

A60-Metre Sprint Learning Model Based on Traditional Chinese Games for Physical Education Students at Zunyi Medical University Medicine& Technology College China

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ABSTRACT:

Conventional sprint instruction in higher education often relies on repetitive drills that reduce students' motivation and engagement. This study developed and evaluated a Traditional Chinese Games (TCG)-Based 60-Metre Sprint Learning Model for undergraduate physical education students at Zunyi Medical University Medicine & Technology College, China. A Research and Development (R&D) approach based on the Borg and Gall model was employed, followed by a quasi-experimental pre-test–post-test control group design involving 80 students. Data were collected through observations, interviews, expert validation, questionnaires, and standardized 60-metre sprint tests, and analyzed using descriptive statistics and t-tests. The results showed that the developed model was valid, practical, and significantly more effective than conventional instruction ($p < 0.001$), improving sprint performance while increasing students' participation, engagement, collaboration, and learning motivation. The findings suggest that Traditional Chinese Games provide an effective and culturally responsive approach to sprint instruction in higher education.

Keywords: Traditional Chinese Games; 60-metre sprint; learning model; physical education; game-based learning; Research and Development.

1. Background

Sprinting is a fundamental discipline in athletics and an essential component of physical education curricula. The 60-metre sprint is widely used to assess acceleration, explosive power, reaction speed, neuromuscular coordination, and overall athletic performance (Cronin & Hansen, 2005; Morin et al., 2015; Haugen et al., 2019). For physical education students, sprint competence is important not only for improving athletic performance but also for developing the

pedagogical skills needed to teach sprint techniques effectively.

Despite its importance, sprint instruction in many universities still relies on teacher-centered approaches characterized by repetitive drills and isolated technical exercises. Although these methods improve technical skills, they often reduce students' motivation, engagement, and active participation (Casey & Goodyear, 2015; Kirk, 2018). Contemporary physical education therefore emphasizes learner-centered approaches that combine skill development with

enjoyable and meaningful learning experiences (Ryan & Deci, 2020).

One promising approach is Game-Based Learning (GBL), which integrates physical activity with problem-solving, cooperation, and competition to create engaging learning environments. Previous studies have shown that game-based learning improves motor competence, physical fitness, motivation, and long-term participation in physical activity (Harvey & Jarrett, 2014; Casey & Goodyear, 2015; Wang, 2024). Within this framework, Traditional Chinese Games (TCGs) provide additional educational value by combining physical activity with cultural heritage. Games such as *Jianzi*, *Cuju*, *Diabolo*, and *Dragon Tail Chase* involve sprint-related movements, including rapid acceleration, agility, reaction, and multidirectional running, which closely correspond to the biomechanical demands of sprint performance (UNESCO, 2021; Ying et al., 2023).

From a sports science perspective, sprint performance depends on explosive strength, stride mechanics, reaction time, and neuromuscular coordination (Morin et al., 2015; Haugen et al., 2019). Traditional Chinese Games naturally stimulate these physical components while providing enjoyable and meaningful movement experiences. Moreover, integrating traditional games into physical education aligns with China's Healthy China 2030 strategy, which promotes student-centered learning, lifelong physical activity, and the preservation of traditional sports culture.

Although previous studies have demonstrated the benefits of game-based learning and traditional games, important research gaps remain. Most existing studies focus on children or adolescents and examine general physical fitness rather than sprint-specific learning. Research involving university students, particularly those in physical education programs, is still limited. In addition, few studies have developed comprehensive sprint learning models that systematically integrate Traditional Chinese

Games with sports science principles and curriculum design.

Addressing this gap, the present study develops a Traditional Chinese Games-Based 60-Metre Sprint Learning Model for physical education students at Zunyi Medical University Medicine & Technology College. The model integrates twenty selected Traditional Chinese Games to improve acceleration, reaction speed, explosive power, agility, coordination, and running mechanics through culturally responsive and student-centered learning activities. Unlike previous studies that investigated individual games or general physical activity outcomes, this research proposes a comprehensive instructional model that combines educational theory, sports science, and Chinese cultural heritage. The findings are expected to contribute to evidence-based sprint pedagogy while supporting the preservation of Traditional Chinese Games within contemporary university physical education.

2. Research Methodology

This study employed a Research and Development (R&D) approach using the Borg and Gall (1983) model to develop and evaluate a Traditional Chinese Games-Based 60-Metre Sprint Learning Model for undergraduate physical education students at Zunyi Medical University Medicine & Technology College, China. The study integrated qualitative and quantitative methods throughout the development and evaluation process.

The research involved 204 undergraduate students aged 17–22 years. A preliminary field trial was conducted with 24 students, followed by a large-scale trial involving 100 students. The effectiveness of the developed model was evaluated using a quasi-experimental pretest–posttest control group design with 80 students, consisting of an experimental group ($n = 40$) and a control group ($n = 40$). The development process included needs analysis, model design, expert validation, product revision, field testing, and final evaluation. The learning model integrated selected Traditional Chinese Games into sprint instruction to improve acceleration,

speed, explosive power, coordination, balance, flexibility, and running mechanics through enjoyable and culturally relevant learning activities. Data were collected using classroom observations, interviews, expert validation sheets, student questionnaires, and standardized 60-metre sprint performance tests. Qualitative findings were used to refine the instructional model, while quantitative data were analyzed using descriptive statistics and paired-sample and independent-sample t-tests after testing the assumptions of normality and homogeneity. Statistical analyses were performed using IBM SPSS Statistics with a significance level of $p < 0.05$. The validity and credibility of the study were ensured through expert judgment, iterative revisions, data triangulation, standardized testing procedures, and repeated field evaluations. These procedures ensured that the developed learning model was both pedagogically appropriate and effective for improving sprint performance among university physical education students.

3. Findings And Discussion

3.1. Needs Analysis

The initial stage of this study focused on identifying the existing conditions of 60-metre sprint instruction among undergraduate physical education students at Zunyi Medical University Medicine & Technology College. A comprehensive needs assessment was conducted through classroom observations, semi-structured interviews with lecturers and students and a review of previous studies concerning sprint learning and game-based physical education.

The findings demonstrated that sprint instruction was still predominantly implemented using conventional teacher-centered approaches. Learning activities mainly consisted of repetitive sprint drills including standing starts, acceleration practice, stride correction and repeated short-distance running. Although these activities were effective in introducing fundamental sprint techniques, they tended to create monotonous learning experiences that gradually reduced students' enthusiasm and motivation.

Observational data indicated that many students became passive after several repetitions of identical sprint exercises. Physical fatigue combined with repetitive instructional patterns resulted in declining participation levels throughout the learning sessions. During interviews, numerous students expressed that conventional sprint practice lacked variation and failed to provide enjoyable learning experiences. They preferred instructional activities that incorporated elements of competition, cooperation and play, allowing them to remain physically active while simultaneously enjoying the learning process.

Another important finding concerned the instructional strategies employed by lecturers. Most instructors relied on traditional demonstration-practice methods with limited use of innovative pedagogical approaches. Furthermore, culturally meaningful learning resources particularly Traditional Chinese Games (TCGs) had never been systematically integrated into sprint instruction despite their potential to enhance movement learning and student motivation.

The literature review further confirmed that game-based learning has been widely recognized as an effective instructional strategy for improving motor competence, physical literacy, intrinsic motivation and active participation. Consequently, integrating Traditional Chinese Games into sprint instruction represents an appropriate pedagogical innovation that aligns with contemporary student-centered learning principles.

Overall, the needs analysis clearly indicated a substantial gap between current instructional practices and students' learning expectations. These findings strongly justified the development of a Traditional Chinese Games-Based 60-Metre Sprint Learning Model capable of enhancing sprint performance while simultaneously increasing learning enjoyment and active engagement.

Table 3.1. Summary of Needs Analysis

Aspect	Findings
Current learning model	Conventional drill-based sprint instruction
Student motivation	Relatively low during repetitive drills
Learning engagement	Declined during prolonged practice
Teaching innovation	Limited instructional variation
Integration of culture	Traditional Chinese Games not yet utilized
Student expectations	Interactive, enjoyable, competitive, game-based learning
Research implication	Development of an innovative TCG-based sprint learning model

3.2 Planning Stage

Following the identification of instructional problems, the planning phase focused on constructing a systematic instructional framework capable of improving both sprint performance and student engagement. The development process emphasized alignment between learning objectives, sprint biomechanics, instructional activities and assessment indicators.

The instructional objectives targeted four essential components determining sprint performance: sprint speed, explosive power, movement coordination, reaction ability. These components formed the conceptual foundation for designing all learning activities included in the instructional model. A total of 39 Traditional Chinese Games were carefully selected based on their movement characteristics and compatibility with sprint biomechanics. Each game was modified to develop one or more physical components required in 60-metre sprint performance.

Learning activities were designed progressively beginning with fundamental locomotor movements before advancing toward complex sprint-specific movement patterns. In addition, implementation procedures emphasized active

participation, collaborative learning, peer interaction and enjoyable competition.

To evaluate the success of the instructional model, several measurable performance indicators were established including sprint time improvement, movement quality, participation rate, learning engagement and student enjoyment. Overall, the planning phase successfully produced a comprehensive instructional blueprint integrating physical conditioning, cultural heritage and student-centered pedagogy into a single learning framework.

3.3 Development of the Preliminary Product

The preliminary product developed in this study consisted of a comprehensive instructional guidebook describing the implementation of a Traditional Chinese Games-Based 60-Metre Sprint Learning Model. The guidebook included learning objectives, instructional syntax, detailed descriptions of each game, teacher guidelines, student activities, assessment instruments and safety procedures.

Unlike conventional sprint instruction that emphasizes repetitive running practice, the developed model incorporated 39 Traditional Chinese Games, systematically classified according to their dominant physical components.

Table 3.2 Distribution of Traditional Chinese Games

Component	Description	Frequency	Percentage
Speed Model	Sprint acceleration and maximal speed	12	30.77%
Explosive Power Model	Leg strength and power	11	28.21%
Coordination Model	Movement rhythm and coordination	9	23.08%
Reaction Ability Model	Reaction speed	7	17.94%
Total		39	100%

The distribution demonstrates that the learning model places greater emphasis on speed and explosive power because these physical qualities contribute most significantly to short-distance sprint performance. Nevertheless, coordination and reaction ability remain integral components supporting efficient sprint mechanics.

Preliminary implementation further revealed encouraging outcomes. Student participation increased substantially during game-based activities compared with conventional sprint practice. Students demonstrated greater willingness to repeat movements, improved interaction with peers and more enthusiastic engagement throughout instructional sessions. Expert evaluation also confirmed high product feasibility with an overall validity score of 88.75% indicating that the developed instructional model possessed excellent pedagogical quality before field implementation.

3.4 Expert Validation Results

Expert validation was conducted by specialists in athletics coaching, motor learning, physical education pedagogy and educational

measurement. The objective was to determine the feasibility, validity and practicality of the developed learning model before implementation.

Overall, the experts rated the instructional model as highly feasible. The highest evaluation was obtained in instructional design (90.10%) indicating that the learning syntax, instructional procedures and sequencing of activities were logically organized and pedagogically appropriate.

Content feasibility (89.20%) also received a very high rating, suggesting that the selected Traditional Chinese Games appropriately represented sprint-related movement characteristics. Safety considerations achieved 89.30% confirming that the modified games could be safely implemented within university physical education settings.

Although practicality obtained the lowest score (86.40%), it still belonged to the "Good" category. Experts recommended several refinements including clearer game instructions, more flexible implementation options and simplified teacher guidelines.

Table 3.3 Expert Validation Results

Assessment Aspect	Score (%)	Category
Content Feasibility	89.20	Very Good
Instructional Design	90.10	Very Good
Practicality	86.40	Good
Safety	89.30	Very Good
Average	88.75	Very Good

These findings demonstrate that the developed learning model satisfies both pedagogical and practical requirements for implementation in university-level physical education.

3.5 Small Group Trial (n = 24)

The revised instructional model was subsequently implemented among 24 students to evaluate its practicality and initial instructional effectiveness. Results demonstrated considerable improvements across all observed indicators. Student participation increased from 69.50%

under conventional instruction to 85.20% representing an improvement of 15.70 percentage points. Learning engagement similarly increased from 71.30% to 86.80%, while learning enjoyment demonstrated the greatest improvement rising from 70.00% to 88.10%.

These improvements suggest that incorporating Traditional Chinese Games successfully transformed sprint learning into a more enjoyable and motivating educational experience.

Table 3.4 Small Group Trial Results

Indicator	Conventional (%)	TCG Model (%)	Improvement
Student Participation	69.50	85.20	+15.70
Learning Engagement	71.30	86.80	+15.50
Learning Enjoyment	70.00	88.10	+18.10
Activity Effectiveness	72.40	87.50	+15.10
Average	70.80	86.90	+16.10

Classroom observations further confirmed that students became increasingly confident, cooperative and motivated during instructional activities. Minor revisions concerning instructional timing and game explanations were subsequently incorporated before conducting the large-group trial.

3.6 Large Group Trial (n = 100)

Following product revision, the instructional model was implemented among 100 students to evaluate its scalability and broader instructional effectiveness. The results consistently demonstrated superior performance across all measured learning indicators.

Table 3.5 Large Group Trial Results

Indicator	Conventional (%)	TCG Model (%)	Improvement
Student Participation	70.20	88.40	+18.20
Learning Engagement	72.10	89.10	+17.00
Collaboration & Interaction	71.50	90.20	+18.70
Movement Coordination	73.00	87.60	+14.60
Reaction Speed	72.80	88.00	+15.20
Sprint Mechanics	74.10	89.30	+15.20
Average	72.28	88.77	+16.49

The highest improvement occurred in Collaboration and Interaction (+18.70%) indicating that Traditional Chinese Games effectively promoted cooperative learning and social engagement. Student participation also increased markedly (+18.20%) suggesting that the game-based approach successfully maintained students' motivation throughout instructional sessions.

Furthermore, substantial improvements in movement coordination, reaction speed and sprint mechanics indicate that the developed model enhanced not only affective learning outcomes but also motor skill acquisition and technical sprint performance.

Overall, the large-group trial confirms that the Traditional Chinese Games-Based 60-Metre Sprint Learning Model is pedagogically effective, practically feasible and highly suitable for implementation in university physical education programs. The consistent improvements observed across cognitive, affective and psychomotor domains demonstrate the potential of integrating culturally relevant game-based learning into sprint instruction providing a more engaging and holistic alternative to conventional drill-based teaching methods.

3.7. Effectiveness Test Results (n = 80)

The final stage of this research focused on evaluating the effectiveness of the developed Traditional Chinese Games (TCG)-Based 60-Metre Sprint Learning Model through an experimental study involving 80 undergraduate physical education students at Zunyi Medical University Medicine & Technology College. This stage represents the most critical phase of the research because it empirically determines whether the developed instructional model produces significantly better learning outcomes than conventional sprint instruction.

To ensure the objectivity of the experiment, participants were randomly assigned into two equivalent groups consisting of 40 students in the experimental group and 40 students in the control group. The experimental group received instruction using the Traditional Chinese Games-based learning model, whereas the control group

participated in conventional sprint instruction characterized by repetitive sprint drills and teacher-centered demonstrations. Both groups underwent the same instructional duration, learning objectives and assessment procedures with the instructional approach serving as the only differentiating variable.

Before the intervention commenced, all participants completed a pre-test measuring their 60-metre sprint performance. The pre-test results demonstrated that both groups possessed almost identical sprint abilities. The experimental group recorded an average sprint time of 9.20 seconds, while the control group recorded 9.18 seconds. The minimal difference between these two mean scores confirms that both groups began the study under relatively equivalent performance conditions, thereby providing a valid basis for evaluating the effectiveness of the developed instructional model.

Following several weeks of instructional implementation, participants completed the post-test using the same standardized sprint assessment procedures. The post-test findings revealed substantial improvements in both groups. However, the magnitude of improvement observed in the experimental group was considerably greater than that of the control group. Students who participated in the Traditional Chinese Games-based learning model achieved an average sprint time of 8.60 seconds representing a reduction of 0.60 seconds or an improvement of 6.52% compared with their baseline performance. In contrast, students receiving conventional instruction improved from 9.18 seconds to 8.95 seconds, corresponding to a reduction of only 0.23 seconds or 2.50%.

The superior improvement observed in the experimental group suggests that integrating Traditional Chinese Games into sprint instruction provides more effective opportunities for developing sprint speed and acceleration. Unlike conventional repetitive drills, the game-based instructional model encourages repeated high-intensity movement through enjoyable and competitive learning situations. Students

continuously perform acceleration, rapid directional changes, explosive movements and quick reactions without experiencing excessive boredom or psychological fatigue. Consequently, the instructional process becomes more motivating, allowing students to maintain higher participation levels throughout the training sessions.

Furthermore, classroom observations conducted during the intervention indicated that students in the experimental group displayed greater enthusiasm, stronger peer interaction and increased willingness to repeat physically demanding activities. These behavioural improvements likely contributed to the greater physiological adaptations reflected in their sprint performance. The integration of culturally meaningful Traditional Chinese Games also created a more relaxed and enjoyable learning atmosphere, reducing students' anxiety while simultaneously increasing intrinsic motivation toward sprint practice.

Although the control group also demonstrated statistically meaningful improvements, the magnitude of change remained relatively modest. Conventional sprint instruction successfully improved technical execution through repetitive practice; however, the monotonous nature of traditional drills appeared to reduce student engagement during prolonged learning sessions. Consequently, the physiological and motivational benefits obtained through conventional instruction were less substantial than those achieved through the game-based learning model.

Overall, these findings provide strong empirical evidence that the Traditional Chinese Games-Based 60-Metre Sprint Learning Model produces greater improvements in sprint performance than conventional instructional approaches. The results indicate that combining structured sprint training with culturally relevant game-based activities not only enhances physical performance but also increases student motivation, participation, and learning enjoyment.

Table 3.6. Effectiveness Test Results (n = 80)

Group	N	Pre-test Mean (sec)	Post-test Mean (sec)	Mean Difference	Improvement (%)	t-value	Sig. (p)	Category
Experimental	40	9.20	8.60	-0.60	6.52	-8.75	0.000	Significant
Control	40	9.18	8.95	-0.23	2.50	-3.20	0.002	Significant
Between Groups	—	—	—	-0.37	—	-4.10	0.000	Significant

The findings presented in Table 4.6 clearly demonstrate that although both instructional approaches contributed to improved sprint performance, the Traditional Chinese Games-based learning model generated substantially greater performance gains. The larger mean difference, higher percentage improvement and stronger statistical significance collectively indicate the superiority of the developed instructional model over conventional sprint instruction.

3.7.1. Pre-test and Post-test Results

A comparison between pre-test and post-test scores was conducted to determine the extent to which each instructional approach influenced students' sprint performance. This comparison also served to evaluate whether the observed improvements resulted from the implemented instructional intervention rather than from initial differences between the groups.

As shown in Table 4.7, the experimental and control groups exhibited nearly identical baseline sprint performances before treatment with

average sprint times differing by only 0.02 seconds. Such similarity indicates that both groups possessed equivalent sprint abilities prior to the intervention, thereby strengthening the internal validity of the experimental design.

Following the intervention, the experimental group demonstrated a remarkable reduction in sprint time, achieving an average improvement of 0.60 seconds (6.52%). In comparison, the control group improved by only 0.23 seconds (2.50%). Consequently, the gap in post-test performance between both groups reached 0.37 seconds, representing a meaningful competitive advantage in short-distance sprint events.

The larger improvement observed among students receiving the Traditional Chinese Games-based instruction suggests that game-oriented learning environments promote more effective physical adaptation than conventional

drill-based training. The modified games repeatedly stimulated explosive acceleration, rapid movement initiation, coordination, and reaction speed under enjoyable conditions. Such repeated movement experiences likely enhanced neuromuscular efficiency while simultaneously maintaining high motivational levels throughout the instructional program.

Moreover, students participating in the experimental group consistently reported greater enjoyment and satisfaction with the learning activities. Increased enjoyment appears to have encouraged more active participation and greater practice intensity, ultimately contributing to improved sprint performance. These findings further reinforce the pedagogical value of integrating culturally relevant games into university physical education.

Table 3.7. Pre-test and Post-test Comparison

Group	N	Pre-test Mean (sec)	Post-test Mean (sec)	Mean Difference	Improvement (%)	Category
Experimental	40	9.20	8.60	-0.60	6.52	High Improvement
Control	40	9.18	8.95	-0.23	2.50	Moderate Improvement
Difference	—	—	—	-0.37	—	Significant Gap

The comparison clearly indicates that the developed instructional model produced more than twice the performance improvement achieved through conventional sprint instruction confirming its superior instructional effectiveness.

3.7.2. Statistical Analysis

To verify whether the observed improvements were statistically significant, inferential statistical analyses were performed using paired sample t-tests and an independent sample t-test. These analyses evaluated both the effectiveness of each instructional method individually and the

comparative effectiveness between the two instructional approaches.

The paired sample t-test conducted for the experimental group yielded a t-value of -8.75 with a significance level of $p = 0.000$, indicating a highly significant improvement in sprint performance following participation in the Traditional Chinese Games-based learning model. The magnitude of this statistical value reflects substantial changes in students' sprint ability after the intervention.

Similarly, the control group also demonstrated statistically significant improvement ($t = -3.20$; $p = 0.002$). Nevertheless, the smaller t-value and

lower mean improvement indicate that conventional instruction generated weaker performance gains than the developed instructional model.

To compare post-intervention outcomes directly, an independent sample t-test was conducted between the experimental and control groups. The analysis produced a t-value of -4.10 with $p = 0.000$ confirming a statistically significant difference in sprint performance after treatment. Since the significance value was substantially lower than the predetermined alpha level ($\alpha =$

0.05), the null hypothesis was rejected and the research hypothesis was accepted.

These statistical findings provide compelling empirical evidence that the Traditional Chinese Games-Based Sprint Learning Model is significantly more effective than conventional sprint instruction. The integration of culturally meaningful game-based activities not only improved students' sprint performance but also enhanced learning motivation, movement repetition, physical engagement and overall instructional effectiveness.

Table 3.8. Hypothesis Testing

Test Type	Group Compared	Mean Difference	t-value	Sig. (p-value)	α (0.05)	Conclusion
Paired Sample t-test	Experimental	-0.60	-8.75	0.000	<0.05	Significant Improvement
Paired Sample t-test	Control	-0.23	-3.20	0.002	<0.05	Significant Improvement
Independent Sample t-test	Experimental vs Control	-0.37	-4.10	0.000	<0.05	Significant Difference

The statistical evidence presented in Table 4.8 unequivocally demonstrates that the developed Traditional Chinese Games-Based 60-Metre Sprint Learning Model significantly outperformed conventional sprint instruction. Therefore, the research hypothesis stating that the developed learning model improves students' 60-metre sprint performance more effectively than conventional instructional methods is supported by the empirical findings. These results validate the instructional value of integrating culturally responsive game-based learning into physical education and provide strong evidence for the broader implementation of the developed model in university-level sprint instruction.

4. Conclusion

This study developed and validated a Traditional Chinese Games (TCG)-Based 60-Metre Sprint Learning Model for undergraduate physical

education students at Zunyi Medical University Medicine & Technology College. The findings demonstrate that integrating Traditional Chinese Games into sprint instruction effectively improves sprint performance while enhancing students' motivation, participation, and engagement. Compared with conventional instruction, the developed model produced significantly better learning outcomes and was confirmed to be pedagogically feasible through expert validation and field testing.

Beyond improving physical performance, the model promotes active learning, collaboration, and appreciation of Chinese cultural heritage, demonstrating that Traditional Chinese Games can serve as effective instructional resources in higher education. The study contributes to the literature by integrating motor learning, game-based learning, and culturally responsive pedagogy into a comprehensive sprint learning

model, while offering lecturers an innovative, practical, and low-cost instructional approach.

This study was limited to one university and a relatively short intervention period. Future research should evaluate the model in broader

educational contexts with larger samples and investigate the integration of digital technologies, such as wearable sensors and artificial intelligence, to further enhance sprint learning and performance assessment.

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