

CURRENT CONCEPTS IN FUNCTIONAL CAPACITY EVALUATION: A Best Practices Guideline

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Intent and Scope

The primary intent of this document is to provide guidelines for the proper design, administration, and interpretation of Functional Capacity Evaluations (FCEs), and to recommend qualification standards for Functional Capacity Examiners (Examiner) in order to promote clinical excellence, accountability, and consistency.

This document is not meant to be part of the Clinical Practice Guidelines of the Orthopaedic Section of the American Physical Therapy Association, part of the Occupational Therapy Practice Framework: Domain & Process of the American Occupational Therapy Association, or meet specific criteria to be included in the National Guideline Clearinghouse. This document is meant to serve as a primary resource for clinicians who perform FCEs, and for consumers of FCEs including physicians, adjusters, case managers, vocational rehabilitation counselors, and attorneys practicing in workers compensation and disability management.

The recommendations contained in this document were developed by a panel with expertise in the design, administration, and interpretation of Functional Capacity Evaluations. The expert panel relied on available literature and clinical experience to arrive at these guidelines. The guidelines were reviewed by stakeholders including physical therapists, occupational therapists, and physicians who either have expertise in FCEs as researchers or examiners or who use the results of FCEs in the administration of workers' compensation or disability claims. The reviewers' comments were considered and incorporated into the guideline as deemed appropriate by the expert panel. Readers of this document should understand that the reviewers' participation in the development of this document does not constitute their endorsement of the final product.

The guideline is provided as current best practice as opposed to standards of practice. An Examiner may deviate from these FCE guidelines when necessary and appropriate in the course of using independent and judicious clinical reasoning in an effort to provide the best information possible as to the functional abilities and limitations of the individual being evaluated in light of the questions posed by the referral source(s).

This document is intended to be used in conjunction with the most current versions of the *APTA Standards of Practice for Physical Therapy*¹, the *APTA Guide to Physical Therapist Practice*, the *AOTA Occupational Therapy Practice Framework: Domain & Process*², and the *International Classification of Functioning, Disability and Health*³.

Examiners should have a full understanding of potential limitations of FCEs which include but are not limited to issues related to validity and reliability (test selection and individual

performance), the influence of an individual's behavior and symptoms on overall test results, Examiner bias, and standardization of testing and reporting.

A Glossary of terms commonly used in FCEs has been developed as part of the guideline. Please refer to the Glossary for definitions of the terms used in this document.

Introduction

A Functional Capacity Evaluation (FCE) is a comprehensive performance-based medical assessment of an individual's physical and/or cognitive abilities to safely participate in work and other major life activities.²⁻⁵ The four major components of an FCE include⁴⁻⁷:

1. Intake interview
2. Medical records review
3. Physical examination
4. Content valid functional testing.

An FCE attempts to identify an individual's ability to safely participate in work and other major life activities. In instances where an individual has an illness, medical condition, or disorder that impairs his/her ability to safely participate in work or other major life activities, functional limitations may be present.

Residual functional capacity represents what an individual can still do despite functional limitations resulting from a medically determinable impairment(s) and impairment-related symptoms. In determining an individual's residual functional capacity, Functional Capacity Examiners should rely on objective clinical measurements and observations during content valid functional testing in combination with objective evidence gathered from a physical examination and a review of medical records. Functional Capacity Examiners should also consider subjective evidence from the individual's self-reported pain and disability reports, which may include standardized questionnaires as well as subjective information provided by the individual through an interview as part of the FCE.⁸

Historically, return-to-work decisions were based upon diagnoses and prognoses of physicians, but did not include objective measurements of an individual's functional abilities. Most physicians are not trained to assess the full array of human functional abilities required for comprehensive disability determinations⁹ or return to work recommendations. The physician or treating provider determines diagnosis and medical prognosis, but should rely on functional testing to more objectively identify an individual's functional abilities and limitations rather than their use of estimates, commonly called restrictions.¹⁰ In an evidence-based medical model, measurements are preferable to estimates.^{4,11}

Medically determinable impairments combined with the results from content valid functional testing administered by qualified Functional Capacity Examiners form the basis for establishing the severity of functional limitations and functional impairments.^{12,13}

FCE Utilization

FCEs are routinely utilized in cases involving workers' compensation, personal injury, long term disability, and Social Security Disability claims to determine an individual's ability to safely participate in work and other major life activities.

FCEs are commonly requested by physicians, attorneys, insurance claims adjusters, medical case managers, employers, and vocational rehab counselors. Individuals with self-reported activity limitations may also request an FCE to provide objective documentation of their ability to safely participate in work and other major life activities.

Frequent indications for an FCE include, but are not limited to, the following:

1. Functional testing performed as part of the work rehabilitation process such as safe entrance into an advanced work rehabilitation program. This may involve the Examiner selecting the most relevant tests for gap analysis between the individual's safe abilities and the job demands. The results are used for program development, to assess progress during the episode of care and as the basis for work recommendations and accommodations, if appropriate.
2. The individual has been participating in ongoing treatment and performance measures used during treatment may be used in combination with further testing to reach conclusions about the individual's ability to safely participate in work and other life activities during their recovery.
3. The individual has reached maximum rehabilitation potential. Current physical and/or cognitive abilities are requested to assist with claim closure.
4. The individual is working, but difficulty performing job tasks has been reported or observed. A job specific FCE should clearly identify whether there are gaps between safe functional abilities and job demands.
5. Healthcare provider's report that there is a discrepancy between the individual's subjective complaints and objective findings, and the FCE is requested to identify the individual's level of participation, consistency, and behaviors during the evaluation.
6. Physical and/or cognitive abilities data are needed for case management, disability determination, determination of loss of earning capacity, litigation settlement, or case resolution.
7. Physical and/or cognitive abilities are needed to help with a job-placement decision.
8. Physical and/or cognitive abilities are needed to assist with future rehabilitation or vocational planning.

The FCE Guidelines are intended for use by:

1. Examiners to properly design, administer, interpret and report FCEs.
2. Referral sources to facilitate appropriate request for type of FCE needed and to integrate the findings into case management.
3. Claims representatives from insurance companies, managed care organizations, and claims review organizations that request, authorize, review, and provide payment for FCEs.
4. State & Federal Workers' Compensation regulatory agencies that request, authorize, review, provide payment, and to set reimbursement and regulations for FCEs.
5. Social Security Disability Administration as a resource document.
6. Employers, employees, organized labor, educators, students, researchers, and others as a resource document.
7. The individual being evaluated.

Functional Capacity Examiner

In this document, a Functional Capacity Examiner (Examiner) is a physical therapist or occupational therapist licensed in the jurisdiction in which the services are performed, who is able to demonstrate evidence of education, training, and competencies specific to the design, administration, and interpretation of FCEs.

Functional Capacity Examiners should utilize the best available evidence from clinically relevant research when designing and performing FCE protocols and when forming conclusions about an individual's ability to safely participate in work and other major life activities.¹⁴⁻¹⁶

Functional Capacity Examiners should use a client centered approach in which the examiner gathers information to understand what is currently important to the individual and to identify past work experiences that may assist in the understanding of the current issues².

Functional Capacity Examiners should be able to demonstrate a post-professional level of knowledge and clinical expertise across a broad spectrum of medical, vocational, psychological, cognitive, and functional testing concepts. At a minimum, Functional Capacity Examiners should be able to demonstrate adequate knowledge and skills in the following areas¹⁷⁻²²:

1. Examination (includes history, systems review and tests and measures)
 - a. Understanding of anatomy and physiology, and knowledge to choose the appropriate clinical examination test and measures to assess the involved area. This includes knowledge of¹
 - i. Cardiovascular/pulmonary system, including understanding and application of exercise and work physiology principles
 - ii. Musculoskeletal system
 - iii. Neuromuscular system

- iv. Psychosocial principles
 - v. Body mechanics and work behaviors
 - vi. Integumentary system.
2. Design and administration of FCEs, and interpretation of test results
 - a. Proficiency with the FCE test process being used, and understand the process' underlying safety, reliability, validity and practicality.²³
 - b. Employ clearly defined test endpoints during testing that include physiological, biomechanical, and psychophysical factors.²⁴⁻²⁹
 - c. The Examiner should be aware of his/her own fear-avoidant beliefs and biases as there is evidence suggesting that these beliefs can impact an individual's test results.³⁰
 3. Physical Demands of work
 - a. Knowledge of physical work demands, activity frequency, repetitive movements and sustained postures.
 - b. Able to utilize information contained in a job analysis to design and test an individual's functional performance of a specific job.
 - c. Understand essential versus marginal job functions.
 - d. Understand activity analysis which "addresses the physical demands of an activity, the range of skills involved in its performance, and the various cultural meanings that might be ascribed to it"³¹
 4. Ability to evaluate an individual's performance and participation with an understanding that "a focus on the whole is considered stronger than a focus on isolated aspects of human function"²
 - a. Consider the physiological, biomechanical and behavioral indicators of effort demonstrated during testing.
 - b. Ability to assess movement and performance consistency.
 - c. Awareness of the facilitators and barriers that may impact the individual that includes individual and work-related factors, such as organizational and environmental considerations.
 - d. Understand pain neuroscience theory.
 5. Communication and coordination
 - a. Ability to establish rapport with the individual during the FCE process.
 - b. Able to write an FCE report that addresses the referral source's questions and clearly identifies the individual's functional abilities and limitations. The report is discussed in detail in the Reporting section.
 6. Laws and regulations relevant to FCE administration and use including
 - a. Worker's Compensation laws and regulations within the jurisdiction in which the injury occurred and/or evaluation is completed
 - b. Social Security Disability Administration criteria⁸
 - c. Americans with Disabilities Act and Americans with Disability Amendment Act^{32,33}
 - d. Code of Uniform Guidelines for Employment Selection³⁴
 - e. Health Insurance Portability and Accountability Act (HIPPA)³⁵
 - f. Regulations regarding expert testimony-Federal Rules of Evidence-Daubert Standard and Frye.³⁶⁻³⁸

Referral, Medical Records, Safety Considerations and Consent

1. Referral for an FCE
 - a. The referral source should clearly communicate the purpose of the FCE and specify any particular issues the examiner should address.
 - b. If a job-specific FCE has been requested, the examiner needs detailed information regarding the physical requirements of the essential and marginal duties. This can be obtained from review of a job description or job analysis. In the absence of adequate information an on-site job analysis is recommended prior to the FCE to identify this information. In cases where on-site analysis cannot be performed, the Functional Capacity Examiner may rely on occupational information from O*Net³⁹ and the Dictionary of Occupational Titles⁴⁰. These sources provide general information and may reflect a range of job demands that might not accurately reflect a specific job position. While the individual being evaluated can provide information about his job duties and requirements, this information should be confirmed with the employer. The Functional Capacity Examiner should document the source of the physical job demands in the FCE report.
 - c. If treatment recommendations are desired, this should be stated in the FCE referral.
2. Medical Records that provide background regarding the individual's mechanism of injury or illness and subsequent treatment can provide helpful information to the Examiner. Records may include operative notes, recent diagnostic test reports, physician records, and occupational and physical therapy records.
3. Considerations for the Individual Being Tested
 - a. The individual should be medically stable, or the FCE test protocol should be administered within the safe confines of the individual's health condition. During the FCE, the Examiner is responsible for ensuring the individual's safety.
 - b. The individual must consent to participate in the FCE. A written informed consent specifically outlining the nature of the FCE is recommended. The consent should inform the individual of potential risks including but not limited to a temporary increase in symptoms, musculoskeletal soreness for several days, a temporary exacerbation of the current condition, re-injury of the affected body part, or an additional injury. The Examiner is responsible for ensuring that the individual fully understands the information presented, has an opportunity to ask questions, and all questions are answered in a manner the individual considers satisfactory.⁴¹
 - c. The Examiner should stay abreast of current evidence-based practice guidelines to ensure safe administration of functional tests. Common reasons not to conduct an FCE or to cease testing include but are not limited to:
 - i. Performance of the test would compromise the individual's safety or medical condition^{6,42-45}. As used herein, safety refers to preventing a new injury or adversely affecting an individual's current condition. A transient increase in soreness or pain symptoms is not considered to be unsafe.⁴⁶
 - ii. Communication barriers preclude understanding test instructions, communicating concerns, or interpreting the individual's responses during the FCE.
 - iii. Individual does not provide consent to participate in the FCE.

- iv. Caution should be used in testing during pregnancy as it may be difficult to differentiate functional impairment due to pregnancy from other more permanent conditions.⁴⁷⁻⁴⁹

Design

Functional Capacity Examiners should design and/or utilize established functional tests that meet the following criteria^{7,23}.

1. Safety. The tests should not be expected to lead to injury.
2. Reliability. The measures from the tests should produce consistent results.
3. Validity. The tests measure what they were intended to measure.
4. Practicality. The time and cost involved in the design, administration, interpretation and reporting of tests should be reasonable.
5. Utility. The results outlined in the FCE report should be comprehensible to non-medical readers and the results should provide useful information.

In addition, Functional Capacity Examiners should consider the following factors in the design and/or selection of functional tests⁵⁰:

1. Is the test or measure supported in the literature with regards to:
 - a. Reliability
 - i. Device
 - ii. Inter-rater
 - iii. Intra-rater
 - iv. Inter-session
 - b. Validity
 - i. Face
 - ii. Content
 - iii. Predictive
 - iv. Concurrent
 - v. Convergent
 - vi. Discriminant
2. In instances where a test does not have substantial accepted evidence, or the Examiner does not have access to the equipment/tools to use a test supported by evidence, the Examiner should consider significance of validity including:
 - a. Face
 - b. Content
 - c. Construct
 - d. Concurrent

There are 2 primary types of FCEs:

1. Job/Occupation Specific FCE
 - a. The individual's functional abilities are matched to the physical and/or cognitive demands of a specific job(s) or a specific occupation(s).
 - b. The individual has usually reached MMI.

2. Any Occupation FCE
 - a. The individual's functional abilities are not matched to the physical and/or cognitive demands of a specific job(s) or a specific occupation(s).
 - b. Often used in long term disability claims and Social Security Disability claims, but also in workers' compensation claims when it is known that the individual will not return to their prior job.
 - c. The individual has usually reached MMI.

The Examiner is ultimately responsible for determining the amount of time necessary to design, administer, and interpret the FCE based on the complexity of the case. Common factors used to determine the amount of time necessary for an FCE include the:

1. Type of FCE needed (job/occupation specific or any occupation).
2. Physical and/or cognitive demands of the job/occupation.
3. Chronicity and severity of the individual's physical and cognitive impairments.

The FCE expert panel recommends an allowance of up to 8 hours for a FCE conducted over a 1 to 2 day period. However, less or additional time may be necessary depending on case complexity. The upper end of the recommended time allowance may be appropriate in the following situations:

1. Individual has chronic physical and/or cognitive impairments.
2. Individual has reached MMI and permanent work restrictions are needed.
3. Referral source requires information about an individual's ability to safely participate in work-related activities over multiple days.
4. The individual has reports of chronic fatigue or delayed onset pain.

Shorter testing time periods may be appropriate in the following situations:

1. Individual has acute to sub-acute physical and/or cognitive impairments.
2. Individual has not reached MMI and temporary work restrictions are needed for early return to work.
3. Baseline functional abilities are needed for participation in an advanced work rehabilitation program.
4. To provide helpful information regarding an individual's ability to work.⁵¹⁻⁵³

Test Components

1. Referral Review
 - a. Reason for referral
 - b. Relationship of individual to referral source.
2. Medical Record Review
 - a. Mechanism of injury
 - b. Individual's response to treatment to date
 - c. Objective diagnostic tests

- d. Surgeries
 - e. Other relevant claims/medical history.
3. Informed Consent
 - a. Include risk for injury, exacerbation of symptoms, or possibility of soreness in response to testing.
 - b. Include the exam procedures that will help to reduce that risk.
 - c. Discuss release of FCE information
 - d. Describe the FCE testing process
 - e. Address individual's concerns.
 4. Intake Interview
 5. Psychosocial Screening and Comprehensive Pain Assessment includes⁵⁴⁻⁵⁹:
 - a. Use of evidence-based psychosocial/psychometric screens
 - b. Observation of the individual's pain behavior throughout the FCE examination.
 - c. Measurement of the individual's physiological responses following acute episodes of increased pain
 - d. Use of a pain scale with functional descriptors.
 - e. Pain diagram.
 6. Systems Review/Physical Examination¹
 - a. Cardiovascular Respiratory
 - b. Integumentary
 - c. Musculoskeletal
 - d. Neuromuscular
 - e. Cognitive.
 7. Cardiovascular Respiratory Abilities Testing⁶⁰⁻⁶³
 8. Material Handling Testing —Ability to exert force to lift, push, pull, or carry objects^{39,64,65}
 - a. Lifting/Lowering
 - b. Carrying
 - c. Pushing/Pulling
 - d. Grasping/Pinching.
 9. Coordination, Flexibility, Postural Abilities Testing- Testing should include sustained and/or repeated observations of the ability to assume, maintain, and exit positions consistent with work including those defined by the DOL/DOT.
 - a. Dynamic Flexibility — the ability to quickly and repeatedly bend, stretch, twist, or reach out with your body, arms, and/or legs.
 - b. Extent Flexibility — the ability to bend, stretch, twist, or reach with the body, arms, and/or legs.
 - c. Gross Body Equilibrium — the ability to keep or regain your body balance or stay upright when in an unstable position.
 - d. Fingering and manual dexterity tasks.
 - e. Common physical demand activities as reported by the Dictionary of Occupational Titles include^{65,66}
 - i. 1. Sitting

- ii. 2. Standing
- iii. 3. Walking
- iv. 4. Climbing
- v. 5. Balancing
- vi. 6. Stooping
- vii. 7. Kneeling
- viii. 8. Crouching
- ix. 9. Crawling
- x. 10. Reaching
- xi. 11. Handling
- xii. 12. Fingering.

10. Cognitive testing may be included dependent on symptoms, diagnosis or referral request and may include:

- a. Cognitive factors
- b. Perceptual/sensory factors
- c. Communicative factors
- d. Behavioral factors
- e. Psycho-emotional factors.

11. Other Work Simulation Testing, as needed

12. Post Test Systems Review

13. Exit Interview and Instructions

Test Administration

Test administration should be sequenced and progressed to optimize the individual's performance and safety. The Examiner should be aware of the reason for referral prior to commencing the FCE. The Examiner should use the initial intake interview and systems review to establish rapport with the individual and to determine the most appropriate test components to include in order to obtain the information requested. Any test that either does not provide the needed information or might place the individual at foreseeable risk of injury should be forgone. Throughout testing the Examiner should monitor the individual's physiological, biomechanical, and psychophysical responses to activity.

Physiological monitoring includes regular assessment of heart rate for safety reasons and also as an indicator of an individual's effort level during testing. In cases when the individual's heart rate and heart rate response may be affected by medication or other factors revealed in the medical history such as a pacemaker, alternative monitoring should be employed. Alternatives may include the use of the Borg Rating of Perceived Exertion Scale⁶⁷ as well as more reliance on respiratory rate and blood pressure. Other physiological monitoring includes, but is not limited to, cardiac rhythm, blood pressure, respiratory rate, oxygen saturation, perspiration, color, and swelling.

Biomechanical monitoring should include, but is not limited to, clinical observations of muscle recruitment, movement patterns, stance, balance, and counterbalancing⁶⁸⁻⁷⁰.

The Examiner should monitor an individual's symptoms during the administration of an FCE for safety and as a component of a comprehensive pain assessment. Pain may be associated with a nociceptive response from injured tissue, an anticipation of a nociceptive response from injured tissue, or an individual's perception of threat of pain or harm. A fundamental challenge for the Examiner is to consider the degree to which psychosocial factors and symptom reports impact performance during functional testing.⁷¹ The Examiner should incorporate a comprehensive pain assessment which includes psychosocial screening, pain behavior assessment, and physiological assessment in the administration of a FCE because research demonstrates that psychosocial factors influence performance.⁷²⁻⁷⁵ Psychosocial factors that influence performance include but are not limited to:

1. Perceived disability
2. Kinesiophobia/Fear Avoidance Beliefs
3. Catastrophizing
4. Anxiousness/Distress/Depressed Mood
5. Self-efficacy
6. Perceived Injustice.

If information is requested about a client's cognitive abilities, cognitive functional testing may be appropriate. Cognitive Functional Evaluations require specialized training above and beyond standard physical based Functional Capacity Evaluations. For more information on Cognitive Functional Evaluations please reference the Emerging Trends in Functional Capacity Evaluation Section.

Test Component Administration:

1. Referral Review

The reason for referral is a key element in preparing for and designing an FCE to provide maximum utility for the referral source.

2. Medical Records Review

Medical records may provide information regarding the individual's medical history, extent of the injury, the treatment provided and the individual's response, and condition stability. The individual's medical history may include conditions directly related to or unrelated to the injury or illness that precipitated the referral, which should be considered by the examiner to ensure the individual's ability to safely participate in an FCE. Examples may include heavy lifting or extreme postures in the presence of mal-union or frank joint instability or unstable cardiovascular disease.

3. Informed Consent

Informed consent should be reviewed with the individual verbally and in writing and should include the purpose, risks, and benefits of testing.

4. Intake Interview

An interview which includes questions about current, recent, and past levels of pain and function provides insight into the nature, severity, and irritability of the individual's

condition. Information from the intake interview can be used to develop the sequencing and rate of progression of test components, and helps the examiner target specific response to monitor.

5. Psychosocial Screening and Comprehensive Pain Assessment

As part of the comprehensive pain assessment the Examiner should incorporate evidence based psychometric/psychosocial questionnaires to determine how psychosocial factors influence pain reports and functional performance. The psychosocial/psychometric questionnaires used within the comprehensive pain assessment should not be used in isolation to make final conclusions in regards to the overall assessment of the individual's pain response. Some useful questionnaires are listed below: ⁷⁶⁻⁸⁹

- i. McGill Pain questionnaire
- ii. Dallas Pain questionnaire
- iii. Orebro Musculoskeletal Pain Screening questionnaire
- iv. Oswestry Back Disability questionnaire
- v. Neck Disability questionnaire
- vi. Quick DASH questionnaire
- vii. Lower Limb Outcomes questionnaire
- viii. Pain Disability Questionnaire
- ix. Pain Disability Index
- x. Perceived Injustice Questionnaire
- xi. Modified Somatic Perception questionnaire
- xii. Fear Avoidance Belief questionnaire
- xiii. Tampa Scale of Kinesiophobia
- xiv. Functional Self Efficacy Scale
- xv. PHQ-9
- xvi. WHODAS 2.0

As part of a comprehensive pain assessment, the Examiner should monitor physiological responses associated with an acute increase in pain.^{90,91} The Examiner should be aware of research that reports that physiological responses may be due to an increased pain stimulus or the anticipation of the pain stimulus. The Examiner should also be aware that physiological response changes can be associated with increased physical exertion during the FCE. Whether the acute physiological responses are due to exertion, anticipation of pain, or an increased pain stimulus, the evidence is clear that during an FCE there should be physiological response changes.⁹² When an individual reports an acute increase in pain during the FCE, the physiological responses monitored could include:

1. Increased heart rate
2. Increased blood pressure
3. Increased breathing rate
4. Diaphoresis
5. Pupil dilatation.

During testing, the Examiner should monitor pain behaviors and reported symptoms, and consider the correlation between the observed behaviors, symptom reports and clinical examination findings. Pain behaviors can include but are not limited to^{54-59,93,94}:

1. Facial expressions: Frowning, grimacing, distorted expression, or rapid blinking.
2. Verbalizations/vocalizations: Sighing, moaning, calling out, or asking for help.

3. Body movements: Rigid, tense, guarding, fidgeting, increased pacing/rocking, biomechanical changes/compensations/substitution patterns and other mobility changes such as inactivity or motor restlessness.
4. Changes in interpersonal interactions: Aggressive, resistive, disruptive, or withdrawn.
5. Changes in activity patterns: Sudden cessation of common routines.
6. Mental status change: Crying, increased confusion, irritability, or distress.

The Examiner may consider utilizing a pain scale with functional descriptors (functional pain scale) during the comprehensive pain behavior assessment to provide further evidence in forming an opinion about how the individual's pain affected observed function during testing.⁹⁵⁻⁹⁷

No single tool can be used to classify an individual's pain report as an accurate representation of pain that affects function or an inaccurate representation of the individual's subjective pain response, and the Examiner should use a battery of the above-mentioned tools throughout the FCE to assist the examiner in determining how pain affects or does not affect the final functional abilities determination.

6. Systems Review/Physical Examination

A full systems review should be done in accordance with the current Guide to Physical Therapist Practice¹ and/or the Occupational Therapy Practice Framework: Domain and Process².

Particular attention should be paid to cardiovascular status including resting heart rate and blood pressure as well as other conditions which might preclude safe testing of specific functions or to levels that may preclude further stressing certain body systems.⁴⁷ Best evidence resources for exercise testing in general and for specific populations should be consulted when designing FCE protocols and considering specific medical conditions and findings and test development.

Examples of organizations providing guidance on exercise testing include, but are not limited to, the American College of Sports Medicine^{42,98}, the American Congress of Obstetricians and Gynecologists, the American Heart Association⁴³, and the Centers for Disease Control.⁹⁹

When conducting components of a physical examination including, but not limited to, range of motion testing, strength testing, girth measurements, temperature measurements, and other diagnostic testing, the Examiner should rely on tools and techniques that have demonstrated reliability and sensitivity to change. An example is volumetric measurement of small body parts rather than circumferential measures. Repeated trials and averages may be used in cases where this will increase reliability and sensitivity. Areas of impairment and those likely to change as a result of testing should be prioritized.

7. Aerobic Abilities Testing

Aerobic response to work demands is an important factor in determining an individual's ability to perform sustained work activity. Aerobic testing should be consistent with guidelines developed for safe test administration.^{42,100} Results of testing should be reported such that they relate to work demands and avoid reporting results that compare to age related normative values.^{100,101} The preferred method for reporting is in METs which can then be compared to functional activities both vocationally with regards to physical demand level or physical demand category,^{100,102} or compared to specific task performance.^{60,103}

There are several methods available for aerobic testing, including walking (on or off of a treadmill), stationary bicycle, steps, etc. The individual's job demands and history are factors to consider when choosing a methodology.

Job simulation tasks can also be used to determine an individual's aerobic tolerance to specific activities and used to substantiate the ability to maintain functions for various intensities, frequencies, and durations.

Research has clearly shown a linear relationship between aerobic capacity (oxygen consumption) and heart rate. Therefore, Examiners should use heart rate measurements obtained during functional capacity testing to reliably determine an individual's physiological endurance for tolerating activities over an 8-hour work day. As noted earlier in the Guideline, Examiners should be aware of any medications or medical conditions that could invalidate the use of heart rate for this purpose. The following formula provides a relatively easy method to estimate an individual's percent maximum aerobic capacity:⁶²

% Maximum Aerobic Capacity = (Peak HR* – Resting HR)/[220-age] – Resting HR *maximum heart rate during activity.

8. Material Handling Testing

The ability to exert maximum muscle force to lift, push, pull, or carry objects are essential functions of most occupations and are considered an essential component of an FCE.^{40,65} It is recommended that testing follow established protocols that are designed to be progressive and include monitoring of the cardiorespiratory, musculoskeletal, and psychophysical responses to testing.¹⁰⁴⁻¹⁰⁶

NIOSH indicates that the size and coupling of the load are key factors for control in addition to the height and weight.⁶⁴ Therefore it is recommended that testing commence with an object that is approximately 8-20" deep, has handles, and with minimal weight but to which additional weight can be added, such as a crate fabricated or sold for this purpose or an industrial crate. Caution should be used to assure that the container is in good condition and is rated for the maximum load to be tested.

NIOSH indicates that the height and symmetry of the load affects the abilities of individuals when lifting/lowering.⁶⁴ Therefore, lifting/lowering should be assessed from and to various heights in an effort to replicate work demands.

Predetermined end points for physiological, biomechanical, and psychophysical responses should be included in any lifting/lower test protocol to assure the safety of the individual.^{104,105}

Physiological monitoring should include at a minimum heart rate and other variables such as respiratory rate, oxygen saturation, and cardiac rhythm when feasible or required for safe testing.

Biomechanical monitoring should include body mechanics including stance and counterbalancing as well as muscle recruitment patterns^{69,70}. This monitoring should be performed visually using predetermined categorical scales designed for the purpose.^{68-70,106}

Psychophysical monitoring includes monitoring the individual's perceived pain, other symptoms, and reported effort. Tools such as a numeric pain rating scale, visual analogue pain scale, rated perceived exertion scale,⁶⁵ and rated perceived load scales provide an objective measure of the pain or perceived exertion.¹⁰⁵

Testing strength, power and endurance for force exertion are needed for most occupations and are generally reported consistent with Dictionary of Occupational Titles (DOT) and Department of Labor (DOL) standards with regards to frequency. The DOT defines Occasional, Frequent, and Constant (see glossary). The DOT further categorizes force exertion related to work demands as Sedentary, Light, Medium, Heavy, and Very Heavy (see glossary).⁴⁰

a. Lifting/Lowering

a. Lifting/Lowering should be tested progressively beginning with weights expected to be easily managed and in a manner that includes maximum opportunity for control.^{68,104,105} The vertical lift height should be noted.

b. Carrying

a. Carrying should be tested progressively beginning with weights expected to be easily managed and in a manner that includes maximum opportunity for control. Carrying can be tested unilaterally or bimanually and should be conducted to best provide information needed by the referral source.

c. Pushing/Pulling

a. Pushing and Pulling are common vocational demands and can encompass moving a number of objects including hospital beds and stretchers, pallet jacks, hand trucks, crates, doors, ropes, and wire.

i. The combination of the surface on which an object is pushed, the surface and weight of the object itself and the speed at which the object is being accelerated or decelerated determine the force needed to push or pull the object. In the case of a wheeled object the surface of the wheels and the supporting surface greatly affect the force needed to push or a pull a load of any given mass. The Examiner should use a calibrated force gauge to determine the forces exerted by the individual during testing.

ii. Pushing/Pulling testing should be progressive starting with the need for relatively little force and ending at maximum safe ability or the amount that provides the information needed by the referral source.

iii. Pushing/Pulling should, to the extent possible, be tested at the height and with similar equipment to that used or intended to be used by the individual.

iv. The individual's ability to generate push/pull force should be reported in pounds of force or ft-pounds, and note the height at which the force was applied.

b. Grasping/Pinching

i. The use of the hands for producing force in grasping and pinching are essential to functioning in most work environments. Assessment of the ability to produce force for grasping and pinching should be measured in accordance with standard protocols.

9. Coordination, Flexibility, Postural Abilities Testing

a. Work tasks require the worker to possess dynamic flexibility, extent flexibility, and gross body equilibrium³⁹ to complete occupational tasks including: Sitting, Standing,

- Walking, Climbing, Balancing, Stooping, Kneeling, Crouching, Crawling, Reaching, Handling, and Fingering.⁴⁰ Testing of the individual's abilities related to flexibility and equilibrium and the ability to assume, maintain, and return from positions and complete handling and fingering tasks should be incorporated in the functional capacity evaluation in an effort to provide the referral source with needed information.
- b. Testing should be completed by direct observation and completed in a way to extrapolate abilities consistent with the DOT and DOL definitions of occasional, frequent, and constant⁴⁰ rather than compared to age related normal values or percentage of the population.
 - c. Where task performance can be performed unilaterally and the individual's condition may affect performance of a single extremity, attempts should be made to provide abilities for each extremity independently. For example an individual with a history of a right shoulder injury may not possess the ability for reaching with the right upper extremity but may be able to reach with the left extremity frequently.

10. Other Work Simulation Testing

To the extent possible the FCE should incorporate work simulation testing once standardized testing indicates that more specific testing is safe. An example is a worker who needs to lift a keg of beer weighing 160.5 lbs. The examiner should perform progressive lifting near the actual weight of the keg prior to attempting to perform lifting of the actual keg of beer.

Another example is an individual whose job requires climbing a utility pole. It is prudent to perform ladder climbing prior to performing pole climbing. Work Simulation testing may need to be performed in the field or equipment borrowed from the employer to adequately test the individual's abilities.

11. Post Test Systems Review, Exit Interview and Instructions

- a. The Examiner should conduct a post test systems review to assure that the testing has not had an unexpected or adverse effect on the body systems. In the event the system review reveals possible changes in the individual's status, further assessments of the relevant areas should be undertaken and documented by the Examiner.
- b. The Exit Interview should assess the subjective response of the individual to the testing procedures including perceived changes in location and intensity of complaints including but not limited to pain. Tingling, numbness, stiffness, weakness, instability, and feelings of swelling or spasm are also changes that the individual may perceive and should be documented.
- c. Exit instructions may include the individual's rights with regards to access to the test results, and a timeframe as to when results might be available, if appropriate. The Examiner should provide instructions to actions that should be taken if the individual has any questions or concerns following testing, including reports of significant symptoms.

Interpretation

Examiners should make every attempt to encourage an individual to report accurate levels of pain and other symptoms, and to put forth good effort during the FCE.

Examiner interpretation of test data requires triangulation of multiple data sets in order to provide meaningful and useful information to the requestor. The 3 primary areas of consideration include a determination of the individual's:

1. Performance or Effort level
2. Effect of pain and other symptoms on test performance
3. Residual functional capacity including functional abilities and functional limitations.

1. Performance or Effort Level

Examiners must consider the individual's test participation and effort during the FCE, and make a determination about effort based on the preponderance of data. The determination should be based on the test endpoints (physiological, biomechanical, and psychophysical), the individual's reported symptoms and associated behaviors, clinical examination findings, movement/performance consistency, and observed signs associated with pain.

A variety of functional testing methods have been utilized extensively in functional capacity evaluations to assess what has been reported as an individual's "sincerity of effort." Some of these methods include: comparing an individual's performance from static (isometric) lift strength testing to their performance during incremental dynamic lift testing, five-rung grip testing, rapid exchange grip testing, and using the coefficient of variance statistical measure with static lift testing and grip strength testing. However, the preponderance of evidence does not support the use of the term "sincerity of effort" nor the use of these testing methods alone for classifying an individual's performance or effort level.¹⁰⁷⁻¹³² Examiners should understand the proper use and limitations of these testing methods and use caution when applying these methods to make a determination about an individual's effort during functional testing. It is recommended that Examiners make determinations about effort based on the presence of physiological and biomechanical signs (i.e., heart rate, respiration rate, muscle recruitment, and consistency of movement patterns) in combination with clinical examination findings and symptom reports.

A determination regarding the individual's effort during the FCE informs the report user the extent to which the data approximates the individual's ability to safely participate in work and other major life activities. When determining an individual's effort or performance level, the Examiner should also consider the scoring patterns (performance patterns). A progressive score increase (increase in performance) may suggest a learning effect or improved confidence of the individual, while a progressive score decrease (decrease in performance) may reflect fatigue or an unresolved clinical condition.

To more accurately predict an individual's ability to safely perform work-related activities over an 8-hour period, it is recommended that Examiners utilize the following work physiology guidelines for interpreting the results of heart rate responses used for calculating percent maximum aerobic capacity:⁶²

<u>Duration</u>	<u>% Max Aerobic Capacity</u>
8 hours	33
1 hour	50
20 min	70
5 min	85

2. Effect of Pain and other Symptoms

Pain or the anticipation of pain or other symptoms may influence an individual's performance during testing. An individual may communicate pain verbally, through facial expressions, body posture and movements¹³³⁻¹³⁷. Examiners should consider the extent to which an individual's reported pain or other symptoms impacted test performance. Significant changes in an individual's reported pain or other symptoms that occur during or after testing should be correlated with objective changes in physical signs including, but not limited to heart rate, blood pressure, muscle spasm, joint warmth, and/or swelling. Examiners should use caution when interpreting an individual's pain behaviors and reports since examiner bias and beliefs can impact interpretation^{136,138}.

If it is determined that an individual's pain and other symptoms are consistent with objective medical evidence, and the individual has demonstrated signs associated with significant effort during testing, the Examiner should adjust the final recommendations about an individual's functional abilities and functional limitations to reflect activity levels to one that is expected to better accommodate their safe work tolerances and be sustainable over time in a productive work environment.

However, if it is determined that an individual's pain and other symptoms are not consistent with objective medical evidence, and the individual's test performance showed less than good effort, the Examiner should not rely on the individual's self-reports of pain or other symptoms as a basis to adjust their functional abilities and functional limitations.

3. Residual Functional Capacity

Residual Functional Capacity represents what an individual can still do despite functional limitations resulting from a medically determinable impairment(s) and impairment-related symptoms.

Static (isometric) strength tests have been used extensively in some functional capacity evaluations to assess maximum capacity for lifting, pushing, and pulling. Static testing involves exerting a force on an object without motion occurring. Some FCE Examiners have used this information to provide recommendations about an individual's residual functional capacity.

Because most work tasks are dynamic in nature (objects are moved from one point to another) as opposed to static, evaluating an individual's dynamic ability better simulates the work activity. More recent research indicates that static strength testing does not accurately predict dynamic lifting capacity.¹³⁹ Potential safety concerns with the use of static lift testing have also been identified.^{139,140} Therefore, Examiners should avoid the use of static strength tests to determine functional abilities unless a job specific static strength requirement exists.

In determining an individual's residual functional capacity, the Examiner should rely on objective clinical measurements and observations during content valid functional testing in combination with objective evidence gathered from a physical examination and a review of medical records. The Examiner should also consider subjective evidence gathered from multiple sources of self-reported pain and disability questionnaires along with subjective information provided by an individual.

In cases where the individual provided appropriate observable signs of effort or predictable compensatory strategies related to diagnosis and physical impairments along with pain behavior, the Functional Capacity Examiner should consider the individual's subjective reports of pain, other symptoms and limitations when arriving at a final conclusion regarding functional abilities and limitations. For example, if an individual reports an increase in pain or other symptoms in conjunction with a functional activity circuit, the individual's tolerance with the specific activities that caused the increase in pain or other symptoms should be adjusted to a lower functional level in order to ensure the individual's activity tolerance on a safe and dependable basis. In cases where an individual consistently performs at a low activity level and has a high symptom-focus, the results reflect the individual's activity tolerance or minimal functional abilities.

Reporting

The FCE report is the product produced by the Examiner. The report should be clearly written and easily understood by nonmedical individuals. The use of abbreviations and jargon should be avoided. The results should be reported using generally accepted terminology as defined in this Guideline and supporting references. Each page should be numbered. If there are intentional blank spaces or pages in the report, it should be noted that this is intentional. The Examiner's name and specialty should be identified. Often, a summary of findings listing functional abilities, functional limitations and the individual's performance participation precedes the detailed report data, to facilitate application of the results. The report should contain the following components⁴, but not necessarily in this order:

1. Introduction: the reason(s) for the FCE/type of FCE performed.
2. Individual's demographic and background information:
 - a. Individual's data: age, sex, height, weight
 - b. Diagnosis
 - c. Occupation, if applicable
 - d. Hand dominance
 - e. Splints, braces or assistive devices worn during the FCE.
3. List and summary of medical records.
4. Summary of information from the individual interview.
5. Summary of results of activities of daily living or psychometric questionnaires with discussion of the significance of the results.
6. Clinical examination findings.
7. Results of the functional tests including test endpoint reached and physiological, biomechanical, and psychophysical results.
8. Discussion of individual's performance level (effort and consistency) and pain behaviors.
9. Summary of functional abilities and limitations

- a. Identification of accommodations to lessen impact of any functional limitations.
10. If job or occupation specific FCE, compare individual's abilities with job and/or occupational demands.
11. Recommendations, if appropriate and requested, may include:
- a. Transitional work recommendations
 - b. Treatment
 - c. If requested, an opinion statement defining the functional limitations as temporary or permanent
 - i. If temporary, functional re-testing may be done at a later date to reassess safe work tolerances, functional limitations, and restrictions
 - ii. If permanent, the results of the FCE should be considered applicable for a range of time up to 6 months. This is dependent on the nature of the injury/illness, and whether any other health condition, injury or other factor changes the individual's health status or lifestyle. In the absence of any substantive change in the individual's health status or lifestyle, a repeat FCE to update the individual's functional status is recommended.

Emerging Trends in Functional Capacity Evaluations

Functional Capacity Evaluations will continue to evolve in response to updates in technology and research. Examiners should stay up to date on trends, legislation, legal precedent, technology and research occurring in the United States and abroad. Functional Capacity Examiners should be aware of current trends which include:

1. Bureau of Labor Statistics Occupational Requirement Survey
 - a. Beginning in 2012 the Bureau of Labor statistics began working with the Social Security Administration to collect information about the occupational requirements for workers in jobs throughout the United States. The Occupational Requirements Surveys "ORS" goal is to collect and publish occupational information that will be used by the Social Security Administration to help make decisions for their disability program. Examiners should monitor of the progress of the ORS as it may change definitions, classifications and terms associated with physical demands, environmental exposure, education/training and cognitive demands.
2. Cognitive Functional Capacity Evaluation
 - a. Cognitive Functional Capacity Evaluations are a fast growing service line for Examiners who receive special training in this specialized evaluation.
 - i. Cognitive functional testing may address four essential and unique components¹⁴¹⁻¹⁴⁷:
 1. An analysis of the essential cognitive demands required of an occupation which include:
 - a. Independent clinical judgment
 - b. Work review and observation
 - c. Work pace and the worker's ability to control pace
 - d. Changes in tasks, location, and work schedule
 - e. Frequency and nature of work related individual interactions

- f. Resources pertaining to cognitive demands (i.e. O*NET, Cognitive Abilities Profiler).
 - 2. An ecologically valid measure of the individual's function and suitability for return to work, with consideration for the individual (intrinsic factors), the environment (extrinsic factors) and the critical cognitive demands of the identified occupation.
 - 3. A valid measure of work-oriented executive functioning, with attention to the individual's approach to the task (i.e. initiation, execution, organization, planning, problem-solving, and task monitoring) and self (i.e. inhibition, impulse control, self-monitoring).
 - 4. Evaluation of insight/awareness through interview, structured observation, questionnaires and collateral information.
- ii. Given issues of complexity, mental stamina/activity tolerance and durability, a range of 6 to 8 hours over 1 to 2 days is recommended when cognitive functional testing is a desired component of the FCE.
- iii. If an FCE is requested pertaining to an individual's cognitive, perceptual-sensory, communicative, behavioral, and psycho-emotional factors, the Functional Capacity Examiner should incorporate standardized assessment of cognitive functioning including but not limited to the following assessments, with test selection determined by contextual factors (i.e. test content, injury severity, etc.):
 - 1. Montreal Cognitive Assessment
 - 2. Mini Mental Status Examination
 - 3. Cognitive Assessment of Minnesota
 - 4. Rivermead Behavioral Memory Test
 - 5. Test of Everyday Attention
 - 6. Multidimensional Task Ability Profiler
 - 7. Rivermead Post-Concussive Symptoms Questionnaire
 - 8. Headache Impact Test
 - 9. Barrow Neurological Fatigue Scale
 - 10. Awareness Questionnaire.

3. Wearable Technology

- a. Wearable technology in therapy clinics and associated with ergonomics is advancing. Examiners should monitor the literature and be aware of applications of wearable technology for use in functional testing. Examples of wearable technology include electrogoniometers, strain gauge sensors, piezoresistive/piezoelectric sensors, accelerometers, and surface EMG.¹⁴⁸

4. Use of Population norms

- a. In cases where an individual self-limits performance throughout the FCE, or performs erratically, some expert Examiners advocate estimating the individual's abilities based on all other objective evidence including but not limited to diagnostic imaging from the individual's medical records, physical examination findings, biomechanical and physiological responses during functional testing, and the use of age-gender based population norms for material handling and other functional activities.^{54,71,76,149-160}

5. Functional Capacity Evaluation Research, Court Precedent and Legislation

- a. Functional Capacity Evaluation research remains an important component of providing a customer with a valid and reliable performance based medical evaluation. Their remains and always will be legal precedent disseminated by the court system in regard to Functional Capacity Evaluations. Federal and state legislation associated with FCE's may change along with modifications in state practice acts, research and legal precedents. Examiners are encouraged to continually monitor research developments, legal precedent disseminated by the court system, and legislation that could alter documentation, testing procedures and a customer's needs when performing FCE's.

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References

1. Guide to Physical Therapist Practice 3.0. 2014; <http://guidetoptpractice.apta.org/>.
2. Association AOT. Occupational therapy practice framework: Domain and process (3rd ed.). *American Journal of Occupational Therapy*. 2014;68(Suppl. 1):S1-S48.
3. International Classification of Functioning, Disability and Health (ICF). <http://www.who.int/classifications/icf/en/>. Accessed 11/17/17.
4. Genovese E, Galper J. *Guide to the Evaluation of Functional Ability*. Chicago: AMA Press; 2009.

5. Gross DP. Are functional capacity evaluations affected by the patient's pain? *Curr Pain Headache Rep.* 2006;10(2):107-113.
6. Hart DL, Isernhagen SJ, Matheson LN. Guidelines for functional capacity evaluation of people with medical conditions. *J Orthop Sports Phys Ther.* 1993;18(6):682-686.
7. Matheson L. The Functional Capacity Evaluation. In: Andersson GBJ, Demeter S, Smith G, eds. *Disability Evaluation.* 2nd ed. Chicago: Mosby 2003.
8. Your residual functional capacity. In: Administration SS, ed. 416.945.
9. Clifton DW, Jr. The functional IME: A linkage of expertise across the disability continuum. *Work.* 2006;26(3):281-285.
10. Duddleston DN, Blackston JW, Bouldin MJ, Brown CA. Disability examinations: a look at the Social Security Disability Income System. *The American journal of the medical sciences.* 2002;324(4):220-226.
11. *AMA Guides to the Evaluation of Work Ability and Return to Work.* second ed. Chicago: AMA; 2011.
12. Ratzon NZ, Amit Y, Friedman S, Zamir S, Rand D. Functional capacity evaluation: does it change the determination of the degree of work disability? *Disability and health journal.* 2015;8(1):80-85.
13. Fore L, Perez Y, Neblett R, Asih S, Mayer TG, Gatchel RJ. Improved functional capacity evaluation performance predicts successful return to work one year after completing a functional restoration rehabilitation program. *PM & R : the journal of injury, function, and rehabilitation.* 2015;7(4):365-375.
14. McKibbin KA. Evidence-based practice. *Bulletin of the Medical Library Association.* 1998;86(3):396-401.
15. Sackett DL, Rosenberg WM, Gray JA, Haynes RB, Richardson WS. Evidence based medicine: what it is and what it isn't. *BMJ (Clinical research ed).* 1996;312(7023):71-72.
16. Bernhardsson S, Larsson ME. Measuring evidence-based practice in physical therapy: translation, adaptation, further development, validation, and reliability test of a questionnaire. *Phys Ther.* 2013;93(6):819-832.
17. *Disability Evaluation Under Social Security*
<https://www.ssa.gov/disability/professionals/bluebook/general-info.htm>. Accessed 8/31/17.
18. Titles I and V of the Americans with Disabilities Act of 1990 (ADA).
<https://www.eeoc.gov/laws/statutes/ada.cfm>. Accessed 8/31/17.
19. ADA Amendments Act of 2008 2008;
<https://www1.eeoc.gov/laws/statutes/adaaa.cfm?renderforprint=1>. Accessed 8/31/17.
20. Uniform Guidelines on Employee Selection Procedures. <http://www.uniformguidelines.com/>. Accessed 8/31/17.
21. Health Information Privacy. <https://www.hhs.gov/hipaa/index.html/>. Accessed 8/31/17.
22. OSHA. <https://www.osha.gov/>. Accessed 8/31/17.
23. NIOSH. *Work Practices Guide for Manual Lifting.* Cincinnati 1981.
24. Gross DP, Battie MC. Construct validity of a kinesiophysical functional capacity evaluation administered within a worker's compensation environment. *J Occup Rehabil.* 2003;13(4):287-295.
25. Legg SJ, Myles WS. Maximum acceptable repetitive lifting workloads for an 8-hour work-day using psychophysical and subjective rating methods. *Ergonomics.* 1981;24(12):907-916.
26. Sparto PJ, Parnianpour M, Reinsel TE, Simon S. The effect of fatigue on multijoint kinematics, coordination, and postural stability during a repetitive lifting test. *J Orthop Sports Phys Ther.* 1997;25(1):3-12.
27. Ayoub MM, Dempsey PG. The psychophysical approach to manual materials handling task design. *Ergonomics.* 1999;42(1):17-31.
28. Dempsey PG. A critical review of biomechanical, epidemiological, physiological and psychophysical criteria for designing manual materials handling tasks. *Ergonomics.* 1998;41(1):73-88.

29. Morgan M, Allison S, Duhon D. Heart rate changes in functional capacity evaluations in a workers' compensation population. *Work*. 2012;42(20):253-257.
30. Lakke SE, Soer R, Krijnen WP, van der Schans CP, Reneman MF, Geertzen JH. Influence of Physical Therapists' Kinesiophobic Beliefs on Lifting Capacity in Healthy Adults. *Phys Ther*.95(9):1224-1233.
31. Crepeau E. In: Crepeau E, Cohn E, Boyt Schell B, eds. *Willard and Spackman's Occupational Therapy*. 10th ed. Philadelphia: Lippincott Williams & Wilkins; 2003:189-198.
32. Americans with Disabilities Act. In: Labor UDo, ed1990.
33. Amendment of Americans With Disabilities Act Title III Regulations to Implement ADA Amendments Act of 2008. In: Justice Do, ed. Vol Section 2 of Public Law 110-325, September 25, 20082016.
34. Uniform Guidelines on Employee Selection Procedure. In: Labor Do, ed. USAugust 25, 1978.
35. Health Insurance Portability And Accountability Act of 1996. In: Congress t, ed. Vol Public Law 104-911996.
36. *Daubert v Merrell Dow Pharmaceuticals, Inc*, (1993).
37. Dominick BK. Daubert & ADA Decisions: Will Functional Capacity Evaluations Hold Up In Court? *Journal of Forensic Vocational Analysis*. 2004;7:119-126.
38. *Frye v US*, (DC Cir 1923).
39. O*NET OnLine-Physical Abilities.
<https://www.onetonline.org/find/descriptor/browse/Abilities/1.A.3/> Accessed 10/24/17.
40. Selected Characteristics of Occupations as Defined in the Revised Dictionary of Occupational Titles. In: DOL, ed. Vol PB94-116282: National Technical Information Service; 1993.
41. Wear S. *Informed consent; patient autonomy and clinician beneficence within healthcare*. 2nd ed. Washington, DC: Georgetown University Press; 1998
42. *ACSM's Guidelines for Exercise Testing and Prescription*. Tenth ed: Wolters Kluwer; 2016.
43. Fletcher GF, Ades PA, Kligfield P, et al. Exercise standards for testing and training: a scientific statement from the American Heart Association. *Circulation*. 2013;128(8):873-934.
44. Sharman JE, LaGerche A. Exercise blood pressure: clinical relevance and correct measurement. *Journal of human hypertension*. 2015;29(6):351-358.
45. Administration USDOTFMCS. What is the effect on driver certification based on FMCSA hypertension stages? In:2014.
46. Soer R, van der Schans CP, Geertzen JH, et al. Normative values for a functional capacity evaluation. *Arch Phys Med Rehabil*. 2009;90(10):1785-1794.
47. *Exercise During Pregnancy-frequently asked questions: FAQ119*. The American College of Obstetricians and Gynecologists.
48. MacDonald LA, Waters TR, Napolitano PG, et al. Clinical guidelines for occupational lifting in pregnancy: evidence summary and provisional recommendations. *American journal of obstetrics and gynecology*. 2013;209(2):80-88.
49. Waters TR, MacDonald LA, Hudock SD, Goddard DE. Provisional recommended weight limits for manual lifting during pregnancy. *Hum Factors*. 2014;56(1):203-214.
50. Portney L, Watkins M. *Foundations of clinical research: Applications to practice*. Upper Saddle River, NJ: Pearson/Prentice Hall; 2009.
51. Branton EN, Arnold KM, Appelt SR, Hodges MM, Battie MC, Gross DP. A short-form functional capacity evaluation predicts time to recovery but not sustained return-to-work. *J Occup Rehabil*. 2010;20(3):387-393.
52. Gross DP, Battie MC, Asante A. Development and validation of a short-form functional capacity evaluation for use in claimants with low back disorders. *J Occup Rehabil*. 2006;16(1):53-62.
53. Gross DP, Battie MC, Asante AK. Evaluation of a short-form functional capacity evaluation: less may be best. *J Occup Rehabil*. 2007;17(3):422-435.
54. Keefe FJ, Crisson JE, Maltbie A, Bradley L, Gil KM. Illness behavior as a predictor of pain and overt behavior patterns in chronic low back pain patients. *Journal of psychosomatic research*. 1986;30(5):543-551.

55. Keefe FJ, Hill RW. An objective approach to quantifying pain behavior and gait patterns in low back pain patients. *Pain*. 1985;21(2):153-161.
56. Keefe FJ, Wilkins RH, Cook WA. Direct observation of pain behavior in low back pain patients during physical examination. *Pain*. 1984;20(1):59-68.
57. Ohlund C, Eek C, Palmbald S, Areskoug B, Nachemson A. Quantified pain drawing in subacute low back pain. Validation in a nonselected outpatient industrial sample. *Spine (Phila Pa 1976)*. 1996;21(9):1021-1030; discussion 1031.
58. Ohlund C, Lindstrom I, Areskoug B, Eek C, Peterson LE, Nachemson A. Pain behavior in industrial subacute low back pain. Part I. Reliability: concurrent and predictive validity of pain behavior assessments. *Pain*. 1994;58(2):201-209.
59. Dirks JF, Wunder J, Kinsman R, McElhinny J, Jones NF. A Pain Rating Scale and a Pain Behavior Checklist for clinical use: development, norms, and the consistency score. *Psychotherapy and psychosomatics*. 1993;59(1):41-49.
60. Astrand PO, Rodahl K, Dahl H, Amme S. *Textbook of Work Physiology:-Physiological Bases of Exercise*. 4th ed. Champaign: Human Kinetics; 2003.
61. Becker TJ. Functional Capacity Evaluations: The Work Physiology Component for Predicting Full-Time Work. *Directions in Rehabilitation Counseling*. 18:177-186.
62. Becker TJ MJ, Stamper EE. Applications of Work Physiology Science to Capacity Test Prediction of Full-Time Work-Eight Hour Work Day. *The Rehabilitation Professional*. 15(4):45-56.
63. Jiang BC, Smith JL, Ayoub MM. Psychophysical modeling for combined manual materials-handling activities. *Ergonomics*. 1986;29(10):1173-1190.
64. Konz S. NIOSH lifting guidelines. *Am Ind Hyg Assoc J*. 1982;43(12):931-933.
65. *Dictionary of Occupational Titles*. Vol II. Fourth ed: US Department of Labor; 1991.
66. *The Revised Handbook for Analyzing Jobs*. Washington, DC: US Department of Labor; 1991.
67. Borg G. *Borg's Perceived Exertion and Pain Scales*. 1998.
68. Isernhagen SJ, Hart DL, Matheson LM. Reliability of independent observer judgments of level of lift effort in a kinesiophysical Functional Capacity Evaluation. *Work*. 1999;12(2):145-150.
69. Reneman MF, Fokkens AS, Dijkstra PU, Geertzen JH, Groothoff JW. Testing lifting capacity: validity of determining effort level by means of observation. *Spine*. 2005;30(2):E40-46.
70. Trippolini MA, Dijkstra PU, Jansen B, Oesch P, Geertzen JH, Reneman MF. Reliability of clinician rated physical effort determination during functional capacity evaluation in patients with chronic musculoskeletal pain. *J Occup Rehabil*. 2014;24(2):361-369.
71. Feuerstein M, Beattie P. Biobehavioral factors affecting pain and disability in low back pain: mechanisms and assessment. *Phys Ther*. 1995;75(4):267-280.
72. Oesch P, Meyer K, Jansen B, Mowinckel P, Bachmann S, Hagen KB. What is the role of "nonorganic somatic components" in functional capacity evaluations in patients with chronic nonspecific low back pain undergoing fitness for work evaluation? *Spine (Phila Pa 1976)*. 2012;37(4):E243-250.
73. Carriere JS, Thibault P, Adams H, Milioto M, Ditto B, Sullivan MJL. Expectancies mediate the relationship between perceived injustice and return to work following whiplash injury: A 1-year prospective study. *Eur J Pain*. 2017;21(7):1234-1242.
74. Monden KR, Trost Z, Scott W, Bogart KR, Driver S. The unfairness of it all: Exploring the role of injustice appraisals in rehabilitation outcomes. *Rehabil Psychol*. 2016;61(1):44-53.
75. Sullivan MJ, Adams H, Horan S, Maher D, Boland D, Gross R. The role of perceived injustice in the experience of chronic pain and disability: scale development and validation. *J Occup Rehabil*. 2008;18(3):249-261.
76. Fritz JM, George SZ. Identifying psychosocial variables in patients with acute work-related low back pain: the importance of fear-avoidance beliefs. *Phys Ther*. 2002;82(10):973-983.
77. Gatchel RJ, Mayer TG, Theodore BR. The pain disability questionnaire: relationship to one-year functional and psychosocial rehabilitation outcomes. *J Occup Rehabil*. 2006;16(1):75-94.

78. Anagnostis C, Gatchel RJ, Mayer TG. The pain disability questionnaire: a new psychometrically sound measure for chronic musculoskeletal disorders. *Spine (Phila Pa 1976)*. 2004;29(20):2290-2302; discussion 2303.
79. Soer R, Koke AJ, Speijer BL, et al. Reference Values of the Pain Disability Index in Patients With Painful Musculoskeletal and Spinal Disorders: A Cross-national Study. *Spine (Phila Pa 1976)*. 2015;40(9):E545-551.
80. Soer R, Koke AJ, Vroomen PC, et al. Extensive validation of the pain disability index in 3 groups of patients with musculoskeletal pain. *Spine (Phila Pa 1976)*. 2013;38(9):E562-568.
81. Bianchini KJ, Aguerrevere LE, Guise BJ, et al. Accuracy of the Modified Somatic Perception Questionnaire and Pain Disability Index in the detection of malingered pain-related disability in chronic pain. *The Clinical neuropsychologist*. 2014;28(8):1376-1394.
82. Crighton AH, Wygant DB, Applegate KC, Umlauf RL, Granacher RP. Can brief measures effectively screen for pain and somatic malingering? Examination of the Modified Somatic Perception Questionnaire and Pain Disability Index. *Spine J*. 2014;14(9):2042-2050.
83. Greve KW, Bianchini KJ, Brewer ST. The assessment of performance and self-report validity in persons claiming pain-related disability. *The Clinical neuropsychologist*. 2013;27(1):108-137.
84. Crook J, Milner R, Schultz IZ, Stringer B. Determinants of occupational disability following a low back injury: a critical review of the literature. *J Occup Rehabil*. 2002;12(4):277-295.
85. Fishbain DA, Cole B, Cutler RB, Lewis J, Rosomoff HL, Rosomoff RS. A structured evidence-based review on the meaning of nonorganic physical signs: Waddell signs. *Pain Med*. 2003;4(2):141-181.
86. Fishbain DA, Cutler RB, Rosomoff HL, Rosomoff RS. Is there a relationship between nonorganic physical findings (Waddell signs) and secondary gain/malingering? *Clin J Pain*. 2004;20(6):399-408.
87. Giordano PC, Alexandre NM, Rodrigues RC, Coluci MZ. The Pain Disability Questionnaire: a reliability and validity study. *Revista latino-americana de enfermagem*. 2012;20(1):76-83.
88. Kaplan GM, Wurtele SK, Gillis D. Maximal effort during functional capacity evaluations: an examination of psychological factors. *Arch Phys Med Rehabil*. 1996;77(2):161-164.
89. Neblett R, Mayer TG, Hartzell MM, Williams MJ, Gatchel RJ. The Fear-avoidance Components Scale (FACS): Development and Psychometric Evaluation of a New Measure of Pain-related Fear Avoidance. *Pain Pract*. 2016;16(4):435-450.
90. Aissaoui Y, Zeggwagh AA, Zekraoui A, Abidi K, Abouqal R. Validation of a behavioral pain scale in critically ill, sedated, and mechanically ventilated patients. *Anesth Analg*. 2005;101(5):1470-1476.
91. Coghill RC, Talbot JD, Evans AC, et al. Distributed processing of pain and vibration by the human brain. *J Neurosci*. 1994;14(7):4095-4108.
92. Moltner A, Holzl R, Strian F. Heart rate changes as an autonomic component of the pain response. *Pain*. 1990;43(1):81-89.
93. Jensen IB, Bradley LA, Linton SJ. Validation of an observation method of pain assessment in non-chronic back pain. *Pain*. 1989;39(3):267-274.
94. Prkachin KM, Craig K. Expressing pain: The communication and interpretation of facial pain signals. *Journal of Nonverbal Behavior*. 1995;19(4):191-205.
95. Briggs M, Closs JS. A descriptive study of the use of visual analogue scales and verbal rating scales for the assessment of postoperative pain in orthopedic patients. *Journal of pain and symptom management*. 1999;18(6):438-446.
96. Gloth FM, 3rd, Scheve AA, Stober CV, Chow S, Prosser J. The Functional Pain Scale: reliability, validity, and responsiveness in an elderly population. *Journal of the American Medical Directors Association*. 2001;2(3):110-114.
97. Gross DP, Battie MC, Asante AK. The Patient-Specific Functional Scale: validity in workers' compensation claimants. *Arch Phys Med Rehabil*. 2008;89(7):1294-1299.
98. American College of Sports Medicine. <http://www.acsm.org/>. Accessed 10/24/17.

99. Physical Activity Recommendations for Adults.
<https://wonder.cdc.gov/wonder/prevguid/p0000391/P0000391.asp#head0070000000000000>. Accessed 11/17/17.
100. Sartor F, Vernillo G, de Morree HM, et al. Estimation of maximal oxygen uptake via submaximal exercise testing in sports, clinical, and home settings. *Sports medicine (Auckland, NZ)*. 2013;43(9):865-873.
101. Bains K, Kaur B, Mann SK. Measurement of energy cost of selected household and farm activities performed by rural women. *Food and nutrition bulletin*. 2002;23(3):274-279.
102. Jette M, Sidney K, Blumchen G. Metabolic equivalents (METs) in exercise testing, exercise prescription, and evaluation of functional capacity. *Clinical cardiology*. 1990;13(8):555-565.
103. Gunn SM, Brooks AG, Withers RT, et al. Determining energy expenditure during some household and garden tasks. *Medicine and science in sports and exercise*. 2002;34(5):895-902.
104. Mayer TG, Barnes D, Kishino ND, et al. Progressive isoinertial lifting evaluation. I. A standardized protocol and normative database. *Spine (Phila Pa 1976)*. 1988;13(9):993-997.
105. Matheson LN, Mooney V, Grant JE, et al. A test to measure lift capacity of physically impaired adults. Part 1--Development and reliability testing. *Spine*. 1995;20(19):2119-2129.
106. Morgan MV, Allison S, Duhon D. Heart rate changes in functional capacity evaluations in a workers' compensation population. *Work*. 42(2):253-257.
107. Sindhu BS, Shechtman O, Veazie PJ. Identifying sincerity of effort based on the combined predictive ability of multiple grip strength tests. *J Hand Ther*. 2012;25(3):308-318; quiz 319.
108. Robinson ME, Geisser ME, Hanson CS, O'Connor PD. Detecting submaximal efforts in grip strength testing with the coefficient of variation. *J Occup Rehabil*. 1993;3(1):45-50.
109. Wachter NJ, Mentzel M, Hutz R, Gulke J. Reliability of the grip strength coefficient of variation for detecting sincerity in normal and blocked median nerve in healthy adults. *Hand Surg Rehabil*. 2017;36(2):90-96.
110. Ashford RF, Nagelburg S, Adkins R. Sensitivity of the Jamar Dynamometer in detecting submaximal grip effort. *J Hand Surg [Am]*. 1996;21(3):402-405.
111. De Smet L, Londers J. Repeated grip strength at one month interval and detection of voluntary submaximal effort. *Acta Orthop Belg*. 2003;69(2):142-144.
112. Dvir Z. Coefficient of variation in maximal and feigned static and dynamic grip efforts. *Am J Phys Med Rehabil*. 1999;78(3):216-221.
113. Fairfax AH, Balnave R, Adams RD. Variability of grip strength during isometric contraction. *Ergonomics*. 1995;38(9):1819-1830.
114. Fishbain DA, Cutler R, Rosomoff HL, Rosomoff RS. Chronic pain disability exaggeration/malingering and submaximal effort research. *Clin J Pain*. 1999;15(4):244-274.
115. Goldman S, Cahalan TD, An KN. The injured upper extremity and the JAMAR five-handle position grip test. *Am J Phys Med Rehabil*. 1991;70(6):306-308.
116. Gutierrez Z, Shechtman O. Effectiveness of the five-handle position grip strength test in detecting sincerity of effort in men and women. *Am J Phys Med Rehabil*. 2003;82(11):847-855.
117. Hamilton A, Balnave R, Adams R. Grip strength testing reliability. *J Hand Ther*. 1994;7(3):163-170.
118. Hoffmaster E, Lech R, Niebuhr BR. Consistency of sincere and feigned grip exertions with repeated testing. *J Occup Med*. 1993;35(8):788-794.
119. Lechner DE, Bradbury SF, Bradley LA. Detecting sincerity of effort: a summary of methods and approaches. *Phys Ther*. 1998;78(8):867-888.
120. Niebuhr BR, Marion R. Detecting sincerity of effort when measuring grip strength. *Am J Phys Med*. 1987;66(1):16-24.
121. Niebuhr BR, Marion R. Voluntary control of submaximal grip strength. *Am J Phys Med Rehabil*. 1990;69(2):96-101.
122. Shechtman O. The coefficient of variation as a measure of sincerity of effort of grip strength, Part II: sensitivity and specificity. *J Hand Ther*. 2001;14(3):188-194.

123. Shechtman O. The coefficient of variation as a measure of sincerity of effort of grip strength, Part I: the statistical principle. *J Hand Ther.* 2001;14(3):180-187.
124. Shechtman O, Anton SD, Kanasky WF, Jr., Robinson ME. The use of the coefficient of variation in detecting sincerity of effort: a meta-analysis. *Work.* 2006;26(4):335-341.
125. Shechtman O, Gutierrez Z, Kokendofer E. Analysis of the statistical methods used to detect submaximal effort with the five-rung grip strength test. *J Hand Ther.* 2005;18(1):10-18.
126. Shechtman O, Taylor C. How do therapists administer the rapid exchange grip test? A survey. *J Hand Ther.* 2002;15(1):53-61.
127. Shechtman O, Taylor C. The use of the rapid exchange grip test in detecting sincerity of effort, Part II: validity of the test. *J Hand Ther.* 2000;13(3):203-210.
128. Taylor C, Shechtman O. The use of the rapid exchange grip test in detecting sincerity of effort, Part I: administration of the test. *J Hand Ther.* 2000;13(3):195-202.
129. Tredgett M, Pimble LJ, Davis TR. The detection of feigned hand weakness using the five position grip strength test. *J Hand Surg [Br].* 1999;24(4):426-428.
130. Tredgett MW, Davis TR. Rapid repeat testing of grip strength for detection of faked hand weakness. *J Hand Surg [Br].* 2000;25(4):372-375.
131. Westbrook AP, Tredgett MW, Davis TR, Oni JA. The rapid exchange grip strength test and the detection of submaximal grip effort. *J Hand Surg [Am].* 2002;27(2):329-333.
132. Townsend R, Schapmire DW, St James J, Feeler L. Isometric strength assessment, Part II: Static testing does not accurately classify validity of effort. *Work.* 2010;37(4):387-394.
133. Courbalay A, Deroche T, Descarreaux M, Prigent E, O'Shaughnessy J, Amorim MA. Facial Expression Overrides Lumbopelvic Kinematics for Clinical Judgements about Low Back Pain Intensity. *Pain Res Manag.* 2016;2016:7134825.
134. Prkachin KM, Schultz I, Berkowitz J, Hughes E, Hunt D. Assessing pain behaviour of low-back pain patients in real time: concurrent validity and examiner sensitivity. *Behaviour research and therapy.* 2002;40(5):595-607.
135. Prkachin KM, Solomon PE. The structure, reliability and validity of pain expression: evidence from patients with shoulder pain. *Pain.* 2008;139(2):267-274.
136. Schafer G, Prkachin KM, Kaseweter KA, Williams AC. Health care providers' judgments in chronic pain: the influence of gender and trustworthiness. *Pain.* 2016;157(8):1618-1625.
137. Craig KD, Hyde SA, Patrick CJ. Genuine, suppressed and faked facial behavior during exacerbation of chronic low back pain. *Pain.* 1991;46(2):161-171.
138. De Ruddere L, Goubert L, Stevens M, de CWAC, Crombez G. Discounting pain in the absence of medical evidence is explained by negative evaluation of the patient. *Pain.* 2013;154(5):669-676.
139. Feeler L, St James JD, Schapmire DW. Isometric strength assessment, part I: static testing does not accurately predict dynamic lifting capacity. *Work.* 2010;37(3):301-308.
140. Hansson TH, Bigos SJ, Wortley MK, Spengler DM. The load on the lumbar spine during isometric strength testing. *Spine (Phila Pa 1976).* 1984;9(7):720-724.
141. Baum CM, Connor LT, Morrison T, Hahn M, Dromerick AW, Edwards DF. Reliability, validity, and clinical utility of the Executive Function Performance Test: a measure of executive function in a sample of people with stroke. *Am J Occup Ther.* 2008;62(4):446-455.
142. Crosson B, P. BP, Velozo CA, et al. Awareness and compensation in postacute head injury rehabilitation. *Journal of Head Trauma Rehabilitation.* 1989;4(3):46-54.
143. Chappell I, Higham J, McLean AM. An occupational therapy work skills assessment for individuals with head injury. *Canadian journal of occupational therapy.* 2003;70(3):163-169.
144. Hartman-Maeir A, Katz N, Baum CM. Cognitive Functional Evaluation (CFE) Process for Individuals with Suspected Cognitive Disabilities. *Occupational therapy in health care.* 2009;23(1):1-23.
145. Lezak MD. THE PROBLEM OF ASSESSING EXECUTIVE FUNCTIONS. *International Journal of Psychology.* 1982;17(1-4):281-297.
146. Matheson L. Executive dysfunction, severity of traumatic brain injury, and IQ in workers with disabilities. *Work.* 2010;36(4):413-422.

147. Matheson L, Dodson M, Wolf T. Executive dysfunction and work: Tying it all together. *Work SIS Quarterly*. 2011;25(1):1-4.
148. Papi E, Koh WS, McGregor AH. Wearable technology for spine movement assessment: A systematic review. *Journal of biomechanics*. 2017;64:186-197.
149. Pincus T, Vogel S, Burton AK, Santos R, Field AP. Fear avoidance and prognosis in back pain: a systematic review and synthesis of current evidence. *Arthritis and rheumatism*. 2006;54(12):3999-4010.
150. Vlaeyen JW, Linton SJ. Fear-avoidance and its consequences in chronic musculoskeletal pain: a state of the art. *Pain*. 2000;85(3):317-332.
151. Vlaeyen JW, Kole-Snijders AM, Boeren RG, van Eek H. Fear of movement/(re)injury in chronic low back pain and its relation to behavioral performance. *Pain*. 1995;62(3):363-372.
152. Vlaeyen JW, Linton SJ. Fear-avoidance model of chronic musculoskeletal pain: 12 years on. *Pain*. 2012;153(6):1144-1147.
153. Geisser ME, Robinson ME, Miller QL, Bade SM. Psychosocial factors and functional capacity evaluation among persons with chronic pain. *J Occup Rehabil*. 2003;13(4):259-276.
154. Smeets RJ, van Geel AC, Kester AD, Knottnerus JA. Physical capacity tasks in chronic low back pain: what is the contributing role of cardiovascular capacity, pain and psychological factors? *Disabil Rehabil*. 2007;29(7):577-586.
155. Reneman MF, Jorritsma W, Dijkstra SJ, Dijkstra PU. Relationship between kinesiophobia and performance in a functional capacity evaluation. *J Occup Rehabil*. 2003;13(4):277-285.
156. Reneman MF, Geertzen JH, Groothoff JW, Brouwer S. General and specific self-efficacy reports of patients with chronic low back pain: are they related to performances in a functional capacity evaluation? *J Occup Rehabil*. 2008;18(2):183-189.
157. Asante AK, Brintnell ES, Gross DP. Functional Self-Efficacy Beliefs Influence Functional Capacity Evaluation. *J Occup Rehabil*. 2007.
158. Alschuler KN, Theisen-Goodvich ME, Haig AJ, Geisser ME. A comparison of the relationship between depression, perceived disability, and physical performance in persons with chronic pain. *Eur J Pain*. 2008;12(6):757-764.
159. Lacker JM, Carosella AM, Feuerstein M. Pain expectancies, pain, and functional self-efficacy expectancies as determinants of disability in patients with chronic low back disorders. *Journal of consulting and clinical psychology*. 1996;64(1):212-220.
160. Nicholas MK, Linton SJ, Watson PJ, Main CJ. Early Identification and Management of Psychological Risk Factors ("Yellow Flags") in Patients With Low Back Pain: A Reappraisal. *Phys Ther*. 2011;91(5):737-753.

Reference Tables

Table 1		Physical Demand Reference Data ^{1,2,3,4}
Sedentary (1.5-2.1 METS)		Exerting up to 10 pounds force occasionally or a negligible amount of force frequently. Sitting is required frequently to constantly and the work may involve brief periods of standing or walking occasionally.
Light (2.2-3.5 METS)		Exerting up to 20 pounds of force occasionally, or up to 10 pounds of force frequently, or a negligible amount of force constantly to move objects. Standing or walking are usually required frequently to constantly and the work may involve brief periods of sitting occasionally. In a few occupations, sitting may be required frequently to constantly while operating arm or leg controls. Light work may also be production pace work requiring negligible force.
Medium (3.6-6.3 METS)		Exerting 21-50 pounds of force occasionally, or 11-25 pounds of force frequently, or greater than negligible up to 10 pounds of force constantly to move objects. Standing or walking are usually required frequently to constantly and the work may involve brief periods of sitting occasionally.
Heavy (6.3-7.5 METS)		Exerting 51-100 pounds of force occasionally, or 26 to 50 pounds of force frequently, or 11 to 20 pounds of force constantly to move objects. Standing or walking are usually required frequently to constantly and the work may involve brief periods of sitting occasionally.
Very Heavy (> 7.5 METS)		Exerting in excess of 100 pounds of force occasionally, or in excess of 50 pounds of force frequently, or in excess of 20 pounds of force constantly to move objects. Standing or walking are usually required frequently to constantly and the work may involve brief periods of sitting occasionally.
(N) Not Present		Activity or condition does not exist.
(O) Occasional		Activity or condition exists up to 1/3 of the time; up to 2 ½ hours day; 1-12 repetitions per hour; or 1-100 repetitions per day.
(F) Frequent		Activity or condition exists more than 1/3 up to 2/3 of the time; more than 2 ½ hours day up to 5 ¼ hours per day; 13-62 repetitions per hour; or 101-500 repetitions per day.
(C) Constant		Activity or condition exists more than 2/3 of the time; more than 5 ¼ hours per day; 63 or more repetitions per hour; or more than 500 repetitions per day.
Non-repetitive		Activity is performed less than 30 times per hour or less than 240 times per day. Use of keyboard less than 4 hours per day.
Sitting		Remaining in a seated position.
Standing		Remaining on one's feet in an upright position at a workstation without moving about.
Walking		Moving about on foot.
Lifting		Raising or lowering an object from one level to another (includes upward pulling).
Carrying		Transporting an object, usually holding it in the hands or arms or on the shoulder.
Pushing		Exerting force upon an object so that the object moves away from the force (includes slapping, striking, kicking, and treadle actions).
Pulling		Exerting force upon an object so that the object moves toward the force (includes jerking).
CL	Climbing	Ascending or descending ladders, stairs, scaffolding, ramps, poles, and the like, using feet and legs or hands and arms. Body agility is emphasized.
BA	Balancing	Maintaining body equilibrium to prevent falling when walking, standing, crouching, or running on narrow, slippery, or erratically moving surfaces; or maintaining body equilibrium when performing gymnastic feats.
ST	Stooping	Bending body downward and forward by bending spine at the waist, requiring full use of the lower extremities and back muscles.
KN	Kneeling	Bending legs at knees to come to rest on knee or knees.
CR	Crouching	Bending body downward and forward by bending legs and spine.
CW	Crawling	Moving about on hands and knees or hands and feet.
RE	Reaching	Extending hand(s) and arm(s) in any direction.
HA	Handling	Seizing, holding, grasping, turning, or otherwise working with hand or hands. Fingers are involved only to the extent that they are an extension of the hand, such as to turn a switch or shift automobile gears.
FI	Fingering	Picking, pinching, or otherwise working primarily with fingers rather than with the whole hand or arm as in handling.

1. The Dictionary of Occupational Titles, 4th edition. U.S. Department of Labor. 1991.
2. Selected Characteristics of Occupations Defined in the Revised Dictionary of Occupational Titles. U.S. Department of Labor. 1993.
3. Skilltran. Job Browser Pro. www.skilltran.com
4. Disability Evaluation. 2nd edition. American Medical Association. Mosby. 2003.

Table 2	Physical Demands Reference Data Supplement¹																	
Strength Level	Sedentary			Light			Medium			Heavy			Very Heavy			Total		
% of all Occupations	11%			49.6%			29.6%			9.1%			0.7%			100%		
# of all Occupations	1405			6326			3773			1165			92			12761		
Physical Demand	O	F	C	O	F	C	O	F	C	O	F	C	O	F	C	O	F	C
Climbing	<1	0	0	7	2	<1	2	4	<1	21	9	0	33	22	1	10	3	4
Total %	1%			10%			7%			31%			56%			17%		
Balancing	<1	0	0	3	<1	<1	8	3	<1	13	5	<1	21	21	2	5	2	<1
Total%	1%			5%			12%			19%			44%			8%		
Stooping	3	0	0	19	5	<1	36	19	<1	35	35	<1	26	51	2	24	11	<1
Total%	3%			25%			55%			71%			79%			36%		
Kneeling	<1	0	0	31	1	0	18	6	0	20	12	0	22	36	1	11	4	<1
Total%	1%			32%			24%			32%			59%			16%		
Crouching	2	<1	0	1	2	0	25	10	<1	28	20	<1	23	43	1	16	6	<1
Total%	3%			3%			36%			49%			67%			23%		
Crawling	<1	<1	0	1	<1	0	4	<1	0	6	1	0	18	13	0	3	<1	<1
Total%	2%			2%			5%			7%			31%			5%		
Reaching	23	63	11	9	78	12	2	89	9	<1	90	9	1	86	12	7	81	11
Total%	97%			99%			100%			100%			99%			99%		
Handling	22	64	12	8	79	12	2	89	9	<1	90	9	2	83	14	7	81	11
Total%	98%			99%			100%			100%			99%			99%		
Fingering	32	49	9	28	52	6	28	51	2	31	43	2	25	42	3	29	51	5
Total%	90%			86%			81%			76%			70%			85%		

1. Skilltran. Job Browser Pro & Occubrowse. www.skilltran.com

Glossary

Activity. The execution of a task or action by an individual.

Activity limitation. Difficulties an individual may have in executing activities. It may also reflect an activity that an individual cannot perform.

Activity restriction. An activity an individual should not do. This is different than an activity limitation, which is an activity an individual is unable to perform.

Adverse impact. A substantially different rate of selection in hiring, promotion, or other employment decision which works to the disadvantage of members of a race, color, religion, sex, ethnic group, age group, or disability.

Aptitudes. Capacities or abilities required of an individual in order to facilitate the learning of some task or job duty. There are 5 levels of aptitude requirements of jobs. There are 11 aptitudes used by the United States Employment Service for job analysis: 1) General Learning Ability; 2) Verbal Aptitude; 3) Numerical Aptitude; 4) Spatial Aptitude; 5) Form Perception; 6) Clerical Perception; 7) Motor Coordination; 8) Finger Dexterity; 9) Manual Dexterity; 10) Eye-Hand-Foot Coordination; 11) Color Discrimination.

Atmospheric conditions. Exposure to conditions such as fumes, noxious odors, dusts, mists, gases, and poor ventilation that affect the respiratory system, eyes, or the skin.

Balancing. Maintaining body equilibrium to prevent falling when walking, standing, crouching, or running on narrow, slippery, or erratically moving surfaces; or maintaining body equilibrium when performing gymnastic feats.

Behavioral. Pertaining to reactions made in response to social stimuli.

Biomechanical limitation. Termination of a particular functional test by an Examiner for safety purposes based on established observational criteria including but not limited to muscle recruitment, body mechanics, base of support, posture, and control and safety.

Capacity. The highest probable level of functioning of an individual in a given domain at a given moment.

Carrying. Transporting an object, usually holding it in the hands or arms or on the shoulder.

Catastrophizing. To imagine the worst possible outcome of an action or event: to think about a situation or event as being catastrophe or having a potentially catastrophic outcome.

Climbing. Ascending or descending ladders, stairs, scaffolding, ramps, poles, and the like, using feet and legs or hands and arms. Body agility is emphasized.

Cognitive Functional Capacity Evaluation (Cog FCE). An FCE with additional evaluation criteria pertaining to cognitive, perceptual/sensory, communicative, behavioral, and psycho-

emotional factors associated with a broad range of diagnoses, including but not limited to acquired or traumatic brain injury, cerebral vascular accident, and mental health diagnoses.

Color vision. Ability to identify and distinguish colors.

Compensation. Correction of an organic defect or loss by [hypertrophy](#) or by increased functioning of another organ or unimpaired parts of the same organ.

Comprehensive Pain Behavior Assessment. An assessment during an FCE to determine if an individual's self-reported symptoms and perceived limitations are consistent with objective medical evidence.

Communicative. Tending to [communicate](#): talkative.

Constant activity. The activity or condition exists more than 2/3 of the time, or more than 5 ¼ hours in an 8 hour work day, or more than 62 repetitions per hour, or more than 500 repetitions in an 8 hour work day.

Continuous activity. Remaining in a posture or performing an activity for a specified amount of time without interruption to change to a different posture.

Content validity. Demonstrated by data showing that the content of a selection procedure is representative of important aspects of performance on the job.

Construct validity. Demonstrated by data showing that the selection procedure measures the degree to which candidates have identifiable characteristics which have been determined to be important for successful job performance.

Criterion-related validity. Demonstrated by empirical data showing that the selection procedure is predictive of or significantly correlated with important elements of work behavior.

Crawling. Moving about on hands and knees or hands and feet.

Crouching. Bending body downward and forward by bending legs and spine. Same as Squatting.

Depression. Condition of general emotional dejection and withdrawal; sadness greater and more prolonged than that warranted by any objective reason.

Depth perception. Three dimensional vision. Ability to judge distances and spatial relationships so as to see objects where and as they actually are.

Diaphoresis. Profuse perspiration artificially induced.

Disability. An umbrella term for impairments, activity limitations and participation restrictions. It denotes the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors).

Distress. Great pain, anxiety, or sorrow; acute physical or mental suffering; affliction; trouble.

Effort. The conscious exertion of physical and/or mental power to participate in an activity.

Environmental conditions. The surroundings in which a job is performed. There are 14 environmental conditions: 1) Exposure to weather; 2) Extreme cold; 3) Extreme heat; 4) Wet/and or humid; 5) Noise intensity level; 6) Vibration; 7) Atmospheric conditions; 8) Proximity to moving mechanical parts; 9) Exposure to electrical shock; 10) Working in high exposed places; 11) Exposure to radiation; 12) Working with explosives; 13) Exposure to toxic or caustic chemicals; 14) Other environmental conditions.

Environmental factors. Environmental factors make up the physical, social and attitudinal environment in which people live and conduct their lives.

Essential job function. The basic duties than an employee must be able to perform, with or without reasonable accommodation.

Evaluation. A dynamic process in which the physical therapist and/or occupational therapist makes clinical judgments based on data gathered during the examination.

Examination. A comprehensive screening and specific testing process leading to diagnostic classification or, as appropriate, to a referral to another practitioner. The examination has three components: the patient/client history; the systems review; and tests and measures.

Executive Functioning. A set of processes that all have to do with managing oneself and one's resources in order to achieve a goal. It is an umbrella term for the neurologically-based skills involving mental control and self-regulation.

Exertional limitations. Functional limitations caused by an individual's impairment(s) and related symptoms such as pain that affect an individual's ability to meet the strength demands of jobs (sitting, standing, walking, lifting, carrying, pushing, and pulling).

Exposure to toxic or caustic chemicals. Exposure to possible bodily injury from toxic or caustic chemicals.

Exposure to electrical shock. Exposure to possible bodily injury from electrical shock.

Exposure to radiation. Exposure to possible bodily injury from radiation.

Exposure to weather. Exposure to outside atmospheric conditions.

Extreme cold. Exposure to non-weather-related cold temperatures.

Extreme heat. Exposure to non-weather-related hot temperatures.

Far acuity. Clarity of vision at 20 feet or more.

Feeling. Perceiving attributes of objects, such as size, shape, temperature, or texture, by touching with skin, particularly that of fingertips.

Field of vision. Observing an area that can be seen up and down or to right or left while eyes are fixed on a given point.

Fingering. Picking, pinching, or otherwise working primarily with fingers rather than with the whole hand or arm as in handling.

Frequent activity. The activity or condition exists more than 1/3 and up to 2/3 of the time, or more than 2 ½ hours up to 5 ¼ hours in an 8 hour work day, or more than 13 and up to 62 repetitions per hour, or more than 100 and up to 500 repetitions in an 8 hour work day.

Functional ability. The ability to safely participate in work and/or other major life activities. Functional abilities are determined by an Examiner based on the results of an FCE.

Functional capacity evaluation (FCE). A comprehensive performance-based medical assessment of an individual's physical and/or cognitive abilities to safely participate in work and other major life activities. FCEs are designed, administered, and interpreted by Examiners.

Functional Capacity Examiner (Examiner). A physical therapist or occupational therapist licensed in the jurisdiction in which the services are performed, who is able to demonstrate evidence of education, training, and competencies specific to the design, administration, and interpretation of FCEs.

Functional impairment. The loss of functional ability to safely perform occupational and/or job specific activities. This term is sometimes but not always associated with the severity of anatomic/physiologic impairment obtained from an impairment evaluation. The severity of an individual's functional impairment is determined by an Examiner based on the results of an FCE.

Functional limitation. The inability to safely participate in work and/or other major life activities due to medically determinable impairment(s). Functional limitations are determined by an Examiner based on the results of an FCE.

General educational development (GED). The formal and informal education which develops basic reasoning, ability to follow directions, math, and language skills. Experience and/or self-study can develop GED. There are 3 categories of GED: Reasoning; Math; and Language. This worker characteristic is expressed as one of 6 levels: 1-3 Low; 4-5 Average; 6 High.

GOE (Interest Areas). Guide for Occupational Exploration. A liking or preference for an activity. There are 12 interest factors used by the USES in job analysis: 1) Artistic; 2) Scientific; 3) Plants and Animals; 4) Protective; 5) Mechanical; 6) Industrial; 7) Business Detail; 8) Selling; 9) Accommodating; 10) Humanitarian; 11) Leading-Influencing; 12) Physical Performing.

Grasping. Seizing, holding, grasping, turning, or otherwise working with hand or hands. Fingers are involved only to the extent that they are an extension of the hand, such as to turn a switch or shift automobile gears. Same as Handling.

Handling. Seizing, holding, grasping, turning, or otherwise working with hand or hands. Fingers are involved only to the extent that they are an extension of the hand, such as to turn a switch or shift automobile gears. Same as Grasping.

Hearing. Perceiving the nature of sounds by ear.

Heavy work. Exerting 51 to 100 pounds of force occasionally, or 26 to 50 pounds of force frequently, or 11 to 20 pounds of force constantly to move objects.

Highly skilled work (levels 8-9). Work requiring over 4 years up to and including 10 years (level 8) or over 10 years (level 9) for the worker to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation.

Impairment. A significant deviation, loss, or loss of use of any body structure or function in an individual with a health condition, disorder, or disease.

Impairment evaluation. A medical evaluation using a standard method (i.e. AMA Guides) to determine permanent anatomic or physiologic impairment associated with a physical or mental condition.

Impairment rating. A consensus-derived percentage estimate of loss of activity reflecting severity for a given health condition, and the degree of associated limitations in terms of activities of daily living. This term is sometimes but not always associated with the severity of functional impairment.

International Classification of Functioning, Disability and Health. The International Classification of Functioning, Disability and Health, known more commonly as ICF, is a classification of health and health-related domains. ICF is the WHO framework for measuring health and disability at both individual and population levels.

Invalid performance. The individual's test performance was not consistent with the severity of their medically determinable impairments based on biomechanical, physiological, and psychophysical factors.

Job. A group of positions within an establishment which are identical with respect to their major or significant tasks and sufficiently alike to justify their being covered by a single analysis. There may be one or many persons employed in the same job.

Job analysis. The process of quantifying the physical and cognitive demands of a job using a combination of techniques including interview, observation, and objective measurements.

Job description. A written statement of job duties, responsibilities, and qualifications necessary to safely perform a job.

Kinesiophobia. A term that describe people's fear of pain due to movement, a factor that hinders rehabilitation and prolongs disability and pain.

Kneeling. Bending legs at knees to come to rest on knee or knees.

Lifting. Raising or lowering an object from one level to another (includes upward pulling).

Light work. Exerting up to 20 pounds of force occasionally, **or** up to 10 pounds of force frequently, **or** a negligible amount of force constantly to move objects. A job should be rated Light work when it requires: (1). Walking or standing to a significant degree; or (2). Sitting most of the time but entails pushing or pulling of arm or leg controls; or (3). Working at a production rate pace entailing constant pushing or pulling of materials even though the weight of those materials is negligible. **SSR 83-10** further defines the full range of Light work as requiring 6 or more hours of intermittent standing or walking in an 8-hour workday. Sitting may be required only intermittently and occasionally.

Major life activities. Activities including, but are limited to, caring for oneself, performing manual tasks, seeing, hearing, eating, sleeping, walking, standing, lifting, bending, speaking, breathing, learning, reading, concentrating, thinking, communicating, and working. A major life activity also includes the operation of a major bodily function, including but not limited to, functions of the immune system, normal cell growth, digestive, bowel, bladder, neurological, brain, respiratory, circulatory, endocrine, and reproductive functions.

Malingering. The intentional production of false or grossly exaggerated physical or psychological symptoms motivated by external incentives. The motive for feigning a disorder may be to obtain financial compensation, drugs, avoid work, lessen a criminal sentence, escape incarceration, or to gain sympathy. The scope of a diagnosis of malingering is reserved to psychiatrists or qualified psychologists based on formal psychological testing.

Marginal job function. The basic duties than an employee may perform, but they are not essential job functions.

Maximum medical improvement. The point at which a patient's medical condition has stabilized and is unlikely to change (improve or worsen) substantially in the next year, with or without treatment as determined by a physician.

Maximum rehabilitation potential. The point at which a patient will no longer benefit from either physical rehabilitation as determined by a physical therapist or occupational therapist, or cognitive behavioral therapy interventions as determined by a psychologist.

Medically determinable impairment. An impairment that results from anatomical, physiological, or psychological abnormalities that can be shown by medical evidence consisting of signs, symptoms, and diagnostic findings. A medically determinable impairment cannot be established in the absence of objective medical abnormalities.

Medically stable. The medical condition is not significantly changing on a day to day basis.

Medium work. Exerting 21 to 50 pounds of force occasionally, or 11 to 25 pounds of force frequently, or greater than negligible up to 10 pounds of force constantly to move objects.

Near acuity. Clarity of vision at 20 inches or less.

Negligible weight/force. The weight or force is so small an amount that measurement is not meaningful (i.e. a pen, a few sheets of paper). Less than 1 pound.

Noise intensity level. The noise intensity level to which the worker is exposed in the job environment. This factor is expressed by one of five levels.

Non-exertional limitations. Functional limitations caused by an individual's impairments and related symptoms, such as pain, that affect an individual's ability to meet the demands of jobs other than the strength demands (i.e. reaching, handling, fingering, stooping, squatting, etc.).

Non-repetitive activity. Performing the same task(s) less than 30 repetitions per hour, or less than 240 repetitions in an 8 hour work day. Use of keyboard less than 4 hours per day.

Not present. The activity or condition does not exist.

Observable. Able to be seen, heard, or otherwise perceived by a person other than the person performing the action.

Occasional activity. The activity or condition exists up to 1/3 of the time, or up to 2 ½ hours in an 8 hour work day, or up to 12 repetitions per hour, or up to 100 repetitions in an 8 hour work day.

Occupation. A group of jobs, found at more than one establishment, in which a common set of tasks are performed or are related in terms of similar objectives, methodologies, materials, products, worker actions, or worker characteristics.

Pain. An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.

Pain behavior. Verbal and/or nonverbal manifestations of discomfort, and perhaps distress and suffering. The behavior or behaviors may be audible complaints – actions such as a grimace or other facial expression, abnormal posture, guarding, or rubbing a body part, a limp, or use of a walking aid, brace or other device – or inaction such as activity avoidance, even bedrest. Pain behaviors reflect the way persons think, feel, and act in response to their discomfort, and the way they communicate their symptoms to others.

Participation. Involvement in a life situation.

Participation restrictions. Problems an individual may experience in involvement in life situations.

Perceptual. Relating to, or involving [perception](#) especially in relation to awareness of the elements of environment through physical [sensation](#).

Perceived disability. An individual's perceptions about their own abilities and limitations with participating in major life activities.

Perceived injustice. An individual's cognitive appraisal comprising of elements of severity of loss, perceived irreparability of loss, a sense of unfairness and the external attribution of blame following a painful injury.

Performance validity. The degree to which an individual's test performance was consistent with objective medical evidence based on biomechanical, physiological, and psychophysical factors.

Physical demands. The physical requirements made on the worker by the specific job-worker situation. There are 26 physical demands: 1) Standing; 2) Walking; 3) Sitting; 4) Lifting; 5) Carrying; 6) Pushing; 7) Pulling; 8) Climbing; 9) Balancing; 10) Stooping; 11) Kneeling; 12) Squatting (Crouching); 13) Crawling; 14) Reaching; 15) Handling; 16) Fingering; 17) Feeling; 18) Talking; 19) Hearing; 20) Tasting/Smelling; 21) Near Acuity; 22) Far Acuity; 23) Depth Perception; 24) Accommodation; 25) Color Vision; and 26) Field of Vision.

Physiological limitation. Termination of a particular functional test by a Functional capacity examiner for safety purposes based on established physiological criteria including but not limited to heart rate, oxygen saturation, blood pressure, and respiratory rate.

Preponderance of evidence. The greater weight of the evidence required in a civil (non-criminal) lawsuit for the trier of fact (jury or judge without a jury) to decide in favor of one side or the other. This preponderance is based on the more convincing evidence and its probable truth or accuracy, and not on the amount of evidence.

Proximity to moving mechanical parts. Exposure to possible bodily injury from moving mechanical parts of equipment, tools, or machinery.

Psycho-emotional. Describing any [psychological](#) interaction with the [emotions](#).

Psychometric. The [psychological](#) theory or technique of mental measurement

Psychophysical limitation. Termination of a particular functional test by the individual being tested based on established subjective criteria including but not limited to the individual reporting the inability to safely perform or complete the activity. The Functional capacity examiner may also choose to terminate a particular functional test based on an individual's uncooperative behaviors compromising safety.

Psychosocial. Involving both psychological and social aspects

Psychosomatic disorders. A group of disorders characterized by the presence of physical symptoms that are caused or exacerbated by psychological factors.

Pulling. Exerting force upon an object so that the object moves toward the force (includes jerking).

Pushing. Exerting force upon an object so that the object moves away from the force (includes slapping, striking, kicking, and treadle actions).

Reaching. Extending hand(s) and arm(s) in any direction.

Reasonable accommodation. Any change in the work environment or in the way things are customarily done that enables an individual with a disability to enjoy equal employment opportunities.

Regular and continuous basis. Being able to maintain a fulltime work schedule 8 hours per day for 5 days per week, or an equivalent work schedule.

Repetitive activity. Performing the same task(s) 30 or more repetitions per hour, or 240 or more repetitions in an 8 hour work day. Use of a keyboard 4 or more hours per day.

Residual functional capacity. Represents what an individual can still do despite functional limitations resulting from a medically determinable impairment(s) and impairment-related symptoms.

Risk. Refers to the chance of harm to the individual, co-worker, or to the general public if the individual engages in specific work activities.

Sedentary work. Exerting up to 10 pounds of force occasionally or a negligible amount of force frequently to lift, carry, push, pull, or otherwise move objects, including the human body. Sedentary work involves sitting most of the time, but may involve walking or standing for brief periods of time. Jobs are Sedentary if walking and standing are required only occasionally and all other Sedentary criteria are met. **SSR 83-10** further defines Sedentary work as requiring about 6 hours of sitting and no more than 2 hours of standing or walking in an 8-hour workday.

Selection procedure. Any measure, combination of measures, or procedure used as a basis for any employment decision. Selection procedures include the full range of assessment techniques from traditional paper and pencil tests, performance tests, training programs, or probationary periods and physical, educational, and work experience requirements through informal or casual interviews and unscored application forms.

Selection rate. The proportion of applicants or candidates who are hired, promoted, or otherwise selected.

Self-Efficacy. Confidence in one's own ability to achieve intended results.

Semi-skilled work (levels 3-4). Work requiring over 1 month up to and including 3 months (level 3) or over 3 months up to and including 6 months (level 4) for the worker to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation.

Sensation. A mental process resulting from the immediate external stimulation of a [sense](#) organ often as distinguished from a conscious awareness of the [sensory](#) process.

Sitting. Remaining in a seated position.

Skill. A present, observable competence to perform a learned psychomotor skill.

Skilled work (levels 5-7). Work requiring over 6 months up to and including 1 year (level 5), over 1 year up to and including 2 years (level 6), or over 2 years up to and including 4 years (level 7) for the worker to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation.

Specific vocational preparation (SVP). The amount of lapsed time required by a typical worker to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation. This training may be acquired in a school, work, military, institutional, or vocational environment. This worker characteristic is expressed as one of 9 levels: 1-2 Unskilled; 3-4 Semi-Skilled; 5-7 Skilled; 8-9 Highly Skilled.

Squatting. Bending body downward and forward by bending legs and spine. Same as Crouching.

Standing. Remaining on one's feet in an upright position at a workstation without moving about.

Stooping. Bending body downward and forward by bending spine at the waist, requiring full use of the lower extremities and back muscles.

Substitution Pattern. The act, process, or result of [substituting](#) a biomechanical motion for another.

Sustained posture. A posture that is maintained for a specified amount of time continuously without interruption.

Talking. Expressing or exchanging ideas by means of the spoken word to impart oral information to clients or to the public and to convey detailed spoken instructions to other workers accurately, loudly, or quickly.

Tasting/Smelling. Distinguishing with a degree of accuracy, differences or similarities in intensity or quality of flavors or odors, or recognizing particular flavors or odors, using tongue or nose.

Temperaments. The adaptability requirements made on the worker by specific types of job situations. Temperaments relate to worker personality traits and can impact long term job retention. There are 11 different temperaments relative to work: 1) Directing, controlling, or planning activities of others; 2) Performing repetitive or short-cycle work; 3) Influencing people in their opinions, attitudes, and judgments; 4) Performing a variety of duties; 5) Expressing personal feelings; 6) Working alone or apart in physical isolation from others; 7) Performing effectively under stress; 8) Attaining precise set limits, tolerances, and standards; 9) Working under specific instructions; 10) Dealing with people; and 11) Making judgments and decisions.

Tolerance. A psychophysical concept that refers to the level of work or activity an individual feels able to endure at a given time. Tolerance is impacted by an individual's symptoms such as pain and fatigue.

Transferrable skills. Skills that an individual developed from past work that can be used in other similar work (transferability) based on worker traits to include specific vocational preparation, work fields, and materials used, products produced, and subject matter or services provided.

Unskilled work (levels 1-2). Work requiring short demonstration only (level 1) or anything beyond short demonstration up to and including 1 month (level 2) for the worker to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation.

Valid performance. The individual's test performance was consistent with the severity of their medically determinable impairments based on biomechanical, physiological, and psychophysical factors.

Very heavy work. Exerting in excess of 100 pounds of force occasionally, or in excess of 50 pounds of force frequently, or in excess of 20 pounds of force constantly to move objects.

Vibration. Exposure to a shaking object or surface.

Visual accommodation. Adjustment of lens of eye to bring an object into sharp focus. This factor is required when doing near point at varying distances from the eye.

Walking. Moving about on foot.

Wet and/or humid. Contact with water or other liquids or exposure to non-weather-related humid conditions.

Work: Labor or exertion, to make, construct, manufacture, form, fashion, or shape objects to organize, plan, or evaluate services or processes of living or governing; committed occupations that are performed with or without financial reward.

Work behavior. An activity performed to achieve the objectives of the job. Work behaviors involve observable (physical) components and unobservable (mental) components. A work behavior consists of the performance of one or more tasks. Knowledges, skills, and abilities are not behaviors, although they may be applied in work behaviors.

Work fields. Groupings of technologies and socioeconomic objectives that reflect how work gets done and what gets done as a result of the work activities of a job, or in other words, the purpose of the job. There are 96 work fields defined by USES.

Worker characteristics. Worker attributes that contribute to successful job performance. Worker characteristics include: 1) General Educational Development (GED); 2) Specific Vocational Preparation (SVP); 3) Aptitudes; 4) Temperaments; 5) GOE (Interest Areas); 6) Physical Demands; and 7) Environmental Conditions.

Working in high, exposed places. Exposure to possible bodily injury from falling.

Working with explosives. Exposure to possible bodily injury from explosion.