling their tightness or pain. Where they reach on their thigh constitutes the starting point.

Progress to the objective can now be calibrated using a line along the top of the thigh, from the starting point to beyond the knee. Progress can be monitored by how far further along the thigh the patient can reach.

Progress is achieved by challenging and teasing resistance.

The patient should, again, reach for their starting point, and remember where that was. They then relax into the upright sitting position.

They should now return towards the starting point but prepare to change course before reaching it. The change is to reach a point 1-2 cm further along the thigh. This becomes the new target point.

If the patient can reach the new target point without aggravating their symptoms, that point becomes the new starting point, and the process is repeated.

If tightness or pain occurs upon attempting to reach the new target point, the patient lets their trunk lean towards it, with their elbow pointing to the new target but not actually reaching it (Figure 6).

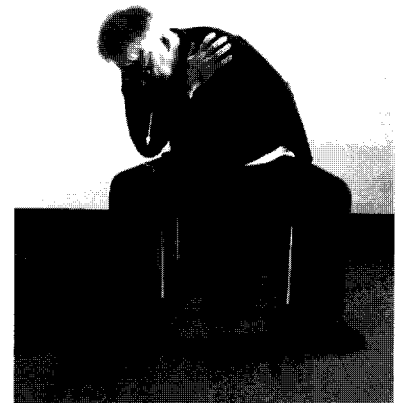


Figure 6. Aiming for a target point, but just failing to reach it.

As they lean they should feel their tightness or pain. They then tease the resistance to a small degree. They do so by letting the weight of their trunk bob towards the target point, in an oscillating fashion,

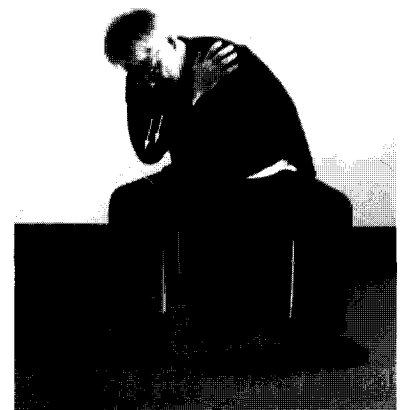


Figure 7. Oscillating the trunk towards the target point.

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that is, bouncing with an amplitude of one finger's breadth, towards the new target point (Figure 7).

A simile can help explain this. It is as if they are teasing an elastic band to stretch just ever so much further.

They continue the bobbing until they can reach the new target on the thigh. They then relax into the upright sitting position, and take a rest.

The patient repeats the exercise until they can reach the new target point in their thigh.

For variety, the patient can now repeat the same exercise to the other side, using their left elbow to point over the left thigh.

At all times, the patient must monitor the orientation of their thighs. If ever they stray back to the midline, the right angle must be reinstated.

The stakes are now raised. A new target point is challenged. The patient selects a point 1-2 cm further along their thigh, and aims for that. If they cannot reach it, they lean towards it until they reach the point of strain. They then tease that strain by bobbing, until they can reach the new target point.

Ultimately, the objective is to overcome tightness and pain, and to reach beyond the knee. This is done progressively (Figure 8), until the knee is reached (Figure 9) and beyond (Figure 10).

The rate at which this progress is achieved is a function of the initial severity of the patient's restrictions, their tolerance, and their perseverance. It is not an objective to reach the knee in a single session, or even in a single day. Progress can be maintained over several days. Nevertheless, each patient, at their own pace, can monitor their own progress, and be advised and encouraged by the doctor. The cardinal rule, however, is that some degree of progress must be achieved each time that the exercise is performed, and the progress each day must be greater than the progress previously.

The fact that this exercise can be executed anywhere allows it to be liberally prescribed. The patient is instructed to perform the exercises at every ceremonial time of the

day, and at critical times.

Ceremonial times are: upon wakening and before rising, before setting off to work or the day's activities, at morning tea, at lunch time, at afternoon tea, after the evening meal, before retiring for the night, or at any time when the patient has nothing better to do (such as waiting at a bus stop).

Critical times are those when the nature of activities changes; for example, prior to commencing work in a seated position, upon completion of work in a prolonged seated position, as a “warm up” before undertaking a walk or any potentially strenuous activity including lifting, as a “cool down” following any such activity. Furthermore, the exercises can be undertaken as a first aid measure whenever symptoms flare, but preferably as they threaten to flare.

Grade II

The Grade II exercises are ones that I introduced into the regimen, after being inspired by Indahl. They are ostensibly self-mobilization exercises as opposed to muscle stretching exercises.

Pelvic flexion

Lie on your back, on a carpet or mat, or any suitably clean surface. However, the surface must be hard, as is a floor. A bed will not do.

The first steps are simply a warm up. If you can achieve the warm up, you can proceed to the main event. If the warm up causes difficulties, the warm up becomes the exercise, until it can be done without difficulties, whereupon you can progress to the main event.

Bring the left knee towards your chest. Grab the knee with both hands (Figure 11).

Gently bring the knee towards your chest by pulling with your hands. Continue to do so until you feel any tightness or pain.

If you feel pain or tightness, stop pulling. Hold the knee in the position just short of where it causes symptoms.



Figure 8. Reaching further along the thigh.



Figure 9. Reaching the knee.



Figure 10. Reaching beyond the knee: the ultimate goal.



Figure 11. Step 1 in the pelvic flexion exercise. Grabbing the knee.



Figure 12. Step 2 in the pelvic flexion exercise. Oscillating the knee towards the chest.



Figure 13. Step 3 in the pelvic flexion exercise. Reaching the chest.

Oscillate the knee by 1-2 cm, several times, taking it just beyond the point of pain, and back again. With each oscillation, try to tease the amplitude by a few millimeters at a time, until you can reach 1 cm further than you could originally (Figure 12). Relax.

Repeat the process until you make a substantial gain in range, or have had enough.

If you can reach your chest with your knee, you have achieved warm up (Figure 13). Repeat for the other knee, until you achieve warm up.

If you cannot reach your chest with your knee, you have to work on the warm up until you can. Repeat the exercise five times a day, striving to increase the range over which you can pull your knee. Do so for both sides.

The main event involves repeating this exercise but with both knees at the same time. Most patients should be able to exercise one knee at a time without any problems, even without aggravating any symptoms. The real challenge is to do both sides simultaneously. This is when most patients will feel symptoms.

Draw both knees towards the chest, stopping at the point at which any symptoms are precipitated, and grab them with your hands (Figure 14).

Slowly and gently, draw the knees towards your chest, by oscillating them by 1-2 cm, just beyond the point of pain, and back again (Figure 15). While still oscillating, strive to draw the knees 1 cm closer than originally achieved. Rest and relax.

Repeat the process according to tolerance. Never hurt yourself. Do no more than challenge and tease the limit.

Repeat three to five times a day, as facilities permit. With each repetition aim to progress further than you did previously. Continue daily, aiming to reach further each day than you did on the previous day.

The ultimate goal is to be able to draw both knees to your chest, and hold them there. If you have achieved this, your sacrum will have left the floor, enough for someone to be able to swipe their hand between the floor and your buttocks (Figure 16).



Figure 14. Step 4 in the pelvic flexion exercise. Grabbing both knees.



Figure 15. Step 5 in the pelvic flexion exercise. Oscillating the knees towards the chest.



Figure 16. Step 6 in the pelvic flexion exercise. Raising the sacrum.



Figure 17. Step 1 in the extension exercise. Lying face down.



Figure 18. Step 2 in the extension exercise. Reaching the limit of painless movement.

Extension

Lie face down on the carpet, on a mat, or any suitable, firm, clean surface. Bring your forearms to lie face down, parallel to your chest (Figure 17).

Use your arms as pistons to raise your chest slowly and slightly off the floor. Continue to lift, while keeping your pelvis and thighs against the floor, aiming to arch your back passively, by pushing with your arms. Feel your back

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Figure 19. Step 3 in the extension exercise.



Figure 20. Step 4 in the extension exercise. Reaching full arching of the back.

(Figure 19). Release the challenge back to the previous position before pain occurred. Challenge the pain again, this time trying to progress a further 1 cm. Release and relax. Flop back to the floor.

The objective is reach full arching, without pain, with the arms outstretched (Figure 20). The rate at which this is achieved depends on the severity of the patient’s presenting symptoms and their tolerance to progress. Repeat three to five times a day, as facilities permit.

Interpretation

The stretches

The purpose of the Indahl exercise is to stretch the contralateral erector spinae. In formal, technical terms, the patient moves their trunk across an oblique meridian that optimally strains the target muscle. The critical point is that spreading the thighs to 90°, and keeping them there, establishes the required meridian. Under those conditions, the elbow points in the direction that the patient should move.

Indahl devised this exercise on the premise that patients with acute low back pain usually develop muscle tightness, irrespective of the cause of their pain. This tightness impeded normal movements, and muscle pain possibly added to their pain. He explained to his patients that it was important that they kept their muscles stretched, lest the muscle problem complicated their complaint. Coincidentally, but no less importantly, doing the exercises kept them moving. That movement possibly has a therapeutic benefit apart from its effect on muscle tightness.

There is no known, established, or professed effect of this exercise on pathology. It is not prescribed for any

sink into the floor as you do so (Figure 18).

Stop pushing at any point that symptoms are precipitated. Pause and reflect. If the pain is severe, or threatens to be so, do not proceed. Discuss the problem with your doctor.

If the pain is slight or tolerable, challenge it by pushing upwards by another 1-2 cm

specific therapeutic effect. It is prescribed explicitly to keep the patient mobile. The selling point is to “keep the back from seizing up”. Meanwhile, the patient gets to keep active by performing an innocuous ritual.

Pelvic flexion

The pelvic flexion exercise is one that Nik learned from a physiotherapy colleague, Greg Schneider. Greg claims that the exercise is particularly useful for his patients with instability. What that condition is and how to diagnose it is another matter, which we do not propose to address. Nor do we presume that any or all patients with acute low back pain have instability and, therefore, require instability exercises. Rather, we propose the exercise for patients who might have what we call microluxation, and which we will explain below. If patients do not have microluxation, doing the exercise might be superfluous, but will not be harmful. Accordingly, the exercise is prescribed as a trial of therapy, to see whether some patients feel that it helps them. The exercise adds to the armamentarium of things that the patient can do for themselves, which is the critical component of the management plan.

Microluxation is a conceptual diagnosis. No-one has found it. It may not exist. Nevertheless, the concept assumes that the patient suffers an anterior displacement of one of their lumbar vertebrae to a small degree (Figure 21). This is not tantamount to spondylolisthesis, for the luxation will be on a fraction of a grade I spondylolisthesis. Nevertheless, the patient feels that their back is “out”.

If there is a microluxation, the patient will not be able to reverse this under normal circumstances. If they stand upright, the axial compression loads on their lumbar spine keep the luxation in position. If the patient tries to flex their trunk while standing, the

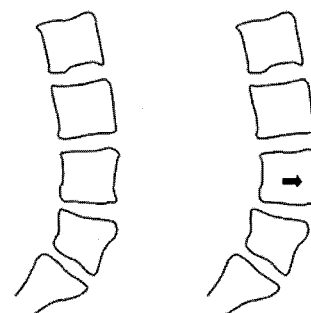


Figure 21. A cartoon of the concept of microluxation. The L4 vertebra has translated slightly forwards of its normal position.

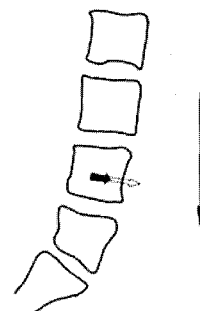


Figure 22. The effect of gravity on luxation is to aggravate it.

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luxated vertebrae moves further into translation. Therefore, flexing cannot reverse the luxation; it worsens it. Nor will extension reverse the luxation. If the patient tries to extend they will rotate about an anteriorly displaced center of rotation. They might extend, but not into the normal extension configuration. This paints a picture of a patient who feels that their back is out. Whatever they do aggravates their pain, and nothing they do relieves it.

The key to treatment is to remove gravity. It is gravity that aggravates the problem. It is gravity that prevents its reversal. Gravity acts in front of the luxation and always draws it forwards (Figure 22).

The objective of treatment is to draw the luxated vertebra back to its normal position, or as near normal as possible. This cannot be done by moving the trunk above the affected vertebra, but might be achieved by moving the sacrum below the affected segment.

Lying down brings the trunk perpendicular to the line of gravity, not parallel to it. Effectively, this switches off the back muscles, because the antigravity tone is removed. The lumbar vertebrae are now better able to move, for they are less affected by muscle action.

Flexing the sacrum from under the affected segment reverses the symmetry of the biomechanics. Flexion from above causes the luxated vertebra to move forwards, that

is, in the direction of pathology (Figure 23). The requirement is to move the affected vertebra backwards. Flexion of the sacrum from below causes the lower vertebra to move forwards, which is equivalent to the affected vertebra moving backwards (Figure 24).

The idea of the pelvic flexion exercise is to oscillate the sacrum gently, encouraging the lower vertebra to move appropriately to reverse the luxation. The exercise is performed in the lying position both to eliminate the confounding influence of muscles, and to allow the sacrum to be able to move. Standing or sitting fixes the sacrum, and precludes the upside down flexion.

Extension

There is no established biomechanical rationale to the extension exercise. It is used essentially as a complement to the other exercises. They each involve flexion. The extension exercise simply encourages movement in the opposite direction, so as to regain a complete range of movement.

Cultural challenge

There is a critical obstacle to the successful implementation of these exercises. It is the reluctance or obstinacy of the doctor.

Doctors are accustomed to operating at arm's length. They prefer that the drug or the referral does the work. In the case of exercises they would prefer a booklet that the patient can read for themselves, and follow the instructions. This does not work.

The cultural challenge is that the doctor must be able, and must be prepared, to demonstrate the exercises. The reinforcement here is that, if the doctor cannot do the exercises, how can they assume that the patient will know how to do them.

As well, patients will learn better by imitating their doctor than by inferring what to do from a set of printed illustrations.

Nik's preference is to demonstrate the exercises, and have the patient mimic what he does. If this means that they both have to get down on the floor, so be it.

Indignity should not be an excuse for not doing this. If you are not prepared to do it, on what grounds do you expect your patients to comply?

One conciliation might be that the doctor can place the patient in the correct position, and then give instructions intimately. At worst, this means crouching beside patients, or standing beside them for the sitting exercises, and guiding them into the positions and manoeuvres required. This means being close to the patient and touching them.

These latter dimensions are a critical component. Intimacy breeds confidence and credibility in the doctor. This is a personal interaction, designed to empower the patient. Working together physically underscores a contract

1. Flexion from above the segment...
2. ...causes forward rotation and further anterior translation of the luxated vertebra

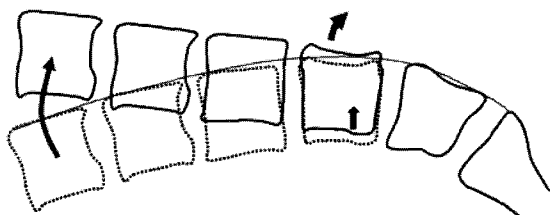


Figure 23. Flexion from above a luxated vertebra worsens the luxation.

2. ...causes the lower vertebra to rotate forwards...
3. ...which results in a relative backward movement of the luxated vertebra.
1. Flexion from below the segment...

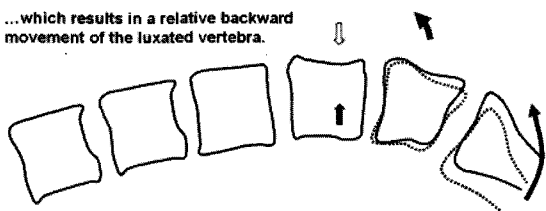


Figure 24. Flexion from below a luxated vertebra results in a relative backward displacement of the vertebra.

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of engagement, and sharing in the management. It contrasts with the impersonal effect of being given a prescription or being handed a booklet.

Once the exercises have been demonstrated and taught, it is vital that understanding be checked. The patient should be able to demonstrate their execution of the exercises to the doctor's satisfaction. If mastery is not confirmed at the time of prescription, there is no guarantee that what the patient does later will be correct, and any benefit of the prescription will be lost or delayed until understanding is later corrected.

Caveats

The exercises are not prescribed precipitously or in isolation. They should not be prescribed for patients with red flag conditions. Therefore, they are prescribed in context, that is, after triage for red flag conditions, and as one component of the management protocol, which otherwise encompasses explanation, assurance, motivation, and analgesia if required.

Nor should the patient be left to discover, alone and isolated, that doing the exercises severely aggravates their pain. If the exercises do aggravate their pain, that should be evident at the time of prescription. In which case, the patient's management should be reassessed. That is a further reason why the patient's execution of the exercises should be checked by the doctor at the time of prescription.

It may be that patients will not be able to “absorb” all the exercises at the first consultation. In that event, prescribe the first exercise alone. Leave the other exercises in reserve, using them as additional elements in the therapeutic armamentarium, and as a reward for progress with the simpler exercise. That is, improvement is accorded more advanced interventions, mastery of which marks greater achievement in recovery; for example, “now you are ready for the next stage”.

On evidence-based medicine

Pundits might ask what is the evidence of efficacy for these exercises. In that event, they have missed the point. If anything, these particular exercises have been shown not to work. Some of them have been the control arm of studies that ventured to vindicate other exercises.

The exercises are not designed to fix a pathological or biomechanical entity. They are a measure by which to empower the patient. It is something that they can take away and do for themselves. They can be used a part of a home rehabilitation program. They serve as a first-aid measure which patients can implement themselves.

Two types of study could test the efficacy of these exercises. In an explanatory trial, patients would be randomly allocated to a group that was empowered with

these exercises or to a group that was not empowered. In a pragmatic trial, patients would be randomized to group empowered with these exercises or to a group empowered by some other measure, if anyone has one to suggest.

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