A comparison of athletic movement between talent identified juniors from different football codes in Australia: Implications for talent development

ABSTRACT

This studied aimed to compare the athletic movement skill of talent identified (TID) junior Australian Rules football (ARF) and soccer players. The athletic movement skill of 17 TID junior ARF players (17.5 – 18.3 *y*) was compared against 17 TID junior soccer players (17.9 – 18.7 *y*). Players in both groups were members of an elite junior talent development program within their respective football codes. All players performed an athletic movement assessment that included an overhead squat, double lunge, single leg Romanian deadlift (both movements performed on right and left legs), a push up and a chin up. Each movement was scored across three essential assessment criteria using a three point scale. Total score for each movement (maximum of nine) and overall total score (maximum of 63) were used as the criterion variables for analysis. A multivariate analysis of variance (MANOVA) tested the main effect of football code (two levels) on the criterion variables, whilst a one-way ANOVA identified where differences occurred. A significant effect was noted, with the TID junior ARF players outscoring their soccer counterparts when performing the overhead squat and push up. No other criterions significantly differed according to the main effect. Practitioners should be aware that specific sporting requirements may incur slight differences in athletic movement skill between TID juniors from different football codes. However, given the low athletic movement skill noted in both football codes, developmental coaches should address the underlying movement skill capabilities of juniors when prescribing physical training in both codes.

Key words: Talent development; Talent identification; Motor skill; Youth sport

INTRODUCTION

The most commonly participated team ball sport in Australia amongst juniors aged 15 years and over is soccer (football), with recent registration statistics suggesting participation rates are in excess of 300,000 children (2). Second to this, Australian Rules football (ARF) currently has over 200,000 registered participants aged 15 years and older (2). Such vast participation has driven both football codes to implement developmental programs with the intention of nurturing prospective talent. For example, Football Federation Australia (FFA) recently remodelled their talent development pathway, with talent identified junior soccer players now being invited to participate in state and national institutes prior to participation in elite junior squads associated with A-League (premier soccer competition in Australia) clubs. Similarly, the Australian Football League (AFL), in conjunction with state-based leagues, have established elite talent development programs referred to as State Academies, in which talent identified junior ARF players are invited to participate. The premise of these developmental programs is to accelerate the acquisition of expertise through the provision of specialised coaching, player welfare, and scientific and medical intervention (1,17,19). Such programs are typically administered across a pre-season and modified in-season period, consisting of two to four structured training sessions per week in addition to or in replace of their normal training schedule. Further, juniors are given the opportunity to compete against fellow talent identified peers from other State Academies or institutes within a three to four month elite national youth competition, which can provide elite senior talent recruiters the opportunity to judge prospective within a game-based context (22).

Historically, these elite junior development programs have focused on providing an environment that harbours the development of functional, technical and tactical skill. However, despite additionally addressing physical performance outcomes specific to game-play (i.e., running endurance), these programs may not highly prioritise the development of athletic movement skill. In part, this foresight may stem from the limited educational opportunity provided to developmental coaches regarding the association between athletic movement skill (i.e., the physical process) and the physical performance outcome (i.e., jump height or sprint time) (15,16). For example, Parsonage et al.

(16) demonstrated that certain athletic movement skills (defined as movements that commonly underpin strength and conditioning exercises) were associated with a superior physical performance outcome in talent identified junior rugby union players. This led the authors to recommend that elite junior talent development programs established in team invasion sports should intentionally seek to develop specific athletic movement skills within talent identified juniors (16). However, a recent study conducted by Woods et al. (23) suggests that this recommendation is yet been extended to elite junior talent development programs in ARF. Specifically, Woods et al. (23) noted that talent identified under 18 (U18) ARF players performed certain athletic movements at a considerably lower competency when compared to their senior AFL counterparts. This suggests that talent identified junior ARF players may not be adequately equipped with the necessary athletic movement skills needed to facilitate a smooth transition into elite senior competitions.

The aforementioned may extend to junior soccer contexts given that the physical match activity profiles of players from both football codes are relatively similar. Specifically, Wehbe et al. (21) reported that elite Australian soccer players (senior A-League representatives) covered a total distance in-excess of 10,000 m at a relative distance of approximately 110 $m.min^{-1}$ during a 90 minute game; physical notational statistics that are consistent with elite competitions abroad (16). Additionally, players spent more than seven percent of their total distance covered in game-play at speeds greater than 19.7 $km.hr^{-1}$ (21). Comparatively, Veale and Pearce (20) and Burgess et al. (3) noted that elite junior and senior ARF players often cover total distances in-excess of 11,500 m at 100 to 140 $m.min^{-1}$ during a two-hour game; whilst spending more than six percent of their total distance at speeds greater than 20 $km.hr^{-1}$. To maximise these physical capabilities, it is critical for physical performance specialists to prescribe appropriate physical training interventions. Typically, these interventions require well-developed athletic movement competencies inclusive of trunk/hip stability, squat and lunge capability and a well-developed posterior-chain (12). Thus, if talent identified juniors do not possess such competencies they may not benefit from certain training interventions; limiting their immediate performance capability upon entering elite senior ranks.

In both general and athletic contexts, movement skill has historically been quantified using the Functional Movement Screen (FMS) (7,8). The FMS is purported to highlight possible asymmetries and muscular dysfunction when performing standardized foundational movements (7,8). Yet its utility may be limited within an athletic population, as it may not adequately quantify the specific athletic movement skills that are required to train, and thus compete, within team invasion sports. Recently, McKeown et al. (14) proposed the use of a reliable alternative; the Athletic Ability Assessment (AAA), which is designed to assess the athletic movement skills that commonly underpin strength and conditioning movements prescribed in elite sporting environments. Thus, the AAA may provide an informative means with which to quantify athletic movement skill in an athletic population (14).

This study aims to compare the athletic movement skills of talent identified junior ARF and soccer players using a modified version of the AAA described by McKeown et al. (14). Given the suggested low priority in both elite talent development programs coupled with the similar physical requirements of competition, it is hypothesised that the athletic movement skills will not meaningfully differ between junior football codes.

METHODS

Experimental Approach to the Problem

A quantitative cross-sectional observational research design was used to address the study hypothesis. Talent identified juniors originating from elite talent development programs in their respective football code (ARF or soccer) were required to perform a specific athletic movement skill assessment, which was modified from the AAA described by McKeown et al. (14). Subjects were unfamiliar with this assessment, and were provided with specific verbal cues where necessary. Following completion of this assessment, the athletic movement skill of the subjects was analysed using a three point scoring criteria; with the reliability of the scores being assessed to ensure their accuracy.

Subjects

Talent identified junior soccer players (n = 17; age range = 17.9 – 18.7 y) and talent identified junior ARF players (n = 17; age range = 17.5 – 18.3 y) were recruited to participate in this study. To be eligible for inclusion, subjects were required to be injury free at the time of data collection, ensuring that their athletic movement skill was not influenced by external factors (e.g. muscular contusions). Player cohorts were defined by identification onto an elite talent development program within their respective football code. Institutional ethical approval was granted by the relevant Human Ethics Advisory Committee, with all subjects (and parents or guardians if U18 years of age) providing written informed consent prior to participation.

Procedures

Each subject performed the AAA protocol which included an overhead squat, double lunge, single leg Romanian deadlift (both the double lunge and single leg Romanian deadlift movements were performed on left and right legs), push up and chin up. Operational definitions and assessment criteria for each movement are displayed in Table 1. All subjects were unfamiliar with the assessment protocol, and were provided with standardized verbal cues and expert demonstration to guide the performance of each movement. Additionally, each subject was provided with a verbal description of the scoring criteria. The overhead squat, double lunge and Romanian deadlift were all performed with a wooden dowel to assist each subject anatomically position themselves in order to perform these movements. Prior to undertaking the assessment each subject performed a standardized warm up, which consisted of light jogging and dynamic stretching. Subjects were assessed by the study's principal investigator who possessed more than four years' experience assessing movement skill. No augmented feedback was provided to the participants during the testing procedures to limit a potential scoring bias (10).

The scoring of each movement was completed using the criteria described in Table 1, where a specific scoring criterion was anchored to a numeric value. Each movement was performed for a total of five repetitions with the exception of the push up and chin up that had specific repetition targets embedded within the scoring criteria. Total score for each movement (maximum of nine) and total score for the movement assessment (each movement score summated; maximum of 63) were the criterion variables used for analysis. The scoring of each movement was performed retrospectively through the use of video footage, thus a standard two-dimensional camera (Sony, HDR-XR260VE) was placed in the optimal position for assessment (sagittal and frontal).

******INSERT TABLE 1 ABOUT HERE******

The inter-tester reliability for each scoring item was determined in order to obtain psychometric results specific to the sample population described within this investigation. The score given across the three essential assessment regions by the study's principal investigator for each movement within the ARF sample was compared to those given by another study author whom also had experience assessing movement skill. Given the categorical nature of the data, the level of agreement between the two scorers was measured using the weighted kappa statistic (κ). The level of agreement was defined as follows: <0 less than chance agreement, 0.01-0.20 slight agreement, 0.21-0.40 fair agreement, 0.41-0.60 moderate agreement, 0.61-0.80 substantial agreement, 0.81-0.99 almost perfect agreement (13). The strength of the agreement for each anatomical assessment region was then averaged to provide an average level of agreement for each movement.

Statistical Analysis

Descriptive statistics (means and standard deviations) were calculated for the total score obtained on the AAA (maximum of 63), as well as the total score obtained for each individual movement (maximum of nine) for the talent identified juniors from both football codes. Multivariate analysis of variance (MANOVA) was used to test the main effect of football code (two levels: ARF, soccer) on the score obtained for each movement, as well as the total score obtained for the AAA. If required, follow up univariate analysis of variance (one-way ANOVA) was used to identify where statistical significance had occurred. The effect size of football code on each criterion value was calculated using Cohen's d statistic, where an effect size of d = 0.01 – 0.20 was considered small, d = 0.21 – 0.50 moderate, d = 0.51 – 0.80 large, and d ≥0.80 very large (6). For all pairwise comparisons, the

Type-I error was set at α <0.05, with all analyses being performed using the SPSS statistical software (Version 22, SPSS Inc., Armonk, New York, 2010).

RESULTS

The level of agreement between the two scorers is displayed in Table 2. As demonstrated, each movement reflected "substantial agreement" between both scorers, with the exception of the single leg Romanian deadlift performed on the left leg, where "moderate agreement" was noted.

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According to the Pillai's Trace (V), the MANOVA revealed a significant effect of football code ($V = 0.72$, $F = 8.18$, P <0.01), with follow up univariate analysis revealing a significant effect for the overhead squat and push up movements (Table 3) (P <0.05). Specifically, the ARF subjects significantly outscored their soccer counterparts; with average scores for the overhead squat and push up of 7.0 ± 1.5 compared to 5.0 ± 0.9, and 7.6 ± 0.9 compared to 6.7 ± 0.6, respectively. Additionally, these movements also expressed very large effect sizes (Table 3). Given these two differences, the total score obtained by both samples also reflected a very large effect size, with the ARF subjects recording a greater total score for the movement assessment in comparison to their soccer counterparts; 41.6 ± 5.1 compared to 37.0 ± 2.9.

******INSERT TABLE 3 ABOUT HERE******

DISCUSSION

This study aimed to compare the athletic movement between talent identified juniors from different football codes; namely ARF and soccer. Given the limited attention directed toward the development of athletic movement skill within elite junior talent development programs in both football codes, it was hypothesised that the athletic movement skill of juniors would not differ. Although partially agreeing with the studies hypothesis, the results did highlight points of difference for two of the seven movements. Specifically, the junior ARF subjects outscored their soccer counterparts by over one point (out of a total of nine) for both the overhead squat and push up movements. This was subsequently reflected in the total score obtained by both samples, with the ARF players outscoring their soccer counterparts by an average of over four points (out of a total of 63). This suggests that although talent identified juniors from these football codes possess similar athletic movement competencies, the requirements of ARF may facilitate the development of more advanced athletic movement when compared to soccer. Additionally, it is possible that the training practices within the ARF program directed a greater appreciation toward the acquisition of athletic movements in comparison to the soccer program. Nonetheless, given the considerable discrepancy Woods et al. (23) noted between elite junior and senior ARF players with regards to their athletic movement competency (average total score of 41.7 compared to 55.7 out of a total of 63), developmental coaches need to consider interventions designed to improve the athletic movement skill of talent identified juniors. Thus, athletic screening may provide an important opportunity for developmental coaches to correct inefficient movement patterns in juniors prior to their transition into elite senior ranks (23).

Given the similar nomadic and dynamic requirements of both football codes (3,20,21), players are likely to apply a high amount of force through the triple extension and flexion of the hip, knee and ankle joints during game-play. Such a movement pattern is reflected within the overhead squat; a movement that additionally requires the development of mobility within the thoracic region and lower extremities (4). Despite this, it was interesting to note the considerably lower movement skill shown by the talent identified soccer subjects when compared to their ARF counterparts. In an attempt to explain this finding, it was noted that one of the primary movement patterns performed in the warm up protocol prior to training and competition by the talent identified junior ARF players was an overhead squat. Conversely, although a squatting movement was included in the warm up protocol for the talent identified junior soccer players; they were instructed to position their hands on their hips. Hence, it is possible that the increased thoracic mobility required to perform the overhead squat was the predominant limiting factor for the talent identified junior soccer players. Additionally, the functional requirements of ARF dictate that players are eligible to use their arms to mark (i.e., catch) the ball, as well as being involved in the tackling process. Comparatively, the functional requirements of soccer do not permit players to use their arms to contact the ball or tackle an opponent. Although speculative, it is possible that these functional differences translated to an increased thoracic mobility, and thus overhead squat performance demonstrated by the ARF subjects.

It was noted that the push up movement also reflected a difference between the football codes. This occurrence may be attributed to the slight differences in physical requirements seen in both codes. For instance, ARF permits players to bump, tackle and wrestle in an attempt to retain or obtain possession of the ball. Primarily, ARF players perform these contacts with their upper extremities; using their arms to ‘fend’ or tackle opposition players. Thus, it is advantageous for ARF player’s at all developmental levels to possess a certain amount of upper body strength and localised muscular endurance (11). Conversely, the requirements of soccer do not allow players to use their upper body when tackling opposition players; rather having to manoeuvre their lower body to deflect the ball from an opposition’s possession. Consequently, the type of player chosen by talent recruiters within both football codes may reflect these requirements, and as such, junior ARF players by nature may possess greater upper body pushing qualities in comparison to their junior soccer counterparts. However, it is important to note that the push up criteria used here did also require players to possess total body control. Thus, in addition to possessing a superior upper body pushing skill, it is possible that the junior ARF players were also able to maintain a stable body alignment when performing the push up movement, contributing to their superior score.

Despite the previously discussed movements, it was expected that the athletic movement skill of talent identified junior ARF and soccer players would not differ given the similar philosophies of the elite talent development programs seen in both football codes. Both programs typically focus on the development of functional, technical and tactical skills needed to perform in elite senior contexts. However, this foresight may hinder the performance of juniors in both football codes when progressing into elite senior ranks (16). For example, the speed at which ARF is played is considerably higher within the AFL when compared to elite U18 AF competitions (3). Notably, AFL players move at higher maximum velocities more frequently, and sustain these efforts for prolonged periods when compared to elite U18 competitions (3). To account for this, physical development specialists will prescribe training exercises designed to optimize a player's physical match activity profile (14). However, such prescription may be ineffective, or even inappropriate, if a player has not developed the desired foundational athletic movement skills inclusive of squatting, lunging, pressing and pulling variations (11). Given this, it is critical for both elite junior programs to seek methods in which players can be provided with the appropriate coaching to facilitate the development of foundational athletic movement skills (23). In turn, this may improve their physical performance (16) and possibly reduce their injury likelihood (5).

In conclusion, our results indicate that although similarities exist between juniors in different football codes with regards to athletic movement skill, there are distinctive differences that may be explained by the unique requirements of both codes, or the different training practices implemented by the coaching staff. Despite these promising findings, there are study limitations which should be addressed. Namely, although still within acceptable limits as defined by Landis and Koch (13), the moderate agreement demonstrated between the two scores for the single leg Romanian deadlift suggests that continued work is required to improve the granularity of certain elements of the scoring criteria used here.

PRACTICAL APPLICATIONS

There are three practical applications to stem from the results of this work. Firstly, developmental coaches in both junior ARF and soccer contexts should direct a training focus toward the process (i.e., athletic movement skill) as well as the product (i.e., the movement outcome) when prescribing physical training to talent identified juniors. This may assist with the acquisition of athletic movement skill, providing the basis for the implementation of more advanced training techniques in elite senior environments. Secondly, the athletic movement assessment described in this study may provide coaching staff and talent recruiters with a median in which to screen the athletic qualities of juniors. This may enable the rectification of inefficient motor patterns in talent identified juniors prior to their entrance into an elite senior environment; assisting with the progression from an elite junior to an elite senior level. Thirdly, in acknowledgement of the time constraints often associated with training sessions implemented in elite junior developmental programs, developmental coaches could include the movements described in this study within a warm up protocol prior to training, thus providing a stimulus for the acquisition of athletic movement, and dynamically readying juniors for the proceeding training.

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