THE FMS™ HURDLE STEP – SCREENING AND CORRECTIVE EXERCISE CONSIDERATIONS FOR PERSONAL TRAINERS WITH MINIMAL FMS™ EXPERIENCE

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The Functional Movement Screen™ (FMS™) is a common movement screen used in various performance and rehabilitation settings (9). Conceptually, the FMS is comprised of four fundamental movement patterns (active straight-leg raise, shoulder mobility screen, rotary stability, and trunk stability push-up) that assess basic mobility and motor control characteristics and three functional patterns (inline lunge, hurdle step, and overhead deep squat) that require a complimentary blend of mobility and motor control to perform optimally. In total, all seven patterns from the FMS offer personal trainers a quick screen that can provide insight into their client's strengths and suggest areas of improvement with movement patterns that reflect common strength training exercises (e.g., single-leg step-up) (1). Specifically, FMS results can help the personal trainer determine the direction of the client's training program. If a client has pain with basic movement patterns, a referral to a healthcare provider would be recommended (1).
A central theme of FMS research has been the ability of the movement screen to predict injury via the overall composite score calculation (7). A common conclusion found in FMS research is the limited ability of the FMS composite score to predict injury/athletic performance, which raises questions about the need for a focus on the individual movement patterns of the FMS and movement asymmetries, as compared to a global focus on the composite score (7,9). Specifically, a current limitation in the present FMS research is a more intimate exploration of each individual pattern and the unique screening and corrective exercise integration decisions relevant to the personal training industry. Therefore, this article is the second in a planned series to review essential considerations of each FMS pattern. This article will examine the FMS hurdle step (HS) pattern in greater detail to help personal trainers with minimal FMS experience better understand the pattern, consistently identify movement compensations, and effectively integrate HS corrective exercises into their current training programs.

PATTERN OVERVIEW

The HS (also known as the double-leg to single-leg transition pattern) is a multi-faceted pattern that primarily assesses a client's ability to maintain pelvic and trunk stability during a dynamic stepping task on a single-leg base of support (1). Globally, the pattern reflects a client's ability to control their center of mass under a dynamically changing base of support replicated via many common exercises such as walking, step-ups, skipping/bounding drills, etc. (1). While traditionally viewed as a linear-specific movement, the pattern can also be reflected in multi-directional exercises common in the fitness industry (e.g., lateral change of direction drills, side lunges, lateral band walks). The pattern shares similarities to the previously reviewed active straight-leg raise (e.g., pelvic dissociation, load transfer through the extremities); however, it is completed in a standing position primarily on a single-leg support base (3). Single-leg support creates greater mobility (e.g., closed kinetic chain ankle dorsiflexion [CKC DF]) and motor control (e.g., proper balance/proprioception). Deficits CKC DF and balance/proprioception (both assessed during the HS) can translate into poor performance on the HS pattern, as well as during exercises that require clients to have a stable single-leg base for optimal movement (e.g., forward skips, agility ladder drills, single-leg step-ups).

To complete the HS, the client actively moves one limb through hip flexion (with the knee flexed and ankle fully dorsiflexed), while the opposite limb provides a stable base of support via pelvic dissociation, CKC DF, and proper balance/proprioceptive input to maintain postural integrity (1). Additionally, the client's core stability and possible reliance on the upper extremity as a compensation mechanism for lower-extremity mobility/motor control deficits are screened via the HS pattern (1). Personal trainers should remember that the HS is a multi-faceted pattern with the spine in a vertical position under load from gravity; thus, deficiency is not solely caused by any singular motor control or mobility possibility referenced above.

SCREENING CONSIDERATIONS AND MOVEMENT COMPENSATIONS

Previous publications have documented the proper setup, cues, and FMS scoring criteria for the HS (1). For a client to receive a functional score (i.e., a score of "three"), they must demonstrate the ability to get their moving leg over the hurdle set at the height of the client's tibia (Figure 1) while maintaining the hip (flexion), knee (flexion), and ankle (dorsiflexion) in the sagittal plane with a stable/vertical trunk (1). Subtle changes in the moving leg and trunk position are commonly overlooked. For example, Figure 2 represents a scenario where a client places excess stress on the dowel rod, indicating upper-body reliance during a core/lower-body focused pattern. Such a strategy may indicate an inability to properly express the pattern's mobility and motor control elements via the lower body. Figure 3 represents a scenario where the client's ankle on the moving leg moves out of dorsiflexion during the screen, which indicates a deviation from the standardization of the movement pattern. Specifically, maintaining maximal dorsiflexion on the moving leg allows the client to clear the hurdle height and minimizes the potential of the client contacting the hurdle during the test. Finally, Figure 4 represents a scenario where the client makes incidental contact with the hurdle as their moving leg approaches the ground. Incidental contact is not uncommon and can occur in instances of excessive muscular bulk or loose-fitting attire during the test. Incidental contact is not considered a reason for a client to receive a lower score on the HS. However, it should not be confused with instances where the client's heel or toe (Figure 5) contacts the hurdle during the test, which are reasons to adjust the HS screen score.

Often overlooked in the HS screen is the potential for CKC DF and vestibular system issues to manifest during the screen. As referenced above, the HS screen requires the client to maximize mobility in one limb while maintaining stability in the other. For this to occur, the client's stable limb must be able to properly express CKC DF (Figure 6); limitations in CKC DF can lead to a cascading effect of compensatory strategies (4). A CKC DF screen, such as the novel standing ankle dorsiflexion screen (SADS), may not perfectly replicate the unique and subtle CKC DF required for the HS screen; personal trainers should consider incorporating CKC DF exercises that better approximate the unique way the stance leg ankle moves during the HS screen (5). It is well documented that single-leg stance tasks require adequate central nervous system feedback from ocular, somatosensory, and vestibular systems to create appropriate muscular activation patterns and maintain balance (8). In instances of extreme balance disruptions during the HS screen (e.g., the client cannot initiate the movement without immediate loss of balance), personal trainers should consider the possibility of an underlying ocular/vestibular deficit that is outside of their scope of practice. A referral to a healthcare provider trained in the assessment and diagnosis of such conditions is warranted. Personal trainers using the HS as part of their client assessment should remember that the compensatory strategies referenced in Figures 2, 3, and 5 can occur in isolation or conjunction with the more commonly identified compensatory strategies, such as observable trunk movement and frontal/transverse plane deviations in the moving limb.

CORRECTIVE EXERCISE INTEGRATION

Clients who do not achieve an ordinal score of three on the HS (both the right and left leg of the pattern) can complete corrective exercise strategies to improve their performance. Corrective exercise integration can occur based on the client's and personal trainer's preferences (3). Uniquely, a recent systematic review and meta-analysis of the literature suggested that exercise-based interventions in untrained populations can have a positive impact on reducing movement asymmetries in FMS patterns such as the HS (6). Corrective exercises for the HS are not simply practicing the movement screen; instead, corrective exercises reflect the different elements of the movement pattern (3). Progressive corrective exercises that mimic various postural positions (Table 1) improve the connection between the pattern and the exercises the client completes in their training program (3). The exercises presented in Table 1 are based on movement pattern retraining principles, focusing on reinforcing the mobility, stability, coordination, and timing needed to complete the HS successfully. For example, the supine reverse pattern HS drill (Table 1) actively engages the client's core (via the hand/knee isometric contraction) before recreating the movement mechanics required in the HS screen, which helps reinforce the proper sequencing of core activation and proper pelvic orientation before the client completes the movement task. The movement pattern retraining established with the supine reverse pattern HS drill is then progressed over time (based on client form, movement quality, and exercise competence) with different postural challenges as reflected in the mountain climber, half-kneeling pelvic dissociation drill, and pattern assistance step-up. Additionally, soft tissue techniques (e.g., foam rolling, static stretching, dynamic stretching) for the muscles of the lower extremity (e.g., calves, hamstrings, hip flexors, tensor fasciae latae, quadriceps) should be incorporated into the client's warm-up and cool-down to help address potential mobility and stability/postural limitations within the pattern.

CONCLUSION

The HS is a multi-faceted pattern that primarily assesses a client's ability to maintain pelvic and trunk stability during a dynamic stepping task on a single-leg base of support, which occurs in many common exercises such as walking, step-ups, and skipping/bounding drills (2). CKC DF of the ankle and possible vestibular dysfunctions can significantly impact a client's ability to complete the HS screen successfully. Clients who cannot achieve a functional score on the HS (both the right and left leg) can benefit from corrective exercise strategies that improve the movement pattern's mobility, stability, coordination, and timing elements. Corrective exercises for the HS should approximate the functional requirements needed to complete the pattern, be completed with adequate form/quality, and progress over time. Personal trainers should communicate their approach to corrective exercise integration with their clients.

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ABOUT THE AUTHOR

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FIGURE 1. MOVING LEG OVER THE HURDLE SET AT THE HEIGHT OF THE CLIENT'S TIBIA

FIGURE 2. EXCESS STRESS ON THE DOWEL ROD, INDICATING UPPER-BODY RELIANCE

FIGURE 3. THE ANKLE ON THE MOVING LEG MOVES OUT OF DORSIFLEXION DURING THE SCREEN

FIGURE 4. INCIDENTAL CONTACT WITH THE HURDLE AS THE MOVING LEG APPROACHES THE GROUND

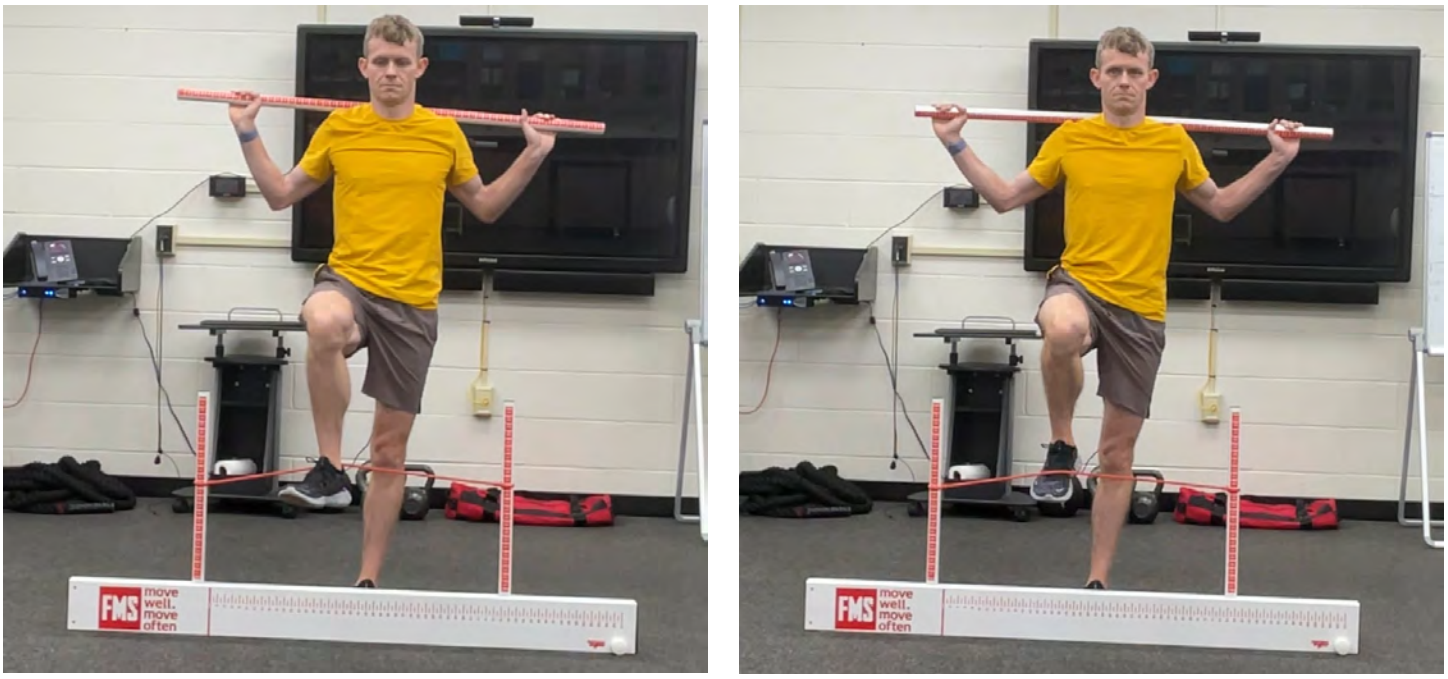


FIGURE 5. HEEL OR TOE CONTACT ERRORS WITH THE HURDLE

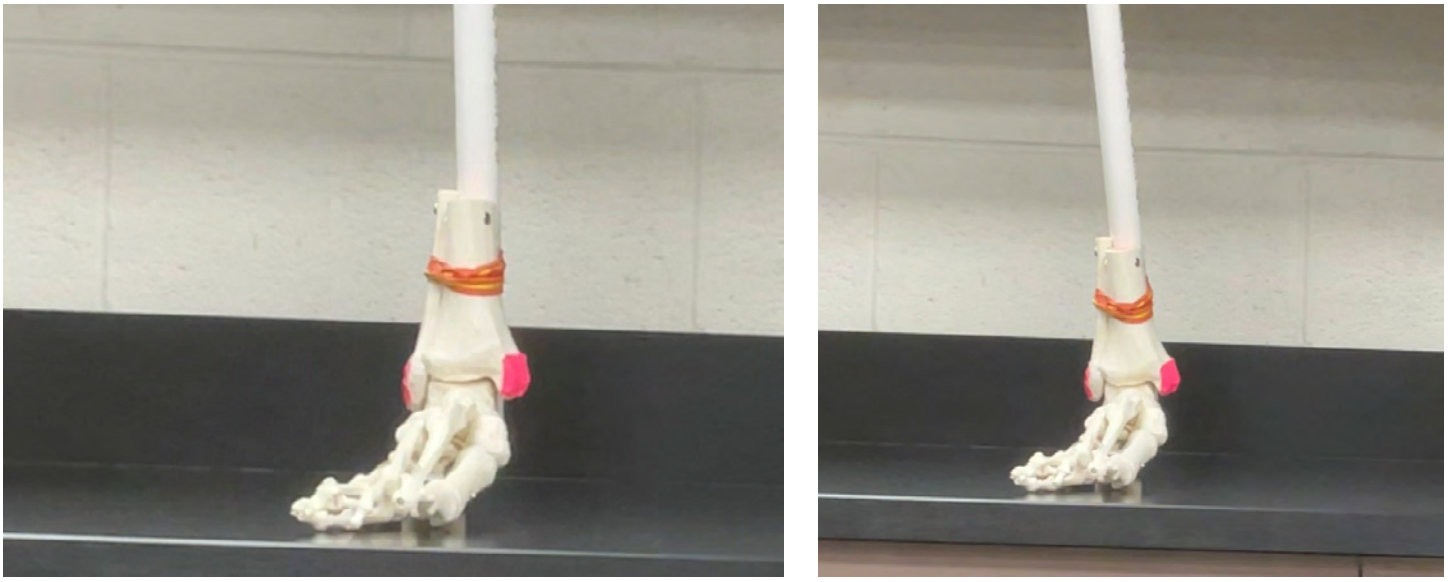
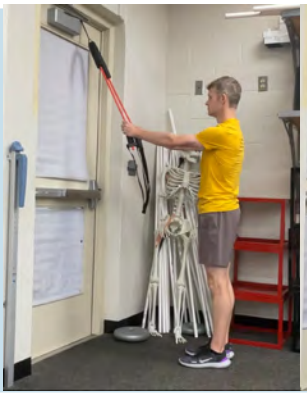
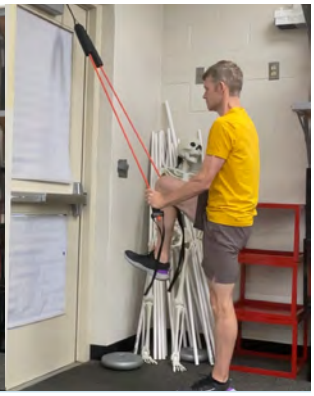


FIGURE 6. CKC DF (FORWARD MOVEMENT OF THE TIBIA MORTISE ON THE TALUS)

TABLE 1. SAMPLE HS CORRECTIVE EXERCISE PROGRESSION

EXERCISE	SETS X REPS	COACHING CUES	EQUIPMENT	START	FINISH
Supine Reverse Pattern HS	1 – 3 x 10 – 12	**Position:** Lie flat on your back; 90/90/90 alignment with the hips, knees, and ankles; and place right hand on top of the right knee **Action:** Push the right knee into the right hand (equal tension); lower the left leg to the ground **Feel:** Front and back of the legs; no back pain **Comment:** 1. After completing a set of the exercise with the right hand pressed into the right knee, repeat the exercise with the left hand pressed into the left knee	Bodyweight		
Mountain Climber	1 – 3 x 10 – 12	**Position:** Hands and toes into the ground (shoulder-width apart); neutral spine **Action:** Bring the right knee towards the right elbow while keeping a neutral spine throughout; return to the start position and repeat on the left leg **Feel:** Front and back of the moving leg and stomach; no knee, back, or hip pain	Sliders or towel		

TABLE 1. SAMPLE HS CORRECTIVE EXERCISE PROGRESSION (CONTINUED)

EXERCISE	SETS X REPS	COACHING CUES	EQUIPMENT	START	FINISH
Half-Kneeling Pelvic Disassociation Drill	1 – 3 x 10 – 12	**Position:** Right knee in the ground; left leg in front with a 90/90/90 alignment (hip, knee, and ankle) **Action:** Raise the left knee in the air (hold for 3 – 5 s) and then return to the ground **Feel:** Stretch sensation in the front of the down leg (no pain) **Comments:** 1. Toes should be loaded into the ground (ankle dorsiflexion) 2. After completing a set of the exercise with the right knee on the ground, switch legs and repeat with the left leg on the ground	Bodyweight		
Pattern Assistance Step-Up	1 – 3 x 10 – 12	**Position:** Stand tall with a neutral spine **Action:** Pull the band to the floor; raise the right leg (bent knee) in the air; repeat on the left leg **Feel:** Hips and lower leg; no knee, hip, or back pain	Light-to-medium resistance		

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