Agility Training for American Football

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ABSTRACT
AGILITY AND CHANGE OF DIRECTION TRAINING IS AN UNDER-STUDIED TOPIC IN AMERICAN FOOTBALL. A CONSIDERABLE AMOUNT OF RESEARCH HAS BEEN PERFORMED WITH ATHLETES COMPETING IN OTHER CONTACT SPORTS. AS SUCH, EVALUATING METHODS THAT HAVE SHOWN TO IMPROVE AGILITY IN OTHER SPORTS MAY LEAD TO NEW METHODS TO ENHANCE FOOTBALL PERFORMANCE. A FRAMEWORK OF THE METHODS USED BY A HIGHLY SUCCESSFUL NCAA DIVISION-1 FOOTBALL CHAMPIONSHIP SUBDIVISION TEAM IS INCLUDED AS A MODEL THAT MAY SHOW PROMISE IN ENHANCING FOOTBALL PERFORMANCE.

INTRODUCTION
Agility is the ability to efficiently and rapidly change direction or speed in response to a stimulus (25). It is currently considered to be an important factor related to performance in field sports and is considered to be a quality independent of sprint speed. There are 2 distinct components of agility: physical (e.g., the ability to change direction or speed) and cognitive (e.g., perception and decision making) (19). Because relative strength is a major factor in agility performance, the physical aspects of agility may potentially be improved by typical strength and power training, whereas the cognitive aspects may potentially be improved by enhancing sport skill level (13,17,20,25,26). Specific training methods should be used that may provide the best transfer to sport performance (3,13,19,26,27). Evaluating the range of demands athletes encounter in the sport allows the strength and conditioning coach and sport coach to design appropriate programs.

To date, no training studies have specifically compared the effectiveness of different agility and change of direction (ACOD) programs in American football players. Few performance alterations in ACOD tests have been observed in studies with this population at any level. Generally speaking, the lack of research-evaluated training programs stems from a lack of researcher access to these athletes. The information within this article has therefore been collected mainly from the relevant literature from other populations, practical experience with American football athletes, print sources that outline common practices used with this population, and training theory.

AGILITY NEEDS ASSESSMENT
Observation of practice and game play will reveal that many agility-related demands of play will vary according to position. For instance, in most offenses, a quarterback will perform relatively low-velocity rapid pivots up to 180° during a planned play (handoffs, etc.) and some may perform very demanding athletic feats during scrambling. Needs for offensive linemen generally involve explosive accelerations forward or rapid pass setting and establishing a stationary or mobile read position, then fast reactive footwork in response to an attacking defender’s position both before and after contact. A linebacker may take a read step or 2 forward, then decelerate and accelerate maximally in another direction to defend a pass. Velocities at which each of these athletes perform game play may vary depending on the position and the play type, opponents’ and teammates’ alignment, skill level, etc. Many similarities also exist between positions. For instance, most linemen begin play from a 3-point stance and maximally accelerate into or around an opponent with a low angle of attack. Backs and linebackers often begin from a 2-point stance and perform a read or stall period before responding to the play (linebacker) or receiving the ball on a counter play (running back). Distances covered, velocities, and number of changes of direction (CODs) by the offensive and defensive players on the same run play may also be very similar in some cases.

TRAINABILITY OF AGILITY
ACOD programming has been reported in football levels as high as the National Football League (NFL) (6,9); however, few studies have documented ACOD performance improvement in football players. Renfro (23) observed a 6-week plyometric/ACOD training program including strength training in high school athletes. Athletes improved...
average T-test performance by −0.2 seconds. Dos Remedios et al. (5) tested community college football players before and after a season and observed a practically significant trend of improvement for the athletes on a 27.4 m T-drill (statistically non-significant mean change of −0.1 seconds). Gettman et al. (9) reported −0.87 seconds of improvement in the Cozen’s agility test by NFL athletes after a 14-week preseason conditioning program. Athletes in this study were likely somewhat detrained after a long season, indicating that around 3 months of training may be sufficient to observe a return to fitness in elite American football athletes.

Several studies in other contact sports have shown interesting results that may have relevance to American football. Gabbett and Benton (7) demonstrated that professional National Rugby League (NRL) players performed a reactive agility test faster compared with recreational club players. The error rate in the test for professional players was also lower than the recreational players. Green et al. (11) found starters had slightly faster 45° change of direction times than non-starters in a group of semiprofessional rugby union (RU) players. Carlson et al. (4) observed that elite Australian Football League (AFL) players displayed slightly faster and considerably more accurate defensive skills in a sport-specific video simulation than advanced junior players. It is possible that cognitive skills (perceptual and decision making) of these athletes may simply be improved over time with sport training and adaptation to a faster-paced game.

Evidence indicates that the development level of the athletes is very closely related to performance on sport-specific reactive drills. Superior tackling skills have also been observed in professional NRL players compared with club players (8). Sport-specific agility skills may potentially be improved with inclusion of small-sided games (SSGs) (13). In another relevant study, Young and Rogers (27) compared the results of an ACOD program to SSG play implemented during an in-season period. Training sessions occurred 2 days per week for 7 weeks. Volunteers were high-level under-18 AFL athletes. Interestingly, the SSG group improved 3.8% in a sport-specific reactive test, whereas the ACOD group did not. Only 1 study has found 6 weeks of programmed ACOD to be more effective than SSGs (2); however, the population was untrained; researchers in this study recommended a combination approach for athletes. Indeed, combination training seems to be the current trend for ACOD training (3,14).

**PLANNING AGILITY TRAINING**

It is common for collegiate strength and conditioning and football coaches to conduct programmed ACOD training as part of a preparatory phase before spring football and during summer training (1,14,17). The intent for winter ACOD programming is to prepare for spring football practice by developing tolerance to CODs with some emphasis on sport-specific agility, along with developing tolerance to repeated short sprints. ACOD drills are often used in a winter conditioning session as part of a “county fair” circuit, where groups of athletes will rotate between coaches who supervise various drills using bags, cones, etc. (1,14). Due to NCAA regulations restricting the use of balls, etc., sport-specific cognitive agility is difficult to address until team practices begin in fall (18). However, some cognitive training transfer may be possible with reactive ACOD drills implemented by strength and conditioning coaches as part of on-field conditioning programs (15,16). Further research should evaluate the effectiveness of common ACOD programming within this population.

Collegiate strength and conditioning coaches have historically implemented programmed ACOD sessions one or more times per week during summer workouts (1,14). Programming typically includes a combination of closed and open (COD and reactive) drills at the collegiate level. Precise training volumes are seldom provided in the literature, so comparing programs implemented at various universities is difficult.

Training theory suggests that the highest volumes of high-impact agility exercise programming should occur during specific preparatory and competitive phases of an annual plan (12). Training volumes should be higher in the specific preparatory phase (summer conditioning) and decrease through the early precompetitive subphase (preseason practice). Lower volumes of sport-specific agility drills should occur during the main competitive subphase (in-season) to maintain the skills developed in the previous training block and transition the emphasis to sport play. In-season ACOD programming is commonly implemented in the form of COD drills during position-group practice periods using bags and other tools (1,14). Many football coaches include reactive drills during spring and in-season sport practice sessions. These drills generally mirror sport position-specific movements and provide further emphasis on agility development and maintenance during sport practice periods. During the off-season, small volumes of lower intensity ACOD drills may be easily integrated into weight room warm-ups, etc. with the use of agility ladders, lines, etc. This type of ACOD training may be appropriate for the rest of the training year in beginner through advanced athletes to maintain coordination on basic footwork and tissue stiffness, while the training emphasis is focused on the development of other skills such as strength.

The success of an agility development program may depend on the appropriate level of complexity of drills used and the use of progression from simple to complex drills (10,15). Simply put, skill development is the most important aspect of this type of training. For new drills, the pace should be limited to allow the athlete to learn the drill. Speed of movement should be increased once the athlete is
competent at the drill to aid in establishing the skill with proper form at a high intensity (23). The practical intent for ACOD training is that the desired skill may be properly executed under high-stress situations in a game to maximize performance and reduce the risk of injury. Implementing open drills without the use of markers or reactive drills may be an appropriate progression for advanced athletes (13,16,19).

**COACHING AGILITY DRILLS**

One practitioner has suggested that the most effective coaching approach may vary according to skill level of the athlete and the novelty of the drill (16). An in-depth discussion of learning styles is beyond the scope of this article; however, because learning styles vary among athletes, a variety of approaches could be undertaken to ensure an effective delivery—this could be an effective strategy for group settings (16). Coaches should focus on important aspects of the skill and avoid over-coaching agility movements. Strategic use of external cues may be more effective to ensure athletes perform the skills at an appropriate pace (21). For instance, cueing athletes to “push the ground away” or “finish through the line,” etc., may be a more effective coaching tool than having the athlete focus on an individual body part once the motor pattern is established. Emphasis on optimal body lean should be made in and out of turns to enable proper form and maximal performance (19,24,25).

**PRACTICAL PROGRAMMING**

Some coordination benefits may occur for beginners through the use of agility ladders, etc. (2); however, greatly improving agility for advanced athletes may require sport-specific drills because of the cognitive aspects of agility (26). Sport-specific performance improvement may be best developed through the use of SSGs, evasion drills, and sport skills practice (26). To reduce risk of injury, we

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<tr>
<th>Monday</th>
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<tr>
<td>10–12 dynamic warm-up exercises (5–40 yd)</td>
<td>10–12 dynamic warm-up exercises (5–40 yd)</td>
<td>Skill and defensive ends only</td>
</tr>
<tr>
<td>6 repetitions of speed acceleration drills (5–15 yd)</td>
<td>8–10 repetition position-specific COD drills (linemen 0–4 CODs per rep; 0 COD = footwork; skill 1–2 CODs per repetition)</td>
<td>10–12 dynamic warm-up exercises (5–40 yd)</td>
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<tr>
<td>8–10 repetitions of linemen and skill-specific speed drills (linemen focus on starting speed, 0–5 yd; skill focus on top end speed, 30 yd)</td>
<td>4–5 repetition general COD drills with 2–3 CODs per repetition</td>
<td>8 repetitions of speed mechanics drills (5–30 yd)</td>
</tr>
<tr>
<td>Position-specific COD drills (linemen: 12 repetitions with 1 COD per repetition; skill: 6–8 repetitions with 1–5 CODs per repetition)</td>
<td>6 repetitions of conditioning with 1 COD per rep (104 yd each)</td>
<td>12–14 position-specific COD drills (1–5 CODs per repetition)</td>
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<tr>
<td>10–12 dynamic warm-up exercises (5–40 yd)</td>
<td>9 repetitions of general COD drills, with 2–5 CODs per repetition</td>
<td>Linemen only</td>
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<td>10–12 dynamic warm-up exercises (5–40 yd)</td>
<td>Offensive line—lift and drive drills, 10 repetitions (2–15 yd)</td>
<td>Defensive line—COD drills, 6 repetitions with 3–5 CODs per repetition, drive drills 3 repetitions (15 yd)</td>
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</tbody>
</table>

COD = change of direction.
would recommend coaches provide considerable time and patience for high school athletes to learn proper movement mechanics before progressing to advanced sport-specific drills. Because practice methods are restricted by regulations established by governing authorities such as the NCAA (18), it may be difficult for collegiate coaches to implement an ideal plan for sport skill development. Current practices of collegiate coaches are supported primarily by anecdotal evidence—for instance, performance improvement comparisons of any popular “county fair” circuit methods found in winter conditioning sessions do not exist in the literature. Common on-field ACOD drills performed during summer conditioning sessions are also yet to be evaluated by research. Appropriate ranges of volume, intensity of drills, etc., may then be assessed.

Some programs have attempted to develop sport-similar skill sessions (sumo, etc.) for linemen in offseason training that are aimed to enhance footwork and balance (22). Coaches should be cautious and highly selective about the inclusion of combative drills, as the health of the athlete is of primary concern in physical conditioning drills. Such drills should be modified to ensure athletes implement techniques that are included in sport play. Coaches must not allow combatives to escalate to situations where an athlete’s health could be in danger (striking, fighting, wrestling, etc.).

It is highly recommended that sport coaches assess sport skill acquisition related to the skill development tools used in training. This will allow the coach to avoid the use of programming that has questionable transfer to sport performance (e.g., the use of speed bags for wide receivers). Coaches should also avoid excessive volumes of training beyond those that are shown to further enhance sport skills. Excessive volumes can produce fatigue that may reduce the overall quality of the training session, residual fatigue that may reduce the quality of work, and eventually lead to overtraining syndrome.

### Table 2

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<tr>
<th>Monday</th>
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<td>Position-specific COD drills (linemen: 12 repetitions with 1 COD per repetition)</td>
<td>Pattern running: position-specific COD conditioning. Progress from 3 sets of 10 repetitions to 5 sets of 10 repetitions. Length and number of CODs vary by position</td>
<td>OL: lift and drive drills, 6 repetitions, 5 yd; skill: speed acceleration drills 4 repetitions (5–15 yd), top end speed drills 2 repetitions (60–70 yd)</td>
<td>Pattern running: position-specific COD conditioning: 2 sets, 10 repetitions. Length and CODs per repetition vary by position</td>
</tr>
<tr>
<td>Position-specific COD drills (skill: 6–8 repetitions with 3–4 CODs per repetition)</td>
<td>Pattern running: position-specific COD conditioning. Progress from 3 sets of 10 repetitions to 5 sets of 10 repetitions. Length and number of CODs vary by position</td>
<td>OL: lift and drive drills, 4 repetitions, 5–10 yd</td>
<td>General agility and COD conditioning: progress from 6 to 12+ repetitions, w/2–3 CODs per repetition</td>
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<td>Reactive COD drills, 4 repetitions</td>
<td>DL: position acceleration drills 6 repetitions, 5–10 yd</td>
<td>Skill: speed acceleration drills 4 repetitions, 10 yd</td>
<td>Top end speed drills 2 repetitions, 40–45 yd</td>
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<td>10–12 position-specific COD drills (1–5 CODs per repetition)</td>
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COD = change of direction; OL = Offensive Line; DL = Defensive Line.
successive training sessions, and potentially may lead to overuse injury.

**SAMPLE AGILITY AND CHANGE OF DIRECTION PROGRAM FRAMEWORK**

We have included a framework for ACOD programming based on the program used by North Dakota State University as an example of effective programming volumes that have been used successfully at a high level of collegiate football competition (Tables 1 and 2). As a caveat to coaches, modification of this program may be appropriate for athletes of different levels. This program is based on the annual plan, which includes NCAA-mandated breaks (Table 3). Relevant to the annual plan, the volume of ACOD drills was increased before spring practice and further increased in a gradual manner during summer conditioning. Winter conditioning began with 2 workouts per week including closed and open ACOD drills with some reactive aspects along with some SSGs. Each workout began with a 15-minute dynamic warmup, and a total of 1 hour was allotted for each session. Summer conditioning workouts were conducted 3 days per week in June and 4 days per week in July, with programming shifting from general to sport position specific. The speed of drills and number of CODs increased throughout the summer training period. Conditioning transitioned from mainly straight ahead programming (e.g., half-gassers) in June to all COD-based in July. Rest intervals were shortened in July to prepare for the demands of fast-paced play. This pattern of increasing volume of high-impact drills leading

### Table 3

**Sample football annual plan**

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Agility

Speed

Conditioning

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Agility

Speed

Conditioning

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Agility

Speed

Conditioning

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Agility

Speed

Conditioning

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**Key**

- De-emphasis
- Minor emphasis
- Moderate emphasis
- Major emphasis
- All = active rest
up to a sport competition period is consistent with training theory (12). High-impact drills are de-emphasized through the rest of the training year (off-season), and emphasis is placed on the development of other skills. In summary, the approach used by North Dakota State’s strength and conditioning staff includes a heavy progressive emphasis on both acceleration and sport-specific ACOD drills during preparatory winter and summer workouts (as allowed by the NCAA regulations).

CONCLUSIONS
Because of the wide array of variables for strength and conditioning and sport coaches to consider in programming agility training, we recommend that coaches develop preparatory agility programs that best mimic movements that the athlete will perform at high intensity during game play. Such an approach may involve observing distances covered, angles, relative speeds, etc. High-level football programs are beginning to hire sport scientists capable of performing such analyses using high-tech tools that allow extremely accurate assessment and may result in very specific and individual programming. Because of differences in physical development and coordination and the nature of skill development, it may be appropriate for less skilled athletes to perform a greater percentage of closed or basic ACOD drills compared with advanced or elite athletes (2,19). Based on research in other populations, sport-specific SSGs may provide agility development in American football athletes; however, the use of substantial amounts of SSGs in development of American football athletes is not yet common. Research in NRL, RU, and AFL athletes indicates that exposure to a faster pace of game play could play a critical role in the development of the cognitive aspects of agility.

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