The Core Mobility Series: A Dynamic Warm-up Tool

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ABSTRACT

Recent trends in whole-body movement exercise have left many clinicians devoid of dynamic movement progressions for warm-up or workout programs with clients. Such deficits can hinder performance gains and quality of movement in these populations. The Core Mobility Series (CMS) is a sequential matrix of movement patterns that starts in a standing position, transitions to the ground, and back to standing, mimicking sport skills through multiple planes and ranges of motion. Moreover, the CMS does not require the use of equipment and can be used with any level of client or athlete for dynamic skill improvement or performance enhancement purposes.

INTRODUCTION

The necessity for dynamic warm-up in sport is a well-established and supported trend in athletic performance (6,11). Furthermore, for proper authentic movement to occur, adequate mobility, stability, and motor control are necessary (3,15). However, many dynamic warm-up routines often lack focus in fundamental patterns. Furthermore, they frequently fail to address mobility, stability, and motor control targeting all major joints in the body through full ranges of motion in one series of movements. The core mobility series (CMS) is a sequence of exercises specifically designed to address the foundational components of squatting, lunging, pushing, pulling, and planking in one fluid sequence (2–8,10–14). Though each of these components is often separated in exercise prescription, they all require similar joint mobility and tissue extensibility to allow full range of motion.

Basic increases in range of motion have often been attempted with various stretching techniques on soft tissue; yet, a lesser focus has traditionally been placed on improving joint mobility (3). Unfortunately, joint mobility deficits at the ankles, hips, and thoracic spine are common among most strength and power athletic populations (3,5). The CMS addresses these components by pushing subjects into end ranges of motion with consistent body weight pressure in an effort to increase the restricted joint motion. Furthermore, improving this joint motion will effectively help to increase overall excitability of the nervous system, which will aid in performance (3,5,8,11). This can occur because of the large load that is placed on the nervous system by training in the end ranges of motion (3,5).

Also, similar to many athletic movements and sport plays, the CMS begins in a standing position, works the subject to the floor, and then returns them to a standing position. Transitioning in this manner helps translate motor control to sport movement and may help to reduce injury (1,6,9,13).

METHODS

The CMS begins with a dynamic single-leg stance. In a single-leg stance position, the subject is asked to raise the contralateral leg to hip height (Figure 1A). From this position, the subject will pull the raised leg across the body in line with the hip (Figure 1B), outward away from the body in line with the hip (Figure 1C), and finally pull the ankle from behind transitioning into a standing quadriceps stretch (Figure 1D). Once the subject achieves a quadriceps stretch, he or she should continue to flow into a single-leg toe touch of the stance leg with the contralateral leg raised posteriorly (Figure 2). This position in movement should mimic that of a single-leg dead lift with a neutral spine and raised leg fully extended at the knee and hip with the ankle dorsiflexed or toes tucked to the shin position. Once the dynamic single-leg stance sequence is performed one time on each leg, the subject will transition to an overhead squat stance with feet hip width apart and both hands overhead (Figure 3A). In this position, the subject performs a hip hinge into a toe touch position (Figure 3B). With a strong neutral spine and hip hinged position, the subject drops the hips into a deep squat position while maintaining hand contact with the toes and elbows inside the knees (Figure 3C). From the bottom of this position with the hips as low as possible, heels remaining in contact with the ground, toes pointed straight ahead, and knees directly over the feet, the subject reaches one arm at a time toward the ceiling following the hand with the head and eyes (Figure 3D). The subject...
should report a strong stretch in the middle to upper back and the hips. Once the subject has completed the rotation of the arm and head toward the ceiling once on each side, they will transition one leg into a deep lunge position and repeat the rotations (Figure 4).

The deep lunge with rotation should be completed with a minimal shift in balance. While the right foot is in the deep lunge position, the right knee should be approximately 4–6 inches off the ground, the right hip should be fully extended, the spine should remain strong and neutral until rotation occurs, the left foot should remain

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**Figure 1.** (A), Single-leg stance position. (B), Pull leg across body. (C), Pull leg away from body. (D), Standing quadriceps stretch.

**Figure 2.** Single-leg hip hinge of the stance leg.

**Figure 3.** (A), Overhead squat stance position. (B), Hip hinge into a toe touch position. (C), Deep squat position. (D), Rotate with one hand toward the ceiling.
in contact with the ground, and the left knee directly over the left foot. With the right foot in the deep lunge, the subject will rotate both the right and left arms and head as previously described. Once both arms have completed the rotation, the subject will return the right leg to the deep squat position and repeat the processes with the left leg in a deep lunge. After completing the deep lunge rotation on the left side, the subject will drop the right foot back to match the left foot transitioning to a top push-up position.

In the top push-up position, the subject will maintain a straight-arm plank with emphasis placed on gluteal and latissimus dorsi engagement for 20 seconds (Figure 5A). At the completion of 20 seconds, the subject will transition into 5 T-rotations on each side (Figure 5B). The T-rotations are a straight-arm side plank with the contralateral arm reaching for the ceiling. In the rotation, only the down hand and lateral aspect of the down foot should be in contact with the ground (Figure 5C). Additionally, the subject should maintain a straight line between the head and feet with a strong and neutral spine and hips not sagging (Figure 5D). Furthermore, the transition between the right and left T-rotation will move through the same top push-up position as previously described. Once the subject has completed all T-rotations, they will return to the top push-up position and then move to a quadruped position on the hands and knees.

In the quadruped position, the subject should maintain approximately a 90° angle at the shoulders and hips along with maintaining dorsiflexion of the ankle. From this position, each limb will move independently in varying positions through 10 lifts directly upward, 10 circles clockwise, and 10 circles counterclockwise, rotations occurring at the shoulder and hip joint, respectively. Also throughout the movement, a strong neutral spine, neutral head, and center of balance must be maintained. The sequence begins with the right arm completing the 3 movements in an overhead reach, palm toward the ceiling.
position in an effort to activate the mid and lower trapezius, and transitions to repeat on the left side (Figure 6A). Once the overhead reach is completed, repeat the 3 movements at 90° to the side with the thumb pointing upward toward the ceiling on both sides to further stimulate the scapular stabilizing muscles (Figure 6B). After completing the arm movements, repeat the same movements on the legs with the legs in a straight position (Figure 6C) and the hip abducted approximately 30–45°, engaging various gluteal muscles (Figure 6D). With the leg movements, be sure the subject maintains ankle dorsiflexion and the toes should be pointed at the ground with all movements occurring at the hip. Once all movements at the arms and legs are completed, the subject will transition to a tall kneeling position (Figure 7A).

In the tall kneeling position, the subject will place knees approximately hip width apart with the ankles dorsiflexed. Once aligned, the subject should sit back on their heels (Figure 7B) and cup their right heel with their right hand and the left heel with the left hand (Figure 7C). While maintaining grip on the heels, the subject should contract the gluteals and latissimus dorsi and push the hips forward (Figure 7D). This position should act as a reciprocal inhibition stretch of the hip flexors with the gluteals activated. In addition, the subject should perform this stretch in a fluid and dynamic manner. After 5 repetitions of the tall kneeling hip stretch, the subject should return to the top push-up position as previously described (Figure 8A).

Once in the top push-up position, the subject is asked to perform 10 perfect push-ups. Emphasis during the push-up should be placed on gluteal engagement and a flat neutral spine. Upon completion of the push-ups, the subject should once again maintain the top push-up position. In this position, the subject should return the right foot to the outside of the right hand (Figure 8B) and repeat the same for the left side (Figure 8C). The resulting position should be the same as the deep squat position described previously. At this point, the subject should raise both arms.
overhead into an overhead deep squat position (Figure 8D) and stand-up (Figure 8E). Note, at this point, the subject may need to reposition feet to an appropriate squatting width. Once the subject is positioned appropriately with feet facing forward and hip width apart with arms overhead, the subject performs 10 overhead deep squats maintaining a strong neutral spine with hands overhead. Furthermore, the overhead deep squats should be performed with emphasis on pushing into restricted portions of the movement feeling a stretch rather than for speed. At the same time, appropriate providers should address painful or compensated movements before continuing with the CMS.

DISCUSSION
Although the core components of the CMS are stated above, numerous modifications can be made to the series to better meet the needs of the subject being trained. Common additions to the CMS are additional push-ups, greater hold times of stretching components, or placing 10 tuck jumps

![Images of exercises](image1)

**Figure 6.** (A), Quadruped with overhead reach. (B), Quadruped with 90° lateral reach. (C), Quadruped with straight leg raise. (D), Quadruped with lateral leg raise.

![Images of exercises](image2)

**Figure 7.** (A), Tall kneeling position. (B), Kneeling with hips sitting on heels. (C), Hands cupping the heels. (D), Kneeling with hips forward for stretch.
to the end of the series. In addition, once shoulder and hip complex mobility is improved, subjects are transferred from a quadruped position to prone on the ground, essentially demanding greater mobility of the shoulder complex, thoracic spine, and hip complex (3,5,8,10,11). Though it is often easier to progress an exercise rather than regress an exercise to meet the needs of a subject, the CMS allows for a vast amount of regression: planks and push-ups can be performed from the knees, a static single-leg stance may be performed rather than dynamic, or T-rotations can simply be side planks. Additionally, sets and repetitions can be altered as necessary to fit the training subject’s needs. For example, additional repetitions of thoracic spine rotations in either the deep squat or the lunge positions can be added to increase the thoracic mobility and rotary stability of throwing athletes, such as baseball or softball players. Another example is the addition of repetitions to the dynamic single-leg stance for athletes struggling with proprioception and balance. Furthermore, it is important to note that the CMS is designed as a performance and injury prevention tool; thus, it is intended to be used with individuals devoid of injury and pain. Although specific modifications can be made to work around pain or injury under the supervision of an athletic trainer, physical therapist, or other health-care professional, the authors do not recommend performing the CMS on individuals with active injuries or pain with any of the movements. Though the versatility of the CMS allows it to be performed nearly anywhere, it is best done on a clean, flat, and firm surface in an area free of objects. Furthermore, the CMS is appropriate for subjects ranging from novice to experienced skill-level athletes and can be used in either an individual or a group-based setting. As described here, it is an appropriate warm-up before any activity, but it should be noted that it can be repeated for multiple times which will turn the warm-up into the actual workout. Because of the comprehensive and demanding nature of the CMS, using it to meet the needs of just about any athlete is simple and effective. Regardless of athletic or performance setting, emphasis should be placed on quality over quantity of movement. In addition, the CMS is designed for individuals who possess low to moderate athletic abilities seeking improvement in overall athletic performance. However, as previously stated, the CMS is not designed for individuals with pain or injury. CONCLUSIONS The CMS matches the recent trend of training with whole-body functional activities and can be integrated into workouts of all types. Although it may appear difficult and complex, with some practice and coaching, the majority of athletes will be able to perform it quickly and effectively. The CMS is effective, comprehensive, versatile, and adaptable, making it a valuable tool for anyone who works with athletes. Conflicts of Interest and Source of Funding: The authors report no conflicts of interest and no source of funding. Mitchell Hauschildt is the Prevention, Rehabilitation, and Physical Performance Coordinator at Missouri State University and the founder and president of Maximum Training Solutions, LLC. Brett McQueen is an athletic trainer and lec- turer currently consulting in Missouri while pursuing a Doctorate of Science in Health Sciences with a concentration in Athletic Training.
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