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The RISE for Health Study: Methods for In-Person Musculoskeletal Assessment

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Abstract

Objectives: To describe the methods for the in-person musculoskeletal (MSK) assessment of the RISE FOR HEALTH (RISE) study, a population-based multicenter prospective cohort study designed to identify factors associated with bladder health (BH) conducted by the Prevention of Lower Urinary Tract Symptoms Research Consortium (PLUS).

Methods: A subset of RISE participants who express interest in the in-person assessment are screened to ensure eligibility (planned n=525). Eligible consenting participants are asked to complete a standardized MSK assessment to evaluate core stability (four component core stability test, lumbar spine pain (seated slump test), pelvic girdle pain, (sacroiliac joint, anterior superior iliac spine, pubic symphysis tenderness and pelvic girdle pain provocation test), hip pain (flexion, abduction, internal rotation and flexion, adduction and external rotation) and pelvic girdle function

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(active straight leg raise). Participants are also asked to complete the Short Physical Performance Battery to measure balance, gait speed, lower extremity strength, and functional capacity.

Results: Detailed online and in-person MSK training sessions led by physical therapy were used to certify research staff at each clinical center prior to the start of RISE in-person assessments. All evaluators exceeded the pre-specified pass rates.

Conclusions: The RISE in-person MSK assessment will provide further insight into the role of general body MSK health and dysfunction and the spectrum of BH.

Keywords

Bladder health; women's health; pelvic health; pelvic muscle; musculoskeletal assessment; physical function; in person examination

Introduction:

Bladder health (BH) is a relatively new concept in the field of prevention and women's health and has recently been defined for research purposes as "a complete state of physical, mental and social well-being related to bladder function, and not merely the absence of Lower Urinary Tract Symptoms (LUTS)".¹ It encompasses storage, emptying and bio-regulatory functions of the bladder and importantly, "permits daily activities, adapts to short term physical or environmental stressors, and allows optimal well-being (e.g., travel, exercise, social, occupational or other activities)." What contributes to a healthy vs. an unhealthy bladder is not well established. Many studies focus on risk factors for LUTS, but few attempt to understand what constitutes a healthy bladder. Those that do, often equate health with merely the absence of one or more symptoms. With a focus towards understanding BH as a continuum from very healthy to very unhealthy and with an aim to design health promotion and LUTS prevention studies, there is a need to identify factors such as musculoskeletal (MSK) conditions associated with the spectrum of BH.

Musculoskeletal conditions such as low back and pelvic girdle pain are commonly associated with LUTS, including urinary incontinence (UI)², and both are highly prevalent in women throughout the life course³. Women with MSK conditions may experience pain, impaired functional mobility/falls, fear of pain due to movement (kinesiophobia)⁴, or imagine the worst possible outcome if chronic (catastrophization)⁵. Techniques to improve MSK health and core stabilization have been associated with improvement in both low back pain and UI.⁶ Similarly, pelvic floor muscle defects such as prolapse and levator muscular tears or weakness are frequently associated with LUTS, particularly UI;^{7,8 9-11}, however, there are few studies of asymptomatic or healthy women to understand the degree to which overall MSK and pelvic floor integrity and strength are associated with overall BH and function.

The RISE FOR HEALTH (RISE) study is a large, longitudinal observational study designed to establish factors associated with the spectrum of BH across the life course within a diverse population of community-dwelling women. Participants from a regional sample of women recruited from the surrounding communities of 9 clinical research centers are utilized to investigate the major scientific goals: 1) Identify factors associated with BH

and LUTS, 2) Estimate the distributions of BH and 3) Describe BH knowledge, attitudes, and beliefs in women across the life course. A subset of participants are invited to attend an in-person assessment of clinical factors deemed relevant to BH including MSK health, pelvic floor muscle integrity, strength and pain. Data collected will be evaluated as potential factors associated with the spectrum of BH for future study and as potential modifiable factors in prevention research.

The MSK assessment, as a part of the RISE in-person assessment, was developed to test the hypothesis that greater MSK impairment (defined as a composite of impaired mobility, perceived MSK pain and fear of movement/catastrophization in relation to chronic MSK pain) will be associated with worse BH. The four specific sub-questions to be addressed include: 1) Is functional mobility associated with BH? 2) Is perceived MSK pain associated with worse BH? 3) Are psychological factors such as kinesiophobia and general catastrophization associated with worse BH in women with MSK pain? 4) Is overall MSK pain association with pelvic floor muscle pain and worse BH? The objective of this manuscript is to describe the detailed components of the RISE in-person MSK assessment designed to address these questions.

Materials and Methods:

A subset of women (N=525) enrolled in the longitudinal RISE cohort are invited to participate in a baseline in-person assessment. The details of the recruitment and enrollment procedures for the in-person assessment are described fully elsewhere. In-person visits occur within 2 months (8 weeks) of completion of baseline surveys including the Bladder Health Scales & Function Indices (BHS/BFI) and the MSK module. This module includes PROMIS pain intensity, pain interference, physical function measures, a body pain diagram, the Tampa Kinesiophobia Scale and the Cognitive Emotion Regulation Questionnaire. For the MSK component of the in-person visit, participants are asked to wear comfortable clothing and shoes. Prior to starting the MSK examination, the rationale for the testing will be presented to participants including how the MSK system may influence the pelvis¹² and an overview of the procedures (Supplemental Table CRF 6/7). A Research Coordinator (RC) will collect an updated medical history including current pain intensity and location along with a query of pain medication taken day of examination.

A standardized 30-minute MSK assessment is performed on all participants regardless of age by a trained clinical investigator/evaluator or RC supervised by the site's principal investigator. An additional assistant, if needed, records outcomes for each study measure and serves as female chaperone to the clinical evaluator if required (regardless of evaluator's gender). Table 1 reflects the exact order of the MSK tests. The evaluator reads a detailed written script describing each maneuver verbatim. Photos are used to facilitate participant understanding. The evaluator demonstrates the SPPB test, followed by the participant completing.

The MSK examination is performed first in a hallway using distance markings and an armchair and then in an examination room on a suitable table or exercise floor mat. The RC documents if any assessment provokes pain or if the participant is unable to perform the test,

with the specific reason after each test noted (e.g., unable to understand instructions, fear of movement, felt unsafe, did not attempt movement or other such as unable to lie supine or position onto the exam table to complete the test). If the evaluator judges that a participant is unable to complete the assessment, the RC records the reason from the following options: at heightened physical/psychological/emotional risk due to participant's circumstances/abilities or trauma history, participant unable to understand instructions, or other.

Description of MSK Physical Examination Procedures:

Core Stability Tests “*Four Dynamic Core Stability Tests*”¹³:

This series of tests assesses a participant's overall core muscle strength in multiple positions. Since the pelvic floor muscles are considered the “floor of the core”^{14,15} and pelvic floor muscle strength has been correlated with BH in previous studies,¹⁶ utilizing a core stability assessment as a proxy for pelvic floor muscle strength is proposed.¹⁷

- a. *Single-Leg Squat*: Participants are asked to put their hands on their hips and balance on their leg of choice. If able to balance for five seconds, then they are asked to slowly squat down to about 45 degrees of knee bend and slowly return to standing.
- b. *Supine Bridge*: Participants are asked to lie down on their backs on the exam table and bend their hips and knees, so that their feet are flat on the table and their arms at their sides. They are asked to raise their pelvis up until their back is straight and hold for five seconds. If able to hold for five seconds, they are asked to lift one leg and extend the knee and hold for five more seconds. If able to hold for five more seconds, then they are asked to alternate legs and hold for five more seconds before returning to initial 2-leg bridge posture and resting their pelvis back to the table.
- c. *Side Bridge*: Participants are asked to roll onto their side of choice, bend their knees, keep their feet together, and rest on their elbow and forearm, with their other hand on their hip. Once appropriately positioned, they are asked to raise their pelvis to make their back straight (supported on knee and forearm). If they can hold this posture for five seconds, then they return to the starting position and are asked to extend their legs out straight and again lift their pelvis from the table and try to make their back straight (supported on ankle and forearm). If they can hold this for five seconds, they are asked to raise their upper leg about 30 degrees for five more seconds before returning to the starting position.
- d. *Prone Bridge*: Participants are asked to roll onto their stomachs and prop themselves up on their forearms and toes until their back is straight. If they can hold this posture for five seconds, then they are asked to raise one leg off the table for five seconds, then alternate legs for another five seconds before returning to the starting position.

All 4 components are scored separately using a 0–3 score wherein the worst score is “0” and best score is “3” (Table 2). The four tests are added together for a maximum total score of 12. For each test, the coordinator will record if pain is provoked.

Lumbar Spine Test—This test assesses the presence of low back pain and a lower extremity radiculopathy. Similar to a straight leg raise, the test places stretch on the ipsilateral neural foramen and exiting spinal nerve roots throughout the lumbar spine.¹⁸ This test is used as a proxy for low back pain severity and will be evaluated for its association with BH.

Seated Slump Test: a progressive series of maneuvers in which (1) the participant starts sitting erect looking straight ahead, (2) places their hands on their lower back with palms facing out, (3) slumps forward, (4) fully flexes their cervical spine, (5) examiner extends one knee and dorsiflexes the foot, (6) if pain is provoked in the back and leg, the participant extends the cervical spine to assess for symptom relief – a positive test demonstrates typical pain initially and symptom relief with cervical extension, (7) the test is then repeated on the contralateral side. The test is performed bilaterally and a “Negative” recorded if no back or leg pain is elicited with leg extension and foot flexion, “Positive” if pain is elicited or “Equivocal” if back pain with no leg pain.

The remaining tests outlined below assess pain and stability of the external pelvic girdle joints (sacroiliac joint and pubic symphysis) and the hip joints bilaterally. These external pain generators will be correlated with both the pelvic floor muscle measures and BH. The examiner applies moderate to firm palpation (similar to pressure that would “blanch” the examiner’s nail bed on a desk top) at each site. The test is performed bilaterally and a “Negative” recorded if no pain is elicited with palpation or “Positive” if pain is elicited.

External Pelvic Girdle Palpation Tests¹⁹

a. Sacroiliac joint (SIJ): Standing behind, with the participant sitting at end of the exam table, the examiner identifies the SIJ bilaterally by visually identifying or palpating the “dimple” medial to the posterior superior iliac spine. Each landmark is palpated one side at a time.

b. Anterior Superior Iliac Spine (ASIS): With the participant supine, the examiner identifies the anterior superior iliac spine (ASIS) (bony protrusion in lower quadrants) bilaterally. Medial and deep to this is the iliacus muscle. Each landmark is palpated one side at a time.

c. Pubic Symphysis Palpation Test: With the participant still in supine position, the examiner palpates with the thumb the pubic symphysis joint.

Hip Provocation Tests:

For the hips, pain provocation on passive range of motion is assessed²⁰ in the supine position. The tests are performed bilaterally and a “Negative” recorded if no pain is elicited in the groin/hip or “Positive” if pain is elicited. If a side is not tested this is recorded.

a. Flexion, Adduction, Internal Rotation (FADIR) Test: The hip is flexed, adducted and internally rotated. Supporting the knee and ankle, the examiner gently pushes the entire leg across the midline of the body.

b. Flexion, Abduction, External Rotation (FABER) Test: The hip is flexed, abducted and externally rotated so that the heel rests on the opposite kneecap while the examiner places counter pressure at the ipsilateral knee and contralateral ASIS.

Pelvic Girdle Pain Provocation Tests: *Posterior Pelvic Pain Provocation Test*

This test is performed in the supine position with the participant's hip and knee flexed to 90-degrees, the examiner grounds the sacrum with one hand and applies a vertically oriented force directed through the femur toward the SIJ with the other hand. The test is positive when the participant experiences pain in the gluteal region of that leg. The test is performed bilaterally and a "Negative" recorded if no pain is elicited in the gluteal region or "Positive" if pain is elicited. If a side is not tested this is also recorded.

Pelvic Girdle Functional Stability Test: *Active Straight Leg Raise (ASLR)*

This test is performed to assess functional stability of the pelvic girdle. The participant lies supine with straight legs extended on the table 20 cm apart and raise each leg one at a time 20 cm above the table without bending the knee. A) The test is positive when the participant describes a heaviness or difficulty in performing the task. B) In the second part of the maneuver, posterior compression is applied to the pelvis bilaterally, and the participant is then asked to actively perform a straight leg raise. If there is greater ease in lifting the leg this is considered a positive test. The test is performed bilaterally and the participant rates the difficulty of the straight leg raise from "0-not difficult at all" to "4-very difficult"; "unable to do" is scored as a "5". If the ASLR test is positive, "Yes" is recorded if function is improved with pelvic girdle compression or "No" if function is not improved with compression. The evaluator assesses if the straight leg raise causes pain as "Yes" or "No" and if pelvic girdle compression causes pain ("Yes" or "No"). The scores on both sides will be added so that the summed score can range from 0–10. Impairment is considered severe if the summed score is at least 4.

In addition, participants undergo a validated global physical assessment. The Short Physical Performance Battery (SPPB)²¹ measures balance, lower extremity strength and functioning. The balance tests include three components: side-by-side standing balance, semi-tandem standing balance, and standing tandem balance. The SPPB measures lower extremity strength through gait speed through two trials of walking over 3 meters (approximately 10 feet), as well as a single and repeated chair stand testing. The supplies needed include a straight-backed armless chair, a stopwatch, and measuring tape with marked length for the gait speed testing. The SPPB is well validated for use in community-dwelling women with normative data on women. SPPB psychometric evaluation includes standard error measurement, test-retest reliability, internal consistency, external validity, predictive validity, minimal detectable change, and minimally clinically important difference.

The minimum score is 0 and maximum score is 12 based on the three components. Gait and chair stand tests will be used as subtests with scores ranging from 0 to 4. Higher scores indicate better lower extremity function. A score <10 indicates one or more mobility limitations and can predict all-cause mortality. The SPPB may not be able to distinguish

functional capacity in high performing adults. However, the gait speed test may be a better test for high performing adults for distinguishing limitations in lower extremity function.

Results:

Training was completed prior to the onset of data collection and included pre-reading of the written protocol, detailed instructions, and all case report forms along with a review of e-Learning recorded slide presentations and videos. This was followed by a two-day in-person hands-on certification course led by experienced physical therapists and physical therapy students who served as both instructors and models. Prior to testing, each test was demonstrated by the physical therapist lead. The trainees were assigned to a physical therapist and practiced with the therapists followed by testing. At the completion of the training, each evaluator underwent a hands-on evaluation of accuracy of each SPPB and MSK test performance (Table 3 and Table 4). For the SPPB, all hands-on trained personnel met or exceeded the pre-specified 75% pass rate for the audit process, with an average passing rate of 99.75%. For the MSK exam, all hands-on trained personnel met or exceeded the pre-specified 80% pass rate for the audit process, with an average passing rate of 97.5%.

While MSK physical examination and imaging is considered the gold standard for determining MSK health, the strength of association between examination and self-report tools collected in the MSK module such as the PROMIS physical function, pain interference and pain intensity is unknown. In this study, descriptive statistics (mean \pm SD, quartiles and range) for the MSK module surveys will be presented overall and stratified by findings from in-person measurements to inform power analyses for future studies. For factors hypothesized to promote bladder health and/or prevent LUTS (e.g., locations/types of pain), with prevalence 10% of the RISE sample, this study will have 90% power to detect differences as small as 0.147 SD in a BHS/BFI score.

Discussion:

The RISE in-person assessment, a nested study in the population-based longitudinal cohort study, is designed to address prioritized research questions that can only be answered by an in-person examination, specifically to explore the impact of MSK function and impairment on the spectrum of BH across the female life course. While pelvic floor muscle integrity, strength, and pain with palpation will be assessed as part of the in-person visit, this aspect of the study looks to explore beyond the idea that pelvic floor muscles are the sole MSK driver of bladder function.

It may make intuitive sense that “good” overall MSK health would be associated with a more favorable bladder health index, however it has not been formally studied. To date, the association between MSK dysfunction and UI has been focused primarily on dysfunction of the pelvic floor musculature. There is a growing body of evidence that MSK dysfunction, such as back pain and/or pelvic girdle pain is associated with UI. In a 2021 systematic review and meta-analysis examining the relationship between UI and low back pain or pelvic girdle pain, Bertuit et al. found positive associations in 15 out of 18 studies for at least one type of UI.²² The authors generated pooled odds ratio estimates of 1.61 for

stress UI, 1.53 for urgency UI, and 1.51 for mixed UI. Recent work by Foster et al.²³ in a matched case-control study found that women with LUTS of urinary frequency had weaker hip external rotator and abductor muscles but similar PFM strength and endurance compared to controls, suggesting that hip strength may be a modulator of urinary frequency symptoms. Erbes et al.²⁴, utilizing the same study population, found that cases with urinary urgency and frequency demonstrated greater impairment during movement tests of the hip, pelvis and spine, urgency provocation during certain movements and tests, such as the FADIR test of the hip, and relief of symptoms with positioning compared to controls. The relationship of MSK health and voiding function has been studied in the context of hyperactivity of urethra and pelvic floor muscles, with small studies suggesting improved voiding parameters, symptoms and quality of life with biofeedback therapy.^{25,26} Additionally, gait impairment and UI severity in the elderly has been shown²⁷. We hypothesize that findings on MSK assessments will be associated with storage and emptying functions of the bladder.

The strengths of this study include the use of validated MSK assessments implemented in a systematic and standardized manner across 9 sites around the US. We used online and in-person training programs with competency assessments for evaluators. Limitations include assessments limited only to participants willing and able to attend one of the clinical research center locations, the lack of gold standard MSK imaging and lack of objective MSK assessments (i.e., dynamometry, algometry, electromyography or accelerometry).

The RISE in-person MSK assessment will provide further insight into the role of general body MSK health and dysfunction and spectrum of BH.

Conclusions:

A standardized in-person MSK assessment is being performed across female age groups and includes assessments of balance, lower extremity strength/function, core stability, lumbar spine, hip and pelvic girdle pain/ function. This will allow for the assessment of how MSK health may influence BH indices and pelvic floor muscle function. The findings will inform future MSK targets for BH optimization.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Musculoskeletal (MSK) Tests

Test	Time (min)	Description	Position	Sides
Short physical performance battery	10 min	<ul style="list-style-type: none"> Side-by-side standing balance Semi-tandem standing balance Standing tandem balance Gait speed test Chair stand test 	Standing Seated/standing	N/A
Core stability	4 min	<ul style="list-style-type: none"> The Core Score: Four Dynamic Core Stability Separate Tests 	Standing Supine Side-lying Prone	N/A
Lumbar spine	1 min	<ul style="list-style-type: none"> Seated Slump Test 	Seated	Bilateral
External pelvic girdle	4 min	<ul style="list-style-type: none"> Sacroiliac joint (SIJ) Anterior Superior Iliac Spine (ASIS) Pubic Symphysis 	Seated Supine	Bilateral
Hip provocation	2 min	<ul style="list-style-type: none"> Flexion, Adduction, Internal Rotation (FADIR) Flexion, Abduction, External Rotation (FABER) 	Supine	Bilateral
Pelvic girdle provocation	1 min	<ul style="list-style-type: none"> Posterior Pelvic Pain Provocation (P4) 	Supine	Bilateral
Pelvic girdle function stability	1 min	<ul style="list-style-type: none"> Active Straight Leg Raise (ASLR) 	Supine	Bilateral

Table 2.

Scoring for Each Core Stability Test

Score	Test
0	Unable to even achieve neutral spine position in bridge for 5 seconds
1	Discontinues testing due to muscle fatigue
2	Performs weight-shifts with poor quality (>3 cm of pelvic rotation or drop, approximately)
3	Performs weight-shifts with good quality (neutral spine and pelvis throughout)

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Table 3.
Certification Checklist for the RISE In-Person Clinical Measures -SPPB

Passing Score 60 Trainee’s Total Score: _____/80

Trainee Name: _____ Clinical Site: _____

Certifying Trainer: _____ Date Certified: _____

To evaluate performance: Score each category that is marked using the following rubric:

4 Performs flawlessly

3 Requires one minor cue for performance

2 Requires one minor recommendation to improve performance

1 Requires >1 minor or 1 major recommendation to improve performance

0 Unsafe or requires >1 major recommendation to improve performance

Points for passing criteria indicated for each section. A score of “1” on any items requires repeating that section. A score of “0” on any section requires remediation and participant will not be certified.

SKILL: SPPB	Score	Comments
Preparation – Required Review		
READ MOP – Appendix 6.4.2	NS	
VIEW Instructional videos	NS	
CONDUCT Practice with Volunteers (if possible)	NS	
Section 1: Preparation of Participant		
Explains and demonstrates testing procedure to participant as suggested in the MOP		
Comfortable assisting participant with correct placement prior to each test		
Asks participant if she is ready to begin prior to each test		
Passing Score Section 1: /12		
Section 2: Side-By-Side, Semi-Tandem and Tandem Standing Test		
Explains procedure to participant and informs may use arms, bend knees or move body to maintain position just not move feet		
Demonstrates to participant how to stand in the Side-by-Side position and for how long		
Demonstrates to participant how to stand in the semi-tandem position and for how long		
Demonstrates to participant how to stand in the tandem position and for how long		
Effectively understands how to perform		
Effectively demonstrates how to time correctly		
Effectively demonstrates how to score correctly		
Score Section 2: /28		
Section 3: Gait Speed		
Effectively understands how to prepare testing and outlines appropriate 4 meters		
Explains procedure to participant		
Effectively demonstrates First Gait Speed test correctly		
Effectively demonstrates Second Gait Speed test correctly		
Effectively demonstrates how to time correctly		
Effectively demonstrates how to score correctly		
Passing Score Section 3: /24		

SKILL: SPPB	Score	Comments
Section 4: Chair Stand Test		
Effectively demonstrates how to set up chair stand test		
Effectively demonstrates how to time chair stand test		
Effectively demonstrates how to score chair stand test		
Passing Score Section 4: /12		
Section 5: Overall		
Demonstrates ability to recognize participant's capability to perform SPPB procedures and ensures the safety of the participant		
Passing Score Section 5: /4		
Total Score (Passing 60/80 points)		

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Table 4.
Certification Checklist for the RISE In-Person Clinical Measures -MSK

Passing Score 240 Trainee’s Total Score: _____/300

Trainee Name: _____ Clinical Site: _____

Certifying Trainer: _____ Date Certified: _____

To evaluate performance: Score each category that is marked using the following rubric:

5 Performs flawlessly

4 Requires one minor cue for performance

3 Requires one minor recommendation to improve performance

2 Requires >1 minor or 1 major recommendation to improve performance

1 Unsafe or requires >1 major recommendation to improve performance

Points for passing criteria indicated for each section. A score of “1” on any items requires repeating that section. A score of “0” on any section requires remediation and participant will not be certified.

SKILL: MSK Examination	Score	Comments
Preparation- Required Review:		
READ MOP – Appendix 6.4.3	NS	
View Powerpoint presentations	NS	
View Instructional Videos	NS	
CONDUCT Practice with Volunteers (if possible)	NS	
Section I. Preparation of Participant		
Explains examination procedure to participant: <i>“Now we will perform what we call the musculoskeletal examination. This includes testing your low back, hips, and the joints and muscles in the pelvis. These areas of your body can sometimes lead to problems with your bladder and muscles below your bladder, called the pelvic floor muscles. We want to see how well these areas move, check your strength and find out if anything feels sore. Only in 2 out of 7 of these tests will we ask you to do something. I will do the other tests and ask how you feel.”</i>		
<i>Passing Score Section I: /4</i>		
Section 1a. Core Stability Test - Single Leg Squat	Score	Comments
With the participant standing, say: <i>“I am now going to have you do 4 tests to check your muscle strength. For each test, I will show you a picture of what I mean before I have you do each test.”</i>		
With the participant standing, have her pick leg of choice (“strong” leg) and say: <i>“I will have you put your hands on your hips and stand on your strongest leg and try to balance for 5 seconds. If you can do that, I will ask you to also bend your knee in that same position then return to standing. I will show you a picture now of what I mean.”</i>		
Shows participant pictures of single-leg squat		
Say to participant, <i>“Now put your hands on your hips and stand on your strongest leg and try to balance for 5 seconds.”</i>		
If able to balance for 5 seconds, say to participant, <i>“Now bend your knee in that same position to about 45 degrees of knee bend then slowly return to standing.”</i>		
Effectively demonstrates how to score test correctly		
<i>Passing Score Section 1a: /24</i>		
Section 1b. Core Stability Test - Supine Bridge	Score	Comments
With the participant in a resting position, say: <i>“I will show you a picture now of what we want you to do for the next test. I am now going to have you lie down on your back on the exam table and bend your hips and knees, so that your feet are flat on the table and your arms at your sides. Next raise your pelvis (butt) up until your back is straight and hold for 5 seconds. Then if you can keep your pelvis up, I will have you lift 1 leg with your knee straight. If able to hold for 5 more seconds, then put that leg back down and do the same thing with your other leg and hold for 5 more seconds then return back to both feet on the table and rest your pelvis back down on the table.”</i>		
Shows participant picture of supine bridge (<i>can be done while reading above script</i>)		

SKILL: MSK Examination		Score	Comments
Has the participant lay on the exam table with legs and knees bent and flat on table.			
On exam table, say, <i>“Now raise your pelvis (butt) up until your back is straight and hold for 5 seconds.”</i>			
If able to hold for 5 seconds, say, <i>“Now lift 1 leg with your knee straight and hold it for 5 seconds”.</i>			
If able to hold for 5 more seconds, say, <i>“Now put that leg back down and do the same thing with your other leg and hold for 5 more seconds”.</i>			
If able to hold for 5 more seconds, say, <i>“Return back to both feet on the table and rest your pelvis back down on the table.”</i>			
Effectively demonstrates how to score test correctly			
<i>Passing Score Section 1b: /32</i>			
Section 1c. Core Stability Test - Side Bridge		Score	Comments
With the participant in a resting position, say: <i>“I will show you a picture now of what we want you to do for the next test. I am now going to have you roll onto your most comfortable side, bend your knees, keeping your feet together, and resting on your elbow and forearm, with your other hand on your hip. Then raise your pelvis to make your back straight (supported on knee and forearm). Hold this posture for 5 seconds, then go back to the starting position. Then straighten out your legs, lift your pelvis from the table and try to make your back straight (supported on ankle and forearm). Hold this for 5 seconds if you are able, then raise your upper leg about 30 degrees for 5 more seconds before returning to the starting position.”</i>			
Shows picture of side bridge progression.			
Have the participant roll onto side of choice, bend knees, feet together, and rest on elbow and forearm, with other hand on hip lying on the exam table.			
Once participant is ready, say <i>“Now raise your pelvis to make your back straight, supported on knee and forearm. Hold this posture for 5 seconds.”</i>			
If the participant able to hold the position for 5 seconds, say, <i>“Return to starting position”.</i> Say, <i>“ Now straighten out your legs, lift your pelvis from the table and try to make your back straight, supported on ankle and forearm. Hold this for 5 seconds if you are able.</i>			
After 5 seconds, say <i>“Now raise your upper leg about 30 degrees for 5 more seconds before returning to the starting position.”</i>			
After 5 seconds, say <i>“Return to starting position.”</i>			
Effectively demonstrates how to score test correctly			
<i>Passing Score Section 1c: /32</i>			
Section 1d. Core Stability Test - Prone Bridge		Score	Comments
With the participant in a resting position, say: <i>“I will show you a picture now of what we want you to do for the next test. I am now going to have you roll onto your stomach and prop yourself up on your forearms and toes until your back is straight. I will have you hold this posture for 5 seconds, then raise 1 leg off the table for 5 seconds, then alternate legs for another 5 seconds before returning to the starting position.”</i>			
Shows participant picture of prone bridge progression.			
Have the participant lay on their stomach.			
Say, <i>“Now prop yourself up on your forearms and toes until your back is straight. I will have you hold this posture for 5 seconds.”</i>			
If participant able to hold prone bridge for 5 seconds, say, <i>“Now raise 1 leg off the table for 5 seconds.”</i>			
After 5 more seconds, say, <i>“Now lower your leg and raise the other leg for another 5 seconds.”</i>			
After 5 seconds, say, <i>“Now return to the starting position and hold it for 5 more seconds.”</i>			
Effectively demonstrates how to score test correctly			
<i>Passing Score Section 1d: /32</i>			
Section 2. Lumbar Spine Test		Score	Comments
With the participant sitting say: <i>“I am now going to have you do a couple of maneuvers on both your right and left side to check for sciatica (pain down your leg)”</i>			

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SKILL: MSK Examination	Score	Comments
Say to participant: <i>“Start by sitting straight up, looking straight ahead. Then, place hands on your lower back with palms facing out. Now slump forward and lower your chin to your chest.”</i>		
Once participant is in the pictured position, say <i>“Now extend one leg out straight.”</i> Examiner effectively dorsiflexes the foot.		
Ask the participant if they are experiencing pain. If pain shooting from the back down the leg is present (radicular pain [leg pain, sciatica]), Examiner should tell participant <i>“Lift your head up”</i> . If the pain goes away when the cervical spine is extended this is a positive test. Pain initially with neck flexed and relieved with neck extended.		
Repeat on other leg		
Effectively demonstrates how to score test correctly		
<i>Passing Score Section 2: /24</i>		
Section 3. External Pelvic Girdle Palpation Test- Sacroiliac joint (SIJ)	Score	Comments
Standing behind, with the participant sitting at end of the exam table say: <i>“I am now going to ask you to sit, I will stand behind you and will press on an area on your back and you will let me know if you have pain/tenderness at that spot”</i>		
Effectively demonstrates how to identify the sacroiliac joints (SIJ) bilaterally by visually identifying or palpating the “dimple” medial to the posterior superior iliac spine.		
Effectively demonstrates the correct pressure to the sacroiliac joints by applying moderate to firm palpation (similar to pressure that would “blanch” the examiner’s nail bed on a desk top) at each site and ask if this elicits pain or discomfort.		
Effectively demonstrates how to score correctly		
<i>Passing Score Section 3: /16</i>		
Section 4. External Pelvic Girdle Palpation Test- Anterior Superior Iliac Spine (ASIS)	Score	Comments
With the participant supine (lying flat on her back): <i>“I am now going to have you lie down and press on 2 separate areas on the outside of your pelvis and you will let me know if you have pain/tenderness in that spot.”</i>		
Effectively demonstrates how to identify the anterior superior iliac spine (ASIS) (bony protrusion in lower quadrants) bilaterally. Medial and deep to this is the iliacus muscle. Palpate one side at a time.		
Effectively demonstrates the correct pressure to the anterior superior iliac spine by applying moderate to firm palpation (similar to pressure that would “blanch” the examiner’s nail bed on a desk top) medial to each site and note if this elicits pain or discomfort.		
Effectively demonstrates how to score test correctly		
<i>Passing Score Section 4: /16</i>		
Section 5. Pubic Symphysis Palpation Test	Score	Comments
With the participant still in supine position (lying flat on her back): <i>“I am now going to ask you to stay lying flat and I will press on one area over your pubic bone and you will let me know if you have pain/tenderness in that spot.”</i>		
Effectively demonstrates how to identify the pubic symphysis joint		
Effectively demonstrates correct pressure to the pubic symphysis joint by Palpating with a thumb, the pubic symphysis joint while participant is lying supine and notes if this elicits pain or discomfort.		
Effectively demonstrates how to score test correctly		
<i>Passing Score Section 5: /16</i>		
Section 6. Flexion, Adduction and Internal Rotation (FADIR) Test	Score	Comments
With the participant still in supine position (lying flat on her back): <i>“I am now going to ask you to stay lying flat and I will move your hips 2 ways. Please let me know with each position if you have any pain.”</i>		
Effectively demonstrates the proper leg position: Leg is flexed, adducted and internally rotated.		
Effectively demonstrates the proper joint rotation: Supporting the knee and ankle, gently push the entire leg across the midline of the participant’s body		
Effectively repeats test on other leg		

SKILL: MSK Examination		Score	Comments
Effectively demonstrates how to score test correctly			
Passing Score Section 6: /20			
Section 7. Flexion, Abduction and External Rotation (FABER) Test		Score	Comments
With the participant still in supine position (lying flat on her back): <i>"I am now going to ask you to stay lying flat and I will move your hips 2 ways. Please let me know with each position if you have any pain."</i>			
Effectively demonstrates the proper leg position: Leg is flexed, abducted and externally rotated so that the heel rests on the opposite kneecap			
Effectively demonstrates the proper counter pressure: Place counter pressure at the ipsilateral (same) knee and contralateral anterior superior iliac spine (ASIS)			
Effectively repeats test on other leg			
Effectively demonstrates how to score test correctly			
Passing Score Section 7: /20			
Section 8. Pelvic Girdle Pain Provocation Test		Score	Comments
With the participant still in supine position (lying flat on her back): <i>"I am now going to place your leg in a position with your hip and knee bent and I will push down from front to back. Let me know if this brings on any pain in your buttock area."</i>			
Effectively demonstrates the proper leg position: Flex hip and knee to 90-degrees			
Effectively demonstrates the proper pressure: Apply a vertically oriented force directed through the femur toward the SI joint with the other hand.			
Effectively repeats test on other leg			
Effectively demonstrates how to score test correctly			
Passing Score Section 8: /20			
Section 9. Pelvic Girdle Functional Stability Test		Score	Comments
With the participant lying flat, legs straight, extended 20 cm (~8 ins) apart say: <i>"I am going to have you lie flat on your back and lift your leg. I will ask you if the leg feels heavy and then how heavy. Then you will place your leg back down. I will then have you lift your leg again and I will give your pelvis some support myself and you will let me know if then it feels easier to lift the leg."</i>			
Say to the participant, <i>"Raise your leg about 8 inches above the table without bending your knee."</i>			
Read the scores out loud to the participant and ask her to choose one. The test is positive when the participant describes a heaviness or difficulty in performing the task (score >0): 0 - not difficult at all, 1 - minimally difficult, 2 - somewhat difficult, 3 - fairly difficult, 4 - very difficult, 5 - unable to do			
Say, <i>"Now place your leg back down."</i> If the score is >0, continue with second part of the maneuver.			
Second part of the maneuver, posterior compression is applied bilaterally to the iliac crests in the lateral to medial direction, and the participant is then again asked to actively perform a straight leg raise. Say to the participant, <i>"Lift your leg again and I will give your pelvis some support myself and you will let me know if then it feels easier to lift the leg."</i>			
Repeat on the other side			
Effectively demonstrates how to score test correctly			
Passing Score Section 9: /28			
Section 10: OVERALL: Professionalism/Communication			
Develops a professional rapport with the participant.			
Speaks at an appropriate pace; gears training to the participant's particular circumstances.			
Assesses participant's comprehension of tasks			
Demonstrates appropriate closure after exam			
Passing Score Section 10: /16			

SKILL: MSK Examination	Score	Comments
Passing Score: 240/300		

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