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Clinical Commentary/Current Concept Review

Suggestions and Considerations for Application of Movement Screens to Clinical Practice

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Pre-participation and return to activity functional assessments are commonly used in clinical practice to assess movement quality and identify athletes' limitations. While there are slight differences between each specific test battery, general guidelines suggest that the tests be completed without a warm-up. This has been suggested because dynamic stretching may improve range of motion and athletic performance. However, athletes typically warm up prior to participating in sport. Therefore, researchers should investigate the acute effects of dynamic stretching on functional tests and movement screens and evaluate other factors that may influence performance on these test batteries. Scientific evidence for standardized implementation of various movement screens is lacking, and future research should aim to identify gaps in the literature to allow clinicians to properly implement evidence-based practice functional assessments. The purpose of this commentary is to discuss various considerations for implementing movement screens and assessment tools into clinical practice.

LEVEL OF EVIDENCE

5

THE PROBLEM

Clinicians (e.g., physical therapists, athletic trainers, and strength coaches) often implement movement screens or functional assessments into their practice. These screens and assessments can be used as clinical tools to examine athletes' or patients' physical capabilities including strength, flexibility, coordination, and endurance. Examples of common tools used with athletes include the Functional Movement Screen™ (FMS™)[1,2] and Athletic Ability Assessment (AAA)[3] along with numerous return to activity assessments to gauge readiness for sport or job demands. Sport-specific and population-specific movement screens also exist, such as the Titleist Performance Institute (TPI) screen,[4] Gymnastics Functional Measurement Tool,[5] and military fitness screening.[6]

While the specific components of these evaluations may vary, there are some common aspects. Typical screens require minimal equipment and can be quickly performed in a clinical setting to test aspects of fitness and/or movement important to individuals' sport, occupation, or daily life. Generally, the clinician demonstrates and verbally explains the test or movement prior to the individual's attempt, and tests are scored on an ordinal scale based on the ability to properly complete a movement without compensations or pain. Composite scores are created from the sum of individual tests within the screen, with some research suggesting cutoff scores for injury risk in certain populations. For example, a score at or below 14 on the FMS™ has been linked to increased injury rates,[7] while other authors have disputed the utility of this cutoff score.[8] The overhead squat is frequently included in movement screens, and is a component of the FMS™, AAA, and TPI screen. Overhead squat performance has been linked to composite FMS™ scores, suggesting this test may be of particular value.[9]

A common thread between these tools is the lack of a designated or specified warm-up. The FMS™ and TPI screen both instruct clinicians to avoid allowing participants to stretch or warm up prior to the test. Their creators suggest that athletes should be able to properly complete the test components without stretching or specifically preparing their bodies for movement, and a designated warm-up would likely improve test scores. While this reasoning has merit, clinicians and researchers should con-

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template the opposing view. Consider an individual who presents with limited shoulder mobility on the FMS™ without a warm-up. The clinician may believe this is an area needing intervention. However, individuals often complete some form of a warm-up routine prior to participating in their activity. If the athlete performs a dynamic stretch which increases their short-term flexibility and they no longer present with an apparent mobility restriction, they likely are not impaired by this restriction during their sport. Increasing range of motion when it is not necessary not only wastes time for the athlete and clinician, but it may also hinder performance. A rehabilitation program focused on increasing shoulder flexibility in an athlete without a need for more range of motion could eventually progress into shoulder hypermobility, which may increase injury risk.[10]

Aside from warm-up status, other factors may impact scoring on movement screens and test batteries, such as fatigue, rater training, reliability, and variability of verbal cues provided to athletes. Some of these factors have been studied extensively, while other areas are lacking evidence, but all should be contemplated. The purpose of this commentary is to discuss various considerations for implementing movement screens and assessment tools into clinical practice.

THE SOLUTION

Since dynamic stretching or warm-up routines are commonly completed prior to exercise or sport participation and may lead to acute gains in range of motion, in the authors' opinions, clinicians should mirror real-world scenarios when assessing their athletes or patients. In the above scenario with a baseball player presenting with limited range of motion on the shoulder mobility tests of the FMS™, a simple warm-up prior to the performance of the FMS™ could reveal the athlete does not have an impairment in the tested movement. Screening tests are often done before practice or on off days and mimicking their practice or game warm-up may provide a more realistic understanding of an athlete's capabilities.

Substantial evidence has examined the effects of various stretching and warm-up routines on athletic performance and physical abilities. Dynamic stretching can increase joint range of motion, reduce muscle stiffness, and increase force production when compared to static and ballistic stretches, with both acute and chronic adaptations possible.[11] Dynamic stretches can be brief activities completed prior to exercise, can mimic the specific demands of their sport, and do not have a substantial time burden. A single set of stretches for major muscle groups can be sufficient to improve performance.[11]

Since current practice according to FMS™ and TPI guidelines instructs avoiding a warm-up prior to testing, future studies should compare the acute effects of dynamic stretching on these screening systems. If findings suggest no difference in scores, clinicians can continue to use their preference or follow the movement screen's instructions. However, if a difference does exist, expanded research may be indicated on this topic which could ultimately add to the evidence regarding these screening tools.

In the meantime, while research expands on this topic, practitioners should strive for consistency. If evidence is inconclusive whether a warm-up should be used prior to assessing athletes, studies should explicitly report whether this component was included. Also, the specifics of the warm-up (i.e., exact exercises, sets, repetitions, and rest periods) should be reported, as most past research vaguely explains the warm-up protocol followed, if at all. It is difficult for clinicians to implement evidence-based practice if the procedures are not specific.

DISCUSSION

Existing evidence comparing the effects of warm-ups on movement screens and assessment tools indicates that sport-specific warm-ups may be more impactful than a general warm-up.[12] In youth male soccer players, the FIFA 11+ protocol led to improvements in sport performance and FMS™ subtests, while a general warm-up showed improvements on sport assessments compared to before a warm-up.[12] However, to the authors' knowledge, this is the only published study directly testing the effects of warm-ups on athletic capabilities. Future research is needed to examine this topic in different athletic populations and with different test batteries.

While few studies have directly examined the effects of a warm-up on movement screens, other factors such as fatigue have been investigated more thoroughly. One study compared FMS™ scores before and after a simulated soccer match. They reported worse FMS™ scores following the match, suggesting that fatigue may decrease athletic capabilities and should also be considered.[13] Similarly, a study of youth baseball pitchers found changes in joint kinematics in the first and last innings of a simulated game.[14] This indicates fatigue alters not only performance on assessment tools, but also influences in-game capabilities. Future research should expand upon this topic in various sports and different lengths of competition. For example, examining pre-match, halftime, and post-match FMS™ scores may provide greater insight into how fatigue impacts athletes' ability to execute specific movement tasks.

The warm-up is an important aspect to consider when using screening tools such as the FMS™, TPI screen, or AAA, but there are other factors deserving attention. Intertester and intra-tester reliability, learning effects, and specific instructions provided may all influence the patient's score and should therefore be considered. Although there is evidence supporting FMS™ reliability,[15] clinicians should determine their own reliability before tracking changes in their athletes' movement competency over time. The lack of reliability evidence for other movement screens does not mean these tests are not reliable, but clinicians should use their best judgement until sufficient evidence exists. Additionally, studies have not directly investigated the effect of verbal cues or instructions provided during movement screens or assessment tools. The specific cues provided by a clinician may impact an athlete's performance, especially

with tasks that are scored with multiple criteria. For example, the overhead squat in the AAA is scored based on bar positioning, lower extremity alignment, and depth.[3] For example, if an athlete is cued at their first assessment to squat to a "maximum depth", this may lead to different interpretation than if they were instructed to squat to a "comfortable depth". To ensure consistent testing, the authors recommend that clinicians should use a script to maintain consistent verbal cueing. Researchers should continue to identify and pursue these gaps in this literature to help guide evidence-based clinical practice.

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CONFLICTS OF INTEREST

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