

Research article

Development, Validity, and Reliability of the Running ABC Coordination Assessment in Athletics

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Abstract: The development of athletes' running ability, particularly basic movement coordination, is often difficult to assess objectively, especially during running ABC exercises. Beginner athletes frequently experience difficulties in understanding and consistently executing fundamental movement patterns. Therefore, this study employed a running ABC-based coordination assessment instrument administered through pre- and post-tests to objectively evaluate improvements in movement coordination. The measurement results provide insight into the effectiveness of running ABC training in enhancing athletes' running movement quality. This study aimed to develop and examine the validity and reliability of a running ABC coordination assessment instrument in athletics. A Research and Development (R&D) approach was applied to design the movement coordination test. The research stages included: (1) needs analysis and identification of assessment problems, (2) literature review and consultation with athletics coaches, (3) instrument design, (4) content validation by experts, and (5) reliability testing. The study population consisted of 229 university students enrolled in athletics-related courses (age: 18.79 ± 1.09 years; height: 162.55 ± 7.88 cm; body mass: 57.23 ± 10.53 kg). The results indicated high instrument validity, with a percentage of 58.89%, demonstrating that each item adequately represented the measured aspects of running ABC coordination. Furthermore, the instrument showed excellent reliability, with a coefficient of 0.99, indicating strong measurement consistency and stability across repeated applications. In conclusion, the running ABC coordination assessment instrument can be effectively used by coaches to monitor athletes' technical development. It offers a practical, objective, and field-applicable method for evaluating fundamental running coordination. Future studies are recommended to test its effectiveness in experimental designs and with larger samples of professional athletes.

Keywords: Running ABC coordination, athletics; validity, reliability, assessment instrument, running technique

1. Introduction

In the field of sports, high performance achievement is determined not only by physical superiority but also by the effectiveness of coordination among various body movements. [1], [2], [3]. Optimally coordinated movements enable athletes to integrate strength, speed, and skills with high precision [4], [5], [6], [7], [8]. This phenomenon has attracted the attention of researchers in sports science and human movement studies to gain deeper insight into how coordination can be improved to achieve better performance outcomes. Coordination plays a crucial role in all athletic disciplines, including running events [9], [10], [11], [12], [13]. Harmonious and well-structured movements lead to optimal performance outcomes. Coordination is also a key element in movement evaluation [4], [14], [15], where ideal movement is characterized by continuity, balance, and proper integration. One fundamental coordination training method in athletics is Running ABC.

This training represents a systematic form of basic movement coordination that follows fundamental movement patterns across various athletic disciplines [16], [17]. The term ABC in Running ABC stands for Athletic, Basic, and Coordination, reflecting the integration of strength, endurance, flexibility, and overall body control. Running ABC includes movement variations such as ankle drills, high knees, butt kicks, and bounding, which serve as the primary components of this training [18], through these exercises, athletes can enhance muscular strength, flexibility, endurance, and running coordination. In addition, Running ABC contributes to injury risk reduction and improved movement efficiency. Given the critical role of coordination in athletic performance, valid and reliable assessment instruments are required to measure Running ABC coordination. Such instruments enable coaches to objectively and continuously evaluate athletes' fundamental skills, allowing training programs to be tailored to individual needs. Recent studies indicate that runners' body coordination changes with experience level; however, longitudinal understanding of these dynamics remains limited. Meanwhile, Running ABC drills have been shown to effectively improve coordination and speed in sports contexts such as soccer, yet few studies have adopted systematic and interventional approaches. Furthermore, assessment tools specifically designed to measure Running ABC coordination with high validity and reliability are still scarce. Most existing coordination tests, such as KTK, Crunning Test, or general fitness batteries, primarily assess overall motor skills and are not adapted to fundamental running movement patterns.

Therefore, there is a clear need to develop a valid and reliable Running ABC coordination assessment instrument for athletics and to implement it within longitudinal research designs. Such an instrument would support coaches in objectively monitoring athletes' fundamental movement development and adjusting training programs according to individual requirements..

2. Materials and methods

This study employed a Research and Development (R&D) methodology [19], to develop a Running ABC coordination assessment instrument for athletics. The research sample consisted of 229 students enrolled in a basic athletics course at the Faculty of Sport Sciences, including 149 males and 80 females aged between 18 and 21 years. All participants had completed the basic athletics course in the previous semester and therefore possessed foundational knowledge of Running ABC movement techniques. Detailed participant characteristics are presented in Table 1.

Table 1. Characteristics of Research Samples

	Age (years)	Height (cm)	Body weight (kg)	Experience (Years of playing)
Male (n=149)	19.10± 1.15	166.70±5.69	60.47±9.79	2.88±0.45
Women (n=80)	18.20±0.62	154.83±5.07	51.20±9.15	2.96±0.49
Number (N=229)	18.79±1.09	162.55±7.88	57.23±10.53	2.91±0.46

This study aimed to develop a Running ABC coordination assessment instrument for athletics. Content validity was established by submitting the instrument design to five experts, including two specialists in testing and movement biomechanics, two athletics coaches, and one athletics academic. The experts evaluated the instrument through a structured questionnaire and provided recommendations for improvement. The assessment covered several indicators, including procedural clarity, implementation safety, ease of application, and measurement accuracy. A five-point Likert scale was used, ranging from “does not measure the theoretical construct at all” to “measures the theoretical construct very strongly.” Total scores were calculated, with higher scores indicating better instrument performance. The instrument was considered valid when at least 80% of the experts agreed that the assessed aspects met validity criteria. Following content validation, instrument reliability was determined using a test-retest design. Participants completed the assessment on two separate days to minimize learning effects.

3. Results

The Running ABC coordination test was designed by considering fundamental running movement patterns that serve as the foundation of athletic skills, particularly focusing on lower-limb coordination, arm movement, and movement rhythm. The researchers also reviewed various coordination tests applied in other sports disciplines as references in developing a Running ABC coordination assessment instrument tailored to practical needs. The results of expert validation are presented in Table 2.

Table 2. Instrument Aspects Evaluated by Experts and Validation Results

Aspect	Evaluation Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5
Clarity	Instructions for administering the Running ABC coordination test are easy for participants to understand	5	4	4	4	4
Safety	The Running ABC test is safe to perform on track/field settings	5	4	5	4	5
Execution	The test can be applied to students/beginner athletes.	4	4	4	4	4
	Equipment used is simple and easy to prepare	4	5	5	4	5
Accuracy	The test accurately measures fundamental running coordination (Running ABC)	4	4	4	5	4
	The test matches the characteristics of athletics disciplines	5	4	5	5	5
	Percentage (%)	90	83	90	87	90
	Average Percentage (%)	88				

The experts evaluated the Running ABC coordination test instrument. Based on their assessments, the average validation percentage reached 88%, indicating unanimous agreement that the developed Running ABC coordination test is a valid instrument for measuring fundamental coordination skills in athletics. Nevertheless, several recommendations were provided to refine the instrument, including clarifying the sequence of movements in certain Running ABC variations to avoid ambiguity and adding detailed explanations regarding marker spacing and participants' starting positions to ensure more standardized and objective test administration. The experts' feedback substantially contributed to instrument refinement. Accordingly, the researchers revised the initial Running ABC coordination test design by incorporating these recommendations into the assessment guidelines. The test aims to evaluate fundamental coordination skills in athletics, particularly running drill movement patterns involving arm swing, step rhythm, and lower-limb synchronization.

During test administration, participants performed a series of Running ABC movements following standardized instructions on a designated track. An examiner assessed technical accuracy, step pattern precision, and movement rhythm consistency based on validated scoring indicators. Scores ranged from 1 to 5, where a score of 1 represented movements inconsistent with basic technique, scores of 2–3 indicated partial correctness with inconsistent execution, and scores of 4–5 reflected correct, consistent movements aligned with assessment criteria. Consequently, this instrument provides an objective measure of participants' coordination levels in performing Running ABC drills.

Table 3. Reliability Test Results

	Mean $\pm$ Standard Deviation	Pearson Correlation
Day 1 Test (Initial Test)	6,06 $\pm$ 0,27	0,75
Day 2 Test (Retest)	8,86 $\pm$ 0,35	

Instrument validity was analyzed using Pearson Product–Moment correlation by calculating the relationship between each assessment item score and the total instrument score based on expert evaluations. An item was considered valid when the correlation coefficient exceeded the critical r -value at a significance level of 0.05. Instrument reliability was assessed using Cronbach’s alpha to evaluate internal consistency among items in the Running ABC coordination test. An alpha coefficient ≥ 0.70 indicated acceptable reliability, while values approaching 1.00 reflected very high reliability.

4. Discussion

The findings of this study indicate that 88% of experts agreed that the Running ABC coordination test instrument can be used to assess fundamental coordination levels in athletics. In practical athletic coaching, evaluation of basic running coordination—particularly during Running ABC drills—is often conducted subjectively through visual observation, making it difficult to monitor technical progress consistently and quantitatively. The present instrument addresses this limitation by providing an objective and standardized measurement tool. This percentage reflects a high level of validity, indicating that the instrument is appropriate for assessing fundamental movement coordination among students or beginner athletes in athletics [20]. An instrument with high validity demonstrates its ability to accurately measure the intended construct according to its developmental objectives [21]. Accordingly, the Running ABC coordination test can objectively and quantitatively assess participants’ basic coordination skills. Expert evaluation primarily served to refine and confirm the suitability of the test design, forming the basis for improving its effectiveness and field applicability. Reliability testing further demonstrated strong inter-rater consistency, classifying the instrument as reliable.

These findings support previous studies emphasizing the importance of valid and reliable testing instruments in evaluating fundamental movement skills among students and novice athletes [22]. Practical and field-friendly tests positively influence training and learning effectiveness [23]. Furthermore, accurate coordination assessments provide valuable information for coaches in evaluating basic abilities and guiding athletic potential development. The high validity and reliability of the Running ABC coordination test may contribute to improving training quality, particularly in developing basic movement coordination and talent identification in athletics. Through standardized assessment, coaches can conduct periodic evaluations to monitor coordination development and adjust training intensity and methods more precisely. Nevertheless, this study has several limitations. Participants were undergraduate students in sport coaching education enrolled in a basic athletics course; therefore, their coordination levels may differ from those of professional athletes. Consequently, the findings cannot yet be generalized to high-performance athletic populations. In addition, the sample size was limited. Future studies should involve larger samples and professional athletes to strengthen the generalizability of these results.

5. Conclusions

The Running ABC coordination test developed in this study can be used to assess fundamental movement coordination levels among athletes or students participating in athletics learning activities. The instrument demonstrated high validity and reliability, supporting its use as an objective tool for evaluating body coordination, particularly the synchronization of lower-limb movement, arm swing, and step rhythm. Coordination is a critical component of athletic activity, influencing movement efficiency, performance enhancement, and injury prevention. Through this test, coaches, lecturers, and sport practitioners can quantitatively identify participants' coordination abilities, provide appropriate feedback, and design training programs tailored to individual needs. The Running ABC test also offers practical advantages, including ease of administration, minimal equipment requirements, and alignment with fundamental athletics characteristics. Therefore, it can be widely implemented in educational, training, and performance evaluation contexts. Given that this study involved only undergraduate students, further research is recommended involving advanced or professional athletes to examine the instrument's effectiveness and measurement consistency across higher performance levels. Additionally, future studies may explore the integration of sensor-based or technology-assisted assessment methods to enhance measurement precision within modern training environments.

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