Solo Warm-up Exercises for Yongmudo

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Introduction

While some students claim that warm-up exercises are the least interesting part of a workout, it is vitally important that we traverse this athletic limbo safely as we rove from our typically sedentary lives to the intense exertions of a yongmudo workout. Skipping forward from bow-in to a heavy workout without such preparation is asking for trouble as cold muscles are more easily strained and stiff joints more easily damaged. As pointless as these exercises may seem to students who are eager to begin doing "real" yongmudo, warm-ups and stretches are an important component of a good exercise regimen because they provide numerous benefits.

Initial warm-up exercises help the body "get going." Joint rotations lubricate these extremities and facilitate smooth motion. Aerobic activities raise the core body temperature and increase blood flow to the joints and muscles. In turn, this promotes muscle flexibility and improved performance, as compared to "cold" exertion. Stretching promotes muscle pliancy, reduces the likelihood of injury due to strain or overextension, and prepares the student for the instruction and vigorous exercise ahead. Additionally, warm-up exercises can also be used to provide the

student an opportunity to review previously acquired skills. Thus warm-ups and stretching are no less important in martial arts class as the primary subject matter, for these preparatory exercises serve to prime the students for the physical rigors of the pedagogy to be delivered during the main portion of the class session.

This paper will present suggestions for such preparatory exercises by showing how they match against various yongmudo skill categories. In particular, yongmudo coursework can be divided into basic and advanced topic categories. The basic topics share a singular focus on individual techniques. A canonical list of a dozen of the most important such techniques are given alphabetically in Table 1.

Table 1: Important Basic Yongmudo Skill Categories

1. Application of Holds, Chokes & Grabs
2. Balance-breaking
3. Blocks & Parries
4. Break-Falls & Rolls
5. Breathing Exercises
6. Hand Strikes
7. Kicks
8. Pressure Points
9. Stances & Movement
10. Sweeps & Reaps
11. Throws
12. Wrist Techniques & Joint Locks

As classified here, advanced topics are those characterized as arising from the synthesis or integration of two or more basic techniques into a new exercise. Table 2 gives a sample of these skills,

focusing on those that are most commonly encountered in yongmudo coursework.

Table 2: Common Advanced Yongmudo Exercises

1. Come-Alongs & Take-Downs
2. Four-Corner Exercises & One-to-Many Defenses
3. Ground Work
4. Rondori
5. The 16-Step Exercises
6. TKD-style & Free-Sparring

Of course, these two skill lists are necessarily incomplete, as yongmudo incorporates hundreds (if not thousands) of individual techniques, which can be combined and re-combined innumerably. Table 3 shows which basic skills are built into these advanced skills. Darkly shaded cells indicate strong correlation (for example, most come-along techniques are built off of joints locks and pressure-point attacks); Medium-shaded cells indicate a medium correlation (stances and throws are certainly more difficult to integrate into ground work, but attention to movement and throws from the ground are important skills to acquire nonetheless); and unshaded cells indicate a weak or non-existent correlation.

In particular, as many of the more advanced techniques are taught only infrequently (e.g., use of kubaton and other weapons, counter-throw and two-man Qi forms, et cetera), showing up only once or twice per semester at most, these latter types have been omitted from consideration in order to focus attention on those warm-up exercises and preparatory stretches most likely to be useful for the typical yongmudo class session.

Table 3: Advanced Yongmudo Exercises, cross-referenced against Basic YMD Techniques.

Advanced Exercise / **Basic Technique**	Come Alongs & Take-Downs	Four Corner Exercises	Ground Work	Randori	16 Step Exercises	TKD-style & Free Sparring
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						

Legend	**Strong Correlation**	**Medium Correlation**	Weak or No Correlation

Here is the scheme to be followed for traversing this topical landscape. The first section will continue

this introduction by reviewing the basic principles of exercise fitness training as enumerated by the U.S. Army Physical Readiness Training Guide. The second section will commence with a general discussion of the health benefits of warm-up exercises and then continue with a survey of those exercises suitable for individual participants. The third section begins by presenting the correspondence between many common stretching exercises and the canonical list of basic yongmudo techniques, then proceeds to a detailed examination of four particular stretching exercises. A brief fourth section on cool-down activities follows and then the paper concludes.

Principles of Exercise Fitness Training

According to the U.S. Army Physical Readiness Training Guide, a good training program should include the following seven design components:[1]

- Regularity
- Progression
- Balance
- Variety
- Specificity
- Recovery
- Overload

Regularity is satisfied by a program that engages the student at least three times per week in a combination of motor fitness activities drawn from the categories of cardiovascular endurance, muscle strengthening, muscular endurance, and flexibility. ***Progression*** implies that there will be a gradual increase in intensity and duration over the course of

the program. ***Balance*** and ***variety*** suggest using a range of activities to work the entire body, reduce boredom from falling into routine activities, increase motivation by providing new challenges, and encourage overall progress among the participants. ***Specificity*** means that the training should fit the desired goals; with yongmudo, this suggests folding review items into warm-up exercises—such as sprints punctuated by falls or rolls. Limiting workouts to every other day fits the concept of ***Recovery***; students who wish to exercise more often might be pursue conditioning activities that exercise different muscle groups on successive training days, or to alternate days of intensive training with days of more relaxed "maintenance" exercises. Finally, the principle of ***Overload*** relates that training will be beneficial only when the student is pushed beyond his or her normal capacity; in the context of yongmudo, with its overabundance of techniques, this is rarely a problem!

Beginning students and those who are otherwise less able to fully participate should ease back on difficult exercises, or substitute simpler activities for more complex ones. Likewise, students who are in good shape already should be encouraged to work harder, faster, or farther than their less-able peers. Furthermore, students complaining repeatedly of fatigue or continued muscle soreness from the regular three- or four-sessions-per-week pace should scale back the frequency of their yongmudo activities in order to increase their recovery time. Students should recognize the limits of their physical ability, be it a limit imposed by lack of endurance, cardiovascular capacity, strength, or flexibility. Once these obstacles have been identified, an instructor can then counsel

the student on means towards achieving a more fit condition wherein they are able to fully participate in all activities appropriate to their rank and ability level.

Warm-up Exercises

A good 10 to 15 minutes should be devoted to warm-up exercises. These exercises fall into two distinct categories: joint rotations and aerobics. Joint rotations are simple, low-intensity movements intended to lubricate the joints by redistributing the *synovial* fluid, a clear or pale yellow liquid derived from blood plasma and contained by cartilaginous membranes in the soft tissue between the hard bones of each joint.

The most obvious methods of conducting these rotations are to work through the joints from head-to-toe, and extremities to center, reversing of either or both of those approaches on occasion for variety's sake. Rotations should be conducted both clockwise and counterclockwise, using large, gently sweeping motions for five to ten seconds per joint. Under cold temperature conditions, compression of the cartilage resulting from these motions will result in the release of synovial fluid from the cartilage cells, consequently facilitating smoother motion of the affected joints.

Since many yongmudo exercises utilize the full body, the safest approach is to devote enough time to complete a full set of joint rotations regardless of the particular topic of the day. Under time constraints or faced with warmer weather conditions, joint-rotation activities might be folded into the day's aerobic warm-ups to conserve time. For example, students might rotate their arm and shoulder joints while jogging

around the room. Table 4 lists the joint groups targeted for rotation referenced against the basic yongmudo skill categories previously listed in Table 1.

Table 4: Joint Rotations and Basic Yongmudo Techniques That Activate These Joints.

Targeted Joint / **Basic Technique**	Neck	Shoulders	Elbows	Wrists, Hands & Fingers	Trunk & Spine	Hips	Knees	Ankles, Feet & Toes
Holds, Chokes & Grabs								
Balance-Breaking								
Blocks & Parries								
Break-Falls & Rolls								
Breathing Exercises								
Hand Strikes								
Kicks								
Pressure Points								
Stances & Movement								
Sweeps & Reaps								
Throws								
Wrist & Joint Locks								

Legend — Strong Correlation | Medium Correlation | Weak or No Correlation

As warm-ups, aerobic exercises are primarily intended to increase heart rates and raise the core body temperature—that is, to "work up a sweat." Since

the viscosity of synovial fluid decreases with increasing temperature, warm joints can be expected to move more smoothly than cold joints. Furthermore, the increase in blood flow commensurate with a higher heart rate corresponds to a greater transport of oxygen to the body,[2] fueling our muscles and recharging them for additional activity. Finally, as we continue to exercise, this additional blood flow also transports heat from the muscles to the skin, where this excess heat can be lost through radiation and the evaporative cooling achieved by sweating.

One misconception about aerobic activity is thinking that it be a high-intensity activity. Moving from low- or medium-intensity exercise into high-intensity workouts crosses over from aerobic exercise (characterized by the oxygen-facilitated breakdown of ATP, adenosine triphosphate, in the muscles) to anaerobic exercise, which is characterized by the consumption of glycogen within the muscles and the subsequent accumulation of lactic acid that leads to "muscle burn." Rather than pushing students into the burn zone, aerobic warm-ups should be designed to promote cardiovascular fitness.

Inasmuch as many activities in yongmudo are not performed at high intensity (blocks and strikes, or wrist techniques, for example), students who desire to build up aerobic endurance might adopt additional training routines outside of class, such as those involving swimming, distance running, or bicycling. Likewise, because increased anaerobic capacity is desirable in situations such as sparring, warm-ups can be altered or lengthened to include activities such as wind sprints or running stairs in order to better condition the fast-twitch muscle fibers needed for

such sustained high-output situations.

In order to break the range of aerobic warm-up exercises into manageable discussion groups, I have classified them as follows:

- Group 1: stationary solo exercises;
- Group 2: solo exercises that involving moving around or across the room;
- Group 3: partner exercises; and
- Group 4: games or relays for an entire group.

Only solo exercises (the first two groups) will be addressed within the current paper so as to keep this discussion manageably short. Tables 5 and 6 list numerous exercises for the solo exercise groups, cross-referenced against those basic yongmudo skills for which these activities would be an appropriate warm-up. Please recall that the total duration devoted to practice these exercises might be 25 minutes at the longest, but is typically only 10-15 minutes long.

Of course, the degree to which any of these warm-up exercises supports a particular yongmudo skill or technique is certainly open to argument, and will depend on many things in practice, such as the ability and enthusiasm of the students, to name but two such factors. The following items should be taken as given for interpreting the correlations below. First, with the sole exception of balance-breaking, assume that the students will deliver the techniques described, rather than being recipients of the same. For balance-breaking, it's reasonable to suppose that the student's development of better balance (through coordinated warm-up exercises) will lead to better skill at both retaining his or her own balance and breaking the balance of an opponent. Secondly, in the case that an

exercise is not commonly known, the text includes a longer description. In most other cases, the text gives only brief commentary, suggestions, or description.

Stationary Solo Warm-up Exercises

Table 5 (which has been split into three parts to accommodate the layout of this publication) describes warm-up exercises best performed by students working alone and moving in place. Most of these exercises are intended to last only a few minutes at most, so choose those that match or complement the day's topic.

While ***running in place*** (and running in general) might be denigrated as boring or a waste of time when compared to more complicated exercises, there's much to be said for simplicity, complementarity, and contrast. Furthermore, any number of discrete yongmudo skills can be easily dropped into such a simple warm-up. For example, an instructor might say to the class, "Run in place at a steady pace, but drop into a break-fall of your choice when I kiyap. After you fall, get back up with awareness and resume running as soon as possible. Don't forget to kiyap when you hit the mat! Ready? Set? Go!" Want to give the upper ranks a bigger challenge? Have them run in place while holding a throwing dummy or heavy punching bag!

Hand-tapping patterns are coordination-building exercises that range from simple ("tap your heels on alternate sides as you run" or "hold your hands down at a 45-degree angle and lift your knees so as to tap your palms") to complex ("while running, tap the top of your head, same-side shoulders, same-side hips, same-side knees, then cross as you come back up—opposite

knees, opposite hips, opposite shoulders, and repeat, alternating same-side and cross until I say 'stop'!").

Table 5.1: Stationary Solo Exercises and the Basic Yongmudo Techniques they support.

Exercise Name or Description / **Basic Technique**	Running in Place	Running in Place w/Hand-tapping	Hopping in Place	Plyometric Jumps	Jumping Jacks	Jumping Rope
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						

Legend	**Strong Correlation**	**Medium Correlation**	Weak or No Correlation

Note that, in general, most students will find hopping to be far more tiring than running; accordingly, hopping episodes should be somewhat foreshortened. Likewise, ***plyometric***[3] ***jumps*** are even more exhausting. Explosive squats (also known as

Sergeant Jumps) are one example of such an exercise. Here's the drill: Start by reaching upward, rising onto the balls of the feet. Then drop suddenly into a squat position and immediately rebound upward with arms reaching for the sky, jumping as high as possible. Repeat between ten and twenty times, but stop sooner if need be. One variations suggests performing this jump while facing a wall, and changing the sky-reach to a push off the wall (adding a balance challenge to the landing). For an alternate sort of challenge, substitute a back kick, scissors kick, axe kick or knee-lift kick for the simpler sky-reach. Many trainers caution that plyometric exercises should be performed with care. To quote Brad Walker, "[Plyometrics] are an advanced form of athletic conditioning and can place a massive strain on un-conditioned muscles, joints and bones,"[4] so be careful not to over do it with beginning students!

Having warned about the danger of plyometric exercises, it is fair to say that they're not all bad. Both ***Jumping Jacks*** and ***jumping rope***, in all their many varieties, depend on plyometric rebound to some extent. And except for the very real possibility of tripping and falling, or the less worrisome possibility of autostrangulation, jumping rope is hardly dangerous for a reasonably fit individual.

Burpees and ***Push-up Burpees*** are other examples of Plyometric Jumping exercises, both commonly used in armed forces fitness training as well as in traditional calisthenics classes. A burpee is performed as follows: Begin in standing position with hands on hips. Extend arms out horizontally and squat. From squatting position, place arms on the ground about shoulder-width apart and jump legs backward to reach

a plank or push-up position. Then keeping the hands on the ground, hop forward, pulling the legs back in under the shoulders to regain a squat. Finally, extend arms out horizontally, stand up, and then rest hands on hips. Ten to twenty vigorous repetitions should be pretty tiring for most students. For more of a challenge, push-up burpees require addition of some sort of push up while in the lower position.

Table 5.2: Stationary Solo Exercises (continued).

Exercise Name or Description / **Basic Technique**	Burpees, Push-up Burpees	Csárdás & Flying Cossacks	Sit-ups & Crunches	Crouching Kicks	Flutter Kicks	Push-ups, Dips & Plank Exercises
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						
Legend	**Strong Correlation**		**Medium Correlation**		Weak or No Correlation	

Csárdás (also known as *Hopping Cossacks*)[5] are

challenging without considerable practice. From a lateral squat position (ie., squatting with legs spread open by 90 degrees or more) with arms crossed over the chest, kick out one leg and the opposite arm (one-legged version). The two-legged version is also known as a *Flying Cossack*, and typically begins from a standing jump rather than a lateral squat. Another variation suggests holding the arms out parallel to the legs, with hands clapping against the feet at the apex of each jump. Don't do too many of any of these exercises unless you have quads of steel!

Given that entire books have been written about the well-known exercises, ***Sit-ups*** and ***Crunches***, there's no need to go into much additional detail here. On the other hand, remember that building core strength by toning the abdomen will help almost all of us perform better on all sorts of strength-based tasks. Can't think of which sort to try? How about picking one of these: circling, twisting, bicycle, lateral, single- and double-leg lifts, alternate- (scissor-) leg-lift, reverse, spread-eagle….

C***rouching kicks*** are another great way to help build core strength while simultaneously exercising the glutes and leg muscles. Some variations to consider: from doggie position on hands and knees are back, side, hook, roundhouse, and knee-lift (doggie) kicks. From crab position (hands and feet on the floor, butt down, face up), try front, scoop, crescent, or axe kicks.

Flutter kicks are quite similar, but start from a relaxed crunch position instead of a crouch. Place the hands under the buttocks and tighten the stomach to pull the legs six to eighteen inches up off the ground. Then with knees slightly bent, try a free-style

swimming flutter kick at a medium cadence (as if immersed in water) for as long as your stomach muscles can hold out. Flutter kicks are great for getting the hip flexors into better shape, which will in turn lead to faster and more powerful kicks.

Push-ups, ***Dips*** and ***Plank Exercises*** have been grouped together based on the rough similarity in starting body position, though they certainly work very different sets of muscles! As a common part of many regular workout routines, they are presumably familiar enough that no additional explanation is necessary.

Table 5.3: Stationary Solo Exercises (continued).

Exercise Name or Description / Basic Technique	High & Low Shoots	Squats & Plies	Forward & Reverse Lunges	Agility Drills	Shadow Sparring	Shadow Fit-Ins
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						

Legend	Strong Correlation	Medium Correlation	Weak or No Correlation

Surprisingly, the ***High Shoot*** and ***Low Shoot*** exercises we occasionally practice in preparation for mat work and free sparring are not to be found on the Internet under those names. Presumably, both exercises have been adopted from wrestling, where similar exercises have been performed under a variety

of names for the past few centuries.[6]

For the high shoot, begin by getting into chimp position, face down on all fours, hands and feet spread comfortably, then unweight the right hand and step or swing the left leg under your body while reaching over and back with the right hand and twisting the trunk so that you end up pivoting with your face and stomach up, supported once more by both hands and feet, in a crab-position, and turned approximately 90 degrees counter-clockwise from the starting orientation. Next, reach over and across with the left hand while twisting with the trunk and stepping under and through with the right foot. This should return you to chimp position, but turned 180 degrees from the start. Repeating the steps but interchanging left and right as described above (ie., leading with the opposite side) returns you to exactly where you started, and completes one repetition.

Asking beginners to perform five fairly slow reps is reasonable, as the exercise requires a fair amount of coordination; more advanced students might be required to do 10-20 reps as fast as possible.[7] As students achieve proficiency, the starting point can be varied to dog (or referee's) position (in a spread stance on hands and knees), or even turtle position (in a balled up position on hands and knees. Beyond practicing agility in the turnover, students should be encouraged to begin with an explosive hip-pop (the better to throw off an opponent in superior position) and to continue immediately from crab position back to the face-down position of choice (all the better for mounting a counter-attack).

Like crunches, ***squats*** and ***lunges*** come in several forms, and sometimes occur in combination with other

calisthenics to create new, more difficult exercises, such as the previously–noted burpee. The ***plies*** (from French, "to fold"), a common ballet exercise, are also referred to as lateral squats.[8]

Agility drills come in many flavors, beginning with traditional Irish step-dancing based on a cross-shaped five-point patter-step. More recently, Greg Shepard suggests a multiplication-sign-shaped five-point pattern for his Dot Drills,[9] while the United States Tennis Association has standardized on a regular hexagon. No matter the specific geometric design, the goal for all agility drills is to train an athlete to be able to move quickly and accurately from one stance to another—exactly the sort of motion needed for sparring. Plenty of information regarding these drills is available for free on the Internet.[10]

As an integrative exercise, ***shadow sparring*** deserves to be more popular as a warm-up. The most important instruction to share with your students when beginning this type of practice is that they should be working on specific moves against their imaginary opponent. For beginning students, this means suggesting the exact techniques or combinations, such as showing particular blocking or striking sequences instead of merely suggesting "90 seconds of hand techniques." Students should be encouraged to use this drill regularly in their practice outside of class. Pantomiming sixteen-step exercises at home is a great way to overcome the hurdle of conscious memorization.

Of course, the ***shadow fit-ins*** of the last group are really just shadow sparring, but re-oriented towards practicing the throwing techniques that have been adopted into standard yongmudo practice. Resistance

can be added to these fit-in exercises by using a throwing dummy, or by wrapping a belt or elastic band about a sturdy pipe or other fixed object and then pulling at the ends as if they were the arms or lapels of a live opponent.

Moving Solo Warm-up Exercises

Table 6, presented in four parts, describes warm-ups best performed by students working alone and moving from one place to another. With regards to the repetition of basic elements in the table columns (such as listing eleven kinds of running), the intent is to review some of the many variations on this theme. Finally, because these exercises are likely to be a bit better known than those in the previous table, the explanatory paragraphs the follow are more concise than the prior set, and descriptions of some items have been omitted altogether.

Note that many of these exercises can be combined with one another to increase the challenge or complexity of the warm-up. One nice reason to mix in some of the stranger runs (like running on the outside knife-edge of the foot) is to help students develop better body awareness and muscle control skills that will presumably carry over to benefit other techniques. In the preceding example, the goal might be to induce better form during side kicks. Another means of posing a challenge is to create circuits composed of items from the stationary group (Table 5) interspersed with activities from the group above (Table 6). Circuits can generally be set up easily and without significant advance planning. Circuit work can be timed (moving from station to station) or free (moving whenever the assigned task has been completed); both approaches

are valid. Sequencing of stations is important in order to allow recovery of the major muscle groups used at any particular station. One simple method of sequencing is to follow a "push" exercise with a "pull" exercise so that similar muscle groups are used in opposing fashion. Another method is to work different muscle groups altogether at successive stations.

In reinforcement of self defense notions, ***sideways slide-step running*** ought to include instruction to hold the arms in a defensive, ready-to-block position. Both head and arms can be oriented forward (as if in pursuit) or backwards (as if in defensive flight).

The ***Carioca run***, also known as *grapevine stepping,* consists of a sideways run using alternating cross-over and cross-under steps. That is, with each step, the back leg is brought forward so that either the foot crosses over in front of the other foot or it crosses behind the other heel. For more of a challenge, try doing these while maintaining good balance on the balls of the foot, or while bringing the knees up as high as possible on each front crossing-step.

Rather than having students simply ***back-pedal*** across the room, an alternative drill that will help build agility and quickness is to ask them to vary the the direction and type of steps being used as they move. For example, alternating three running steps forward with two back-pedaling steps. Other variations are easy to construct: alternating *slide-step* and *carioca* running, for example, though it pays to practice these exercises a few time in advance to make sure that the footwork isn't too difficult!

Table 6.1: Moving Solo Exercises and the Basic Yongmudo Techniques they support.

Exercise Name or Description / **Basic Technique**	Run, normal	Run, Sideways Slide-step	Run, Carioca	Run, Back-pedal	Run, Stiff-Legged	Run, Knees Up (Drum Majors)
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						
Legend	**Strong Correlation**		**Medium Correlation**		Weak or No Correlation	

Similarly, another method of modifying these drills is to include quick direction changes, as might be useful during sparring. Single-leg ***drum majors*** (repeatedly raising the same leg, rather than alternating leg knee lifts) can be linked together so that the participants turn towards the supporting leg, ultimately traveling in a circle. This sort of exercise does wonders to build the quads and to develop the

reflexes necessary to deliver a quick counter-kick. In field sports, exercises that focus on direction-changes are commonly referred to as *cutting* drills.

Table 6.2: Moving Solo Exercises (continued)

Exercise Name or Description / Basic Technique	Run, Bounding	Run, Glute-kicking	Run, Varying Foot Placement	Run, Boxer's Sprint	Run, Stairs	Power Skipping
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						

Legend	Strong Correlation	Medium Correlation	Weak or No Correlation

Bounding offers an alternative to jogging that will quickly help the leg muscles stretch and warm up, as the exaggerated steps needed to produce this motion natuarlly induce the participant to move the legs throughout the entire range of motion.

For yet another means of modifying standard

movement drills, students might be instructed to ***vary their foot placement***, running on the outside knife edge of the foot, perhaps, or keeping the heels off the ground as much as possible.

The ***Boxer's run*** consists of alternating periods of jogging and sprinting. As with other combination drills, the time or distance for each can be fixed or left free for student choice. And there's no reason to stop with the jog/sprint combination. A common basketball drill is to backpedal across the court (defense) then sprint forwards back to the start (offense) and repeat—certainly this skill applies to sparring just as well!

Running the stairs is great exercise, but because exercises on the stairs are so intense, most participants will quickly zoom through the aerobic zone and cross over into anaerobic exercise. This can be good or bad…it depends on your intent in assigning this practice. An interesting exercise mentioned in Shepard's text is the *down-stairs sprint*—descending a flight of steps as fast as possible (with knees high for extra torture). It is purported to be very good at building an athlete's ability to accelerate explosively—the descent helps by building in a plyometric bounce,[11] and the muscles learn to react faster and faster to the wish to step high.

Power skipping is a faily low-intensity plyometric exercise. Similar to *bounding*, it works to strengthen the hip flexors and calf muscles by exagerating the motion of a regular skip step. To perform this exercise, initiate a skip-step by bringing one knee up towards the chest while swinging the arms upwards. Complete the skip by hopping off the support foot, swinging the arms downwards and crouching into a single-leg squat

as the support leg touches back down to the ground. Repeat, alternating legs. *Backwards skipping* is another alternative; mixing it in to a workout set will help build complimentary leg muscle groups.

Because they are used so commonly, the numerous variations of run plus additional action for corners or turnarounds, such as touching both hands to the mat, jumping, spinning, performing assorted break-falls, and so on, have been omitted from Table 6. Which is not to argue that these omitted drills should be discontinued, only that they are too familiar to warrant further discussion. Why not breathe some fresh air into warm-ups by using a figure-eight or zigzag pattern instead of simply looping about the perimeter of the room? Or set out a row or circle of 6–12 small obstacles (such as paddles or shields) so that the students can be instructed to follow a weaving pattern for their run (or hop or two-foot jump).

Moving by ***hops***, ***squats*** or ***lunges*** are yet further means of conditioning various leg muscles. As much as we might like to push ourselves hard, it's a good idea with any of these more difficult exercises to remember that it's perfectly OK to reduce the intensity by decreasing their pace or by substituting less strenuous exercises for those first attempted. After all, the point is mainly to warm up quickly in order to be ready to practice martial arts, not to exhaust oneself so that the following martial arts practice is ineffectual.

Hopping exercises can be augmented through use of a step. Beginners might utilize a low step, say four to six inches high; more gung ho practitioners might work with a ten to fourteen inch step. As with running exercises, speed hopping will quickly push students to

exhaustion; the trick then is to guage how much is just enough practice. Timing such sessions ("how many jumps can you complete in the next thirty seconds?") is one means of avoiding that problem.

Table 6.3: Moving Solo Exercises (continued)

Exercise Name or Description / **Basic Technique**	Hop, Both Feet (Mule Kick)	Hop, Just One Foot	Hop, Alternate Feet	Hop, Skip & Jump	Hop, Lateral	Squat-walking
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						

Legend	**Strong Correlation**	**Medium Correlation**	Weak or No Correlation

An additional agility component can be built into hopping exercises by introducing rotations, either during the hop, or with a following step. For example, start with toes almost touching the step. Hop up, aiming to rotate exactly 180 degrees, and land with

toes close to, but not overhanging the edge of the step. Repeat the turn on the hop down. In both cases, the hop should end via touchdown on the ball of the foot.

Yet another variation on hopping drills that build agility are the numerous jump rope exercises: single leg hop, double leg hop, side-to-side skip, double hop, et cetera. And while martial arts belts are not optimal for jumping rope, they do make acceptable substitutes!

Table 6.4: Moving Solo Exercises (continued)

Exercise Name or Description / Basic Technique	Lunge-walking	Knee-walking	Chimp or Giraffe Walk	Horse or Dog Walk	Crab Walk	YMD Techniques, across the room
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						

Legend	Strong Correlation	Medium Correlation	Weak or No Correlation

The various ***animal walks*** are named in emulation

of the titular animals' characteristic gait. Chimpanzees tend to move with a rolling gait on bent arms and legs. Giraffes, on the other hand, move with their spindly legs held relatively stiff and straight. In both drills, the practitioner has hands and feet on the ground, whereas horse or dog walks occur from the hands and knees. Of course, crabs really walk side-to-side, but our arms/shoulders aren't generally strong enough to do that safely, so we'll stick with crab-walking forwards (feet first) and backwards (head first). Even then, crab walking has the potential for generating shoulder or tricep injuries if the students are not in good condition, so suggest that they take it slowly instead of trying to race. Likewise, since it's fairly easy to overload the muscles of the forearm, most of these animal walking exercises run the risk of causing wrist injuries; when in doubt, the best counsel is to go slow!

Finally, moving across the room while walking or practicing any of the aforementioned motion exercises while repeatedly performing yongmudo techniques such as strikes, blocks, pantomime fit-ins, break-falls or rolls is an excellent way to reinforce the latter skills by practicing them in a slightly altered setting (moving, rather than stationary) in order to increase the challenge for our beginning students and to help all of us continue to make the patterns of motion required to execute these yongmudo techniques more natural and instinctive.

Stretches

Many humorous epigrams have been composed regarding the nature of yongmudo, such as "Better Living Through Pain" and "I Hurt, Therefore I Am," to name but two examples. Given that pain is an unavoidable component of yongmudo practice, it is incumbent upon beginning students of yongmudo to become better acquainted with their bodies so as to avoid injury. Performed naturally, like a cat or otter awaking from a nap and then commencing to play, stretching affords student a simple and repeatable means of developing awareness for the pain-free range of motion of their joints. In addition to acquainting students with normal ranges of motion, stretching also helps promote relaxation through release of muscle tension. Moreover, relaxed students are less likely to suffer muscle strain injuries and more likely to be able to follow the examples of the instructor once the class moves on to the main instructional topic of the day.

Types of Stretches

As with other forms of exercise and athletic training, stretching has been the subject of fads that come and go, and numerous reference books are available should you be interested in pursuing further knowledge of the techniques that will be examined in the next few pages; the bibliography includes brief reviews of several such texts. When introducing stretching to martial arts students, it is useful to differentiate between a simple easy stretch, a developmental stretch, and a drastic stretch.[12] Both an easy stretch and a developmental stretch should be pain free. An easy stretch stops when you feel mild

tension, which should relax as you hold the stretch for ten to fifteen seconds. To perform a developmental stretch, try moving a fraction of an inch further after encountering mild tension. If the tension fails to relax, or if the stretch becomes painful, ease off, for this is the realm of the drastic stretch, which can result in muscle tears or other soft tissue damage. For example, young adult males who have not previously practiced martial arts may find it quite difficult to achieve any of the various leg splits. For the motivated student, gradually increasing flexibility in the hips through careful practice of developmental stretches can pay off in acquisition of the flexibility necessary to achieve one or more of the leg split positions, but a hurried approach can lead to long-lasting hamstring injury or worse. The main point here is to encourage students to go easy; most texts agree that stretching injuries can occur within three to six seconds of a poorly chosen position.

Correspondance of Common Stretching Exercises to the Canonical List of Basic Yongmudo Skills

Table 7 compares the basic yongmudo skills list against eighteen common stretches deemed particularly important for this art. Brief descriptions of some of the stretches follow the table. Note that while the table contains a mixture of static and dynamic stretches, it is the dynamic stretches that will be more directly applicable to yongmudo, since the active motion they involve is to prepare for and mimic the similar motion of various yongmudo exercises. Shading in the table follows the same convention here as elsewhere.

Table 7.1: Common Stretches and Basic YMD Techniques.

Exercise Name or Description **Basic Technique**	Shoulder Stretch	Standing Shoulder, Trunk & Spine Twist	Hand, Wrist & Elbow Stretches	Overhead Arm Stretch	Neck Rolls	Bridge Stretches (Face Up/Face Down)
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						
Duration (sec)	8–10	8–10	10–12	15–20	8–10	20–30
Repetitions	4	2	4	4	2	1

Legend	**Strong Correlation**	**Medium Correlation**	Weak or No Correlation

Table 7.2: Common Stretches (continued).

Exercise Name or Description **Basic Technique**	Zazen Quad Stretch	Butterfly Hamstring Stretch	Sitting Shoulder, Trunk & Spine Stretches	Back Rolls	Asian Sit-Squat	Side Kick Stretch
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						
Duration (sec)	20–30	20–30	8–10	2–4	20–30	15–20
Repetitions	1	1	2	10	1	2
Legend	**Strong Correlation**		**Medium Correlation**		Weak or No Correlation	

Table 7.3: Common Stretches (continued).

Exercise Name or Description / Basic Technique	Hurdler's Splits	Standing Front Splits	Sitting Front Splits	Sitting Hamstring Stretches	Hip Flexor Stretch	Foot & Ankle Roll
Holds, Chokes & Grabs						
Balance-Breaking						
Blocks & Parries						
Break-Falls & Rolls						
Breathing Exercises						
Hand Strikes						
Kicks						
Pressure Points						
Stances & Movement						
Sweeps & Reaps						
Throws						
Wrist & Joint Locks						
Duration (sec)	10–15	10–15	20–30	10–20	10–15	10–15
Repetitions	2	2	1	2	4	4

Legend	Strong Correlation	Medium Correlation	Weak or No Correlation

Most of these stretches should seem familiar. Remember that the ***shoulder stretch*** can be done side-to-side (twisting about the body) or up-and-down (rotating about the arm). The ***Zazen Quad stretch*** is named after the standard Zen sitting meditation position. In the ***Asian Sit-Squat***, the stretcher starts in a standard forward squat, and continues to ease downwards until "sitting" with the backs of the upper legs pressed against the top of the calves on the lower leg. The feet should remain flat on the ground. New students commonly have trouble balancing in this position, tending to tip over one way or another; regular practice will ameliorate that problem! With regards to the various ***splits***, students should be encouraged to work on flexibility without pushing themselves so far that they become injured. Achieving splits is the goal, not the starting point! ***Hip Flexor Stretches*** can be performed from a variety of starting posistions, for example, stretching one or both legs while lying either face up or face down, possibly with assistance from a belt or resistance band. Alternately, a single leg stretch may be performed from a kneeling lunge position. Similarly, ***foot and ankle rolls*** should be tried in both directions for each limb.

Detailed Examination of Several Stretching Exercises

Following are four somewhat more detailed examples selected (and paraphrased) from several of the reference texts. Inclusion of these particular exercises is not meant as an endorsement of the selected texts, nor of the stretches, but is done in order to give a flavor for the activities contained within each book, and generally within this topic area.

Wrist Flexor Stretching Exercises

First are stretches #40 and 41, respectively, the ***Wrist Flexor Palm Down*** and the ***Wrist Flexor Palm Up***, drawn from Wharton's Stretch Book.[13] Both stretches result in contraction of the extensor muscles along the top of the hand. The basic instruction for each is quite similar: Stand upright and straight, with one arm held out front at approximately an 8 o'clock position (12 o'clock being up and 6 o'clock being down). Slowly flex the hand up (#40) or down (#41) at the wrist until you encounter tension, hold the flexed hand in place with the other hand by placing the thumb across the back of the flexed hand and gripping across the meat of the palm with the fingers.

For the upward stretch (#40), final hand position in the range of 8 to 10 o'clock indicates a relatively stiff joint (a "red zone" in the Wharton's terminology); from 10 to 11 o'clock is moderate flexibility ("yellow zone"); 11 to 12 o'clock is good flexibility ("green zone") and 12 to 1 o'clock is *hypermobile* flexibility ("blue zone"). Similarly, for the downward stretch (#41), final position in the range of 8 to 7 o'clock indicates a relatively stiff joint ("red zone"); from 7 to 6 o'clock is moderate flexibility ("yellow zone"); 6 to 5 o'clock is good flexibility ("green zone") and 5 to 4:30 o'clock is *hypermobile* flexibility ("blue zone").

The Quadraplex Stretch

Next, a stabilization stretch, ***the Quadraplex***, comes from Aaberg's tome, ***Strength, Speed and Power***.[14] For this dynamic stretch, start by putting the hands and feet flat on the ground while bending at the waist, similar to the yoga position known as *down-facing*

dog. Simultaneously lift and hold opposite limbs, for example, the left arm and right leg, holding each out and as high as possible while balancing on the two remaining extremities. Hold this position for up to 30 seconds, then switch sides and repeat.

The Face-up Bridge Stretch

The third example, another dynamic stretch, is ***the Face-up Bridge***, taken from Wallace's ***Dynamic Stretching and Kicking***.[15] Wallace recommends this stretch primarily for strengthening the neck and spine, recommending five to ten repetitions. The upper and lower abdominal muscles also accrue benefit from this stretch, as do, to a lesser extent, the lower back and upper shoulder. Wallace warns that beginners need to start out slowly, being careful not to overarch or over twist. Some other books label this stretch potentially dangerous, because a good deal of body weight is supported by only the neck. Wallace shows this stretch in five sequenced photographs. Begin by lying flat on your back with knees bent and feet flat on the ground. Next, arch upwards by pushing up from the pelvis until the legs are bent about 90 degrees at the knees and a portion of your body weight has shifted onto the crown of the head. If need be, the arms can be held out as balance bars. Carefully roll towards the right, and then the left, stretching the neck while maintaining the pelvis-up position attained previously. Return to the center and, if possible, raise the pelvis higher so that you are in full arch. Hold and then release slowly.

the Shoulder Circumduction Stretch

The final example is another dynamic stretch, ***the Shoulder Circumduction stretch***, found in Mattes text,

Active Isolated Stretching, the Mattes Method.[16] Start by leaning the body forward about 45 degrees at waist from a regular stance, then flex knees slightly and tighten the stomach muscles. At this point the arms should hang "like wet noodles." Begin making arm circles, of small diameter at first, then larger and larger. Complete 10 to 15 reps each direction.

The warm-up period ought to conclude with these sorts of stretching activities; primary instruction then takes place and fills out the remainder of class time. Given a typical vigorous workout, five to ten minutes should be set aside for additional stretching and somewhat milder aerobic "cool-down" activities at the end of class.

Cool–Down

Cool down activities are necessary after any period of intense exercise, regardless of the type of workout. These activities help to gradually slow the heart rate and prevent the pooling of blood in the extremities, which can accentuate the effects of *hypotension*, the drop in blood pressure that occurs as the heart relaxes. In mild cases, hypotension often results in symptoms of lightheadedness or dizziness. Less commonly, *syncope* (fainting) or seizures may occur. As hypotension is accentuated by the decrease in blood volume that accompanies the excessive sweating of an intense workout, attention to rehydration is a must! Following such extreme exertion sessions, students should walk, stretch or perform low-intensity calisthenics for five to seven minutes in order to abet the cool down process. Three simple physiological signs to look for that mark the end of the cool-down

period are the cessation of heavy sweating, reassertion of the body's normal breathing rhythm, and the decrease of the heart rate to less than 100 beats per minute.

Conclusion

This paper has presented an overview of warm-up and preparatory exercises for the typical yongmudo class, focusing separately on why such activities are necessary, how samples measure up against the needs of primary yongmudo skills, and detailing these examples where additional discourse was necessary for clarity's sake. As stated more than once within the body of this paper, the intent here was to provide an overview of such activities, and not to endorse or denigrate any particular exercises. Following an introduction that discussed how basic yongmudo skills lead into more advanced yongmudo techniques came a short section on general principles of exercise and fitness training. The body of the text then appears as assorted and sundry warm-up exercises are reviewed, from joint rotations to stationary calisthenics to movement exercises, finally concluding with an assortment of stretching and cool-down procedures. My hope is that other martial artists will find the information here useful within the daily class context, and towards that end, the concluding bibliography contains brief reviews of the reference material used in creating this paper.

Bibliography of Reference Texts

The texts noted below were used as reference for this paper. Brief comments follow each bibliographic entry to guide the reader who might be interested in purchasing one or more of these books.

Aaberg, Everet H. *Strength, Speed and Power*. Alpha Books, 2002, ISBN 0028643321

This text has plenty of good training information, particularly on improving strength and speed (as one might guess from the title!), but it also does a good job covering related topics such as active or dynamic stretches, agility building and exercises to develop better balance. Aaberg particularly emphasizes that developmental training for strength and speed must be married to the particular needs of an athlete's sport. He emphasizes further that even in a particular sports category, careful attention must be paid to the athlete's role. For example, a defensive back in football may benefit more by focusing on improving his backwards and lateral acceleration (the better to react to an opposing team's quarterback) rather than working on his forward acceleration to keep up with the opposing receivers). Unfortunately for us in yongmudo, Aaberg discusses only traditional sports (tennis, soccer, football, swimming, et cetera), neglecting specific mention of the needs of the martial artist.

Anderson, Bob. *Stretching*. Shelter Publications, 3rd Edition, 2000, ISBN 0936070226.

First published in 1980, Anderson's text is deservedly a popular one, covering the basics in sound

and forthright manner with plenty of great illustrations. Some folks might argue that the work is a bit outdated, omitting mention of newer, more 'scientific' techniques such as isometric stretching, active-isolated stretching, ballistic stretching, Proprioceptive neuromuscular facilitation (PNF) stretching and so on.

Appleton, Bradford D. *Stretching and Flexibility, Everything You Never Wanted to Know*. version 1.42, 1998.

Available widely via the Internet, the author's current iteration of the document can be found at http://tinyurl.com/e65wu. Although in many respects, it lacks detail, this brief reference (about 70 pages) is a terrific place to start learning about stretches and stretching, especially considering that it costs nothing to acquire. The range-of-motion section is a particularly useful read for developing a sense of one's own overall flexibility compared against other normal adults.

Bacso, Stanley and Christopher Oswald. *Stretching for Fitness, Health and Performance*. Sterling Publishing Co., NY, 2003, ISBN 0806909854.

Written by two chiropractors, this book gives an overly pessimistic view of flexibility, suggesting that nearly all of the stretches performed in martial arts are dangerous and liable to cause injury. Moreover, as the text covers only static stretches; anyone interested in increasing their flexibility and range of motion will need to look elsewhere for useful information. On the positive side, the authors agree with Anderson and others about the utility of gentle static stretches, to be

maintained for 20–30 seconds in order to develop nerve and muscle memory for the stretch.

Foran, Bill, editor. *High Performance Sports Conditioning*. Human Kinetics, 2001, ISBN 0736001638.

While the sales blurb on the back cover proclaims that this text "will be the training bible for coaches and athletes for many seasons to come", I found the compendium to be relatively lacking in new, useful and practical advice for my own training. For example, Nikos Apostolopolous' article, Performance Flexibility, Chapter 3, merely reiterated advice given in other books on stretching, that high intensity stretches can lead to micro tears in muscle tissue within the first three to six seconds of a stretch (p.51-52), and that the best solution for avoiding injury due to tight muscles is to stretch at low intensity for relatively long periods (up to 60 seconds). On the positive side, Chapter 13, Creating Conditioning Drills, had some interesting suggestions, even though the emphasis was on traditional sports rather than martial arts. Likewise, Mark Verstegen's article, Coordination and Agility, Chapter 8, included several good ideas for agility and attention building exercises which were incorporated into Table 5.

Huang, Chungliang Al & Jerry Lynch. *Thinking Body, Dancing Mind, Taosports for Extraordinary Performance in Athletics, Business, and Life*. Bantam, 1994, ISBN 0553373781.

This text contains approximately one hundred mental exercises for focusing the mind, grouped around various aspects of athletic training and the

obstacles faced by athletes. Each problem is generally resolved by an appeal to the Tao Te Ching and a suggestion how one might visualize success. I was hoping to find some good mental activities to share with other students here, but the overall tone was a bit too fluffy and new agey for me.

Mattes, Aaron L. *Active Isolated Stretching, the Mattes Method*. Aaron Mattes Therapy, 2002, ISBN 0965639614.

As originator of the AIS method, Mattes has plenty to say regarding why his text is better than the competition (see his website, www.stretchingusa.com for testimonials, as well as the expected catalog of products—the wall charts of upper and lower body stretches might be a useful addition to a martial arts room décor!). And although there's plenty of good material here for athletes, a larger chunk of the exercises in this text seem to be oriented towards physical therapists.

Shaw, Scott. *Taekwondo Basics*. Tuttle Martial Arts, 2003, ISBN 0804834849.

While this text is likely a bit too lean for the experienced martial artist, a beginner (even in yongmudo!) will find plenty of useful information to supplement the knowledge they acquire in class. Several chapters of this new text look particularly interesting. Chapter 13 covers the basic leg stretches (front, side-kick and so on), and Chapter 14 discusses ways to build up cardiovascular endurance for sparring matches. For those looking to improve their kicks, Chapters 17–25 cover a wide variety of kicking

and sparring drills.

Shepard, Greg. *Bigger, Faster, Stronger*. Human Kinetics, 2003, ISBN 0736048146.

Greg Shepard has been building an expanding empire of fitness training, BFS, since the mid 1970's. While the core focus of this text is on weightlifting, it contains several interesting chapters (11–14) on flexibility-, speed- and agility-building exercises. For example, one section covers the use of dot drills (borrowed from Football) to build explosive speed and agility—a skill quite useful in sparring, no doubt.

Sigmon, Chip. "Agility Drills." *FIBA Assist Magazine*, 17 2005, pp. 59–63.

Sigmon, Chip. *52-Week Basketball Training*, Human Kinetics Publishers, 2003, ISBN 0736045147.

Although Sigmon's article focuses on drills for Basketball (as might be easily guessed from the second reference!), his suggestions can easily be generalized to martial arts as well as other sports. A pdf of the article is available online from http://tinyurl.com/25p3qj; furthermore, the article is apparently excerpted from Sigmon's book, though I was unable to find the latter text locally for review.

Stark, Dr. Steven D. *The Stark Reality of Stretching: An Informed Approach for All Activities and Every Sport*. Stark Reality Corp; 4th edition, 2000, ISBN 0968360718.

Although this text isn't nearly as comprehensive as one might infer from the grand title, it does contain quite a bit of good information about the physiology

of stretching. In particular, Stark's discussion of 'good' versus 'bad' stretches is rather useful, and he reinforces Anderson's idea that the best stretch is a relaxed stretch.

Wallace, Bill. *Dynamic Stretching and Kicking*. Unique Publications, 1982, ISBN 0865680183.

Despite being over twenty years old (and showing it's age with the somewhat dated hair and clothes in the photographs), I still highly recommend this book to anyone interested in improving their warm-up routines or bettering their kicks. The instructions are clear, the succession of pictures adequately depict the dynamic nature of the stretches, and the overall tone is straight and to the point. No mumbo-jumbo here, just the facts!

Wharton, Jim and Phil, *the Wharton's Stretch Book*, Three Rivers Press, 1996, ISBN 0812926234.

The Wharton's advocate a radically different approach to stretching (first publicized by Aaron Mattes) called 'active isolated stretching.' In a nutshell, this method suggests two steps to a good stretch: first contract a muscle that opposes that which you wish to stretch, compressing the target muscle, then stretch only that targeted muscle. These authors advocate a more intense stretch than others, but temper that advice by suggesting only a two second hold period. At a suggestion of ten repetitions per stretch, the total time is thus roughly equivalent to other methods. A nice feature of this book is the use of range of motion diagrams (consistently modeled after an analog clock face) to suggest ranges for tight, normal, good and hypermobile flexibility for each stretch.

[1] I found this resource while perusing the website http://www.armystudyguide.com/ in search of useful references for additional callisthenic exercises. A 1998 edition of the manual was formerly available as an unorganized collection of 29 .pdf documents via a self-extracting archive at http://www.adtdl.army.mil/cgi-bin/atdl.dll/fm/21-20/fm21-20.exe; and an html edition of the same manual is posted at www.adtdl.army.mil/cgi-bin/atdl.dll/fm/21-20/toc.htm. Unfortunately, neither of those URLs remain current, and the replacement site bearing an updated manual requires a login and password not available to the general public. Copies of the 1998 manual in .pdf can be found at http://www.funfolks.net/UCMAP_M7/Vogel/APRTG/. The bullet items are taken from a subsection of Chapter 1 entitled Principles of Exercise.

[2] According to notes provided by Human Physiology instructor Frank Orme on the Internet, individual muscles may consume up to a hundred times more oxygen as compared to their resting rate; in a hard-working athlete, oxygen consumption increases twenty- to twenty-five times over the resting rate.

See members.aol.com/Bio50/LecNotes/lecnot22.html for Orme's complete lecture notes on exercise physiology.

[3] As far as I can tell, pliometric and plyometric are often misused as near exact synonyms, no doubt because they are homonyms, and most people are lazy spell-checkers. Pliometric has a longer history in medical usage; it refers specifically to the lengthening of muscle tissue being pulled by an external force that overwhelms the muscle fiber's natural contractive force. On the other hand, Plyometric was specifically coined to refer to the rebound-assisted training exercises first popularized by communist track and field coaches in the mid 1970's. For plenty more information about the meaning of the latter term, visit either http://tinyurl.com/38rd5s or http://www.grapplersgym.com/public/307.cfm.

[4] See the heading “Caution, Caution, Caution!” at www.thestretchinghandbook.com/archives/plyometrics.htm

[5] Despite the implication by attribution to the Cossacks that the Csárdás is a Russian folk dance, it is in fact, a Hungarian folk dance, originated and popularized by the Roma (Gypsy) people, who transmitted the style throughout Eastern Europe.

[6] Some wrestlers call our high shoot a *hip heist*. Additional discussion of the exercise and related variants can be found at http://stickgrappler.tripod.com/ug/ns2.html.

[7] For a partner-drill version, give advanced students an extra challenge by having another student lie over them at the start, face down, gripping lightly at the hands and legs so as to provide more weight to lift and additional resistance against the initial turn from face-down to face up.

[8] Ladies Home Journal has some well-conceived animated gifs showing how to do these exercises. For example, go to http://tinyurl.com/wa6q to see the plies in action!

[9] If I read correctly, Greg Shepard claims credit for popularizing dot drills in his book, ***Bigger, Faster, Stronger*** (see detailed reference above), but somehow I think that recognition is about as warranted as Bob Dylan's copyright credit for traditional American blues-folk tunes such as *Corrina, Corrina* and *Little Sadie*, as basketball, football and tennis coaches have been using these drills since 1940's.

[10] See for instance Chip Sigmon's article above, or the abbreviated instruction set for dot drills posted at http://www.bodybuilding.com/fun/staley11.htm.

[11] The broken down old skeptic within me says "it's just gotta be murder on your knees to be hammering down the stairs like that. Why else would bouncing down the moguls in downhill skiing be so tough on the knees?"

[12] Anderson, p. 12.

[13] Wharton, pp. 84–85.

[14] Aaberg, p. 82.

[15] Wallace, pp. 62–63.

[16] Mattes, p. 19.