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Construction of Training Program to Improve Sports Vision, Core Strength, Endurance, and Skills in Orienteering for College Students

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Abstract

Background and Aim: Orienteering is a sport that combines endurance, spatial cognition, and rapid decision-making, requiring athletes to navigate unfamiliar terrain using maps and compasses. Strong sports vision, core strength, and endurance are essential for success. However, current training programs in Chinese universities often isolate these elements, limiting athletes' overall performance. Studies have shown that integrating these aspects can significantly enhance orienteering skills. This study aims to develop a comprehensive training program for the Orienteering Club of Guangdong Eco-Engineering Polytechnic. By incorporating sports vision, core strength, and endurance training, the program seeks to improve athletes’ navigation efficiency, stability, and stamina, aligning with international best practices.

Materials and Methods: This study employed a quasi-experimental design with a nonequivalent pretest-posttest control group structure. Forty male members of the Orienteering Club of Guangdong Eco-Engineering Polytechnic were non-randomly assigned to either an experimental group (n = 20) or a control group (n=20) based on systematic allocation to ensure baseline comparability. The experimental group received a training program integrating sports vision, core strength, endurance, and orienteering skills. In contrast, the control group engaged only in routine orienteering skill training to maintain ecological validity. The intervention lasted for eight weeks, with training sessions conducted four days per week, each lasting 120 minutes to maintain consistency in training intensity. Data collection occurred at three time points: baseline (pretest), mid-intervention (week 4), and post-intervention (week 8). Statistical analyses included descriptive statistics (mean and standard deviation), independent t-tests for between-group comparisons, and repeated-measures one-way ANOVA to assess within-group changes over time. Bonferroni post hoc tests were conducted to determine specific differences between time points. The level of significance was set at $\alpha = 0.05$.

Results: The experimental group showed significant improvements in sports vision (+17.90 times), core strength (sit-ups +14.80 repetitions), and endurance (1000m run -24.05 seconds), while the control group had no significant changes. Orienteering skills also improved notably, with a 12.65-point increase in the Field Patrol Test and a 19.25-point increase in the Field Checkpoint Layout Test. No significant differences existed between the group’s pre-experiment and post-experiment results; the experimental group outperformed the control group in all areas ($p<0.001$), demonstrating the effectiveness of the integrated training program.

Conclusion: The experimental group demonstrated significantly greater improvements in sports vision, core strength, endurance, and orienteering skills compared to the control group, confirming the effectiveness of an integrated training program. The most notable gains were observed in sports vision and endurance, highlighting their critical role in orienteering performance. These findings suggest that incorporating targeted training into college sports programs can enhance students' overall physical fitness and navigation abilities, providing a structured framework for optimizing orienteering training at the collegiate level.

Keywords: Orienteering; College Students; Orienteering; Sports Vision; Core Strength; Endurance; Orienteering Skills; Training Program; Quasi-Experimental Study; Training Intervention

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Introduction

Orienteering is a sport requiring endurance, spatial cognition, and rapid decision-making, often described as “running international chess” (Liu & Mi, 2020). Originating in Scandinavia, it has evolved into a global discipline, with countries like Sweden and Finland pioneering integrative training models that emphasize sports vision, core stability, and navigation skills (IOF, 2021). The World Health Organization also advocates for holistic sports development. In China, orienteering has been incorporated into university curricula since the 1980s, yet challenges remain. The 2020 National Student Physical Fitness report found that only 68.3% of university students met endurance standards, and fewer than 60% achieved core strength benchmarks (Ministry of Education, 2021). Current training programs often focus on isolated skill drills rather than comprehensive conditioning (Li, 2019). This fragmented approach contrasts with IOF’s recommendation for “cogni-physical” training that integrates physical and cognitive skills (IOF, 2021).

Core strength is essential for balance, stability, and injury prevention (Kibler, Press, & Sciascia, 2020), while endurance supports sustained exertion and efficient oxygen utilization (Bassett & Howley, 2010). Sports vision is equally critical, as orienteers must interpret maps and environmental cues rapidly. Studies confirm that training in these areas significantly improves athletic performance (Liu & Yan, 2021).

Despite these findings, orienteering training in Chinese universities remains skill-focused, neglecting physical conditioning. This study aims to develop an integrated training program for the Orienteering Club of Guangdong Eco-Engineering Polytechnic, combining sports vision, core strength, endurance, and technique training to enhance navigation efficiency, stability, and stamina, aligning with international best practices.

Objectives

1. To construct a training program for sports vision, core strength, endurance, and Orienteering skills for college students.
2. To compare the performance of the experimental group and the control group in sports vision, physical fitness, and Orienteering skills after training.
3. To compare the performance of the experimental group in sports vision, physical fitness, and Orienteering skills before the test, after the 4th week, and after the test.
4. To set the experiment to find the effectiveness of the training program.

Literature review

This review synthesizes evidence on key components of orienteering performance—sports vision, core strength, endurance, and technical skills—and their interdependencies within a cohesive training framework. Drawing from global research and China’s policy-driven priorities, it establishes a scientific rationale for integrating these elements to address gaps in collegiate orienteering training.

1. Content and skills of Orienteering

Orienteering, rooted in military navigation (Zhang, 1987), demands a unique synergy of physical stamina and cognitive agility. Athletes must decode 2D maps into 3D spatial models (Shan, 2011), execute rapid compass-based decisions (Xue, 2018), and optimize route efficiency under fatigue (Li, 2019). This integration of endurance, visual processing, and biomechanical control distinguishes orienteering from conventional endurance sports (Zhang & Zhou, 2023). For instance, map-reading accuracy declines by 23% under aerobic exhaustion, underscoring the interdependence of physical and cognitive capacities (Andersson et al., 2021).

2. Sport Vision

Since Fullerton’s (1921) discovery of Babe Ruth’s superior vision, sports vision research has evolved to address sport-specific demands. In orienteering, dynamic visual acuity (DVA) enables athletes to track terrain features while navigating at speed (Wilson & Daly, 2004). Studies quantify that 40% of orienteering errors stem from delayed visual processing (Liu & Yan, 2021), with DVA training reducing checkpoint misidentification by 31% (McLeod, 2019). Critical skills include: Peripheral awareness: Detecting

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landmarks without fixating (Wang, 2003). Depth perception: Judging slope gradients for route optimization (Shan, 2011). Visual-motor integration: Translating map symbols into coordinated movements (Zhong, 2012). These skills are trainable through gaze-contingent tasks, directly enhancing navigation efficiency (r = 0.68 between DVA and route-planning speed; IOF, 2022).

3. Core Strength

Core musculature stabilizes the trunk during uneven terrain traversal, minimizing energy leakage and injury risk (Handzel, 2003). Willson et al. (2005) differentiated core stability (maintaining posture) from core strength (force generation), both vital for orienteering: Stability reduces lateral sway by 18% on slopes, preserving navigation focus (Li et al., 2008). Strength improves force transfer during uphill sprints, shortening checkpoint intervals by 12% (Zhao, 2021). Exercises like anti-rotation planks and Russian twists enhance these capacities, with EMG studies showing 27% greater oblique activation in trained orienteers (Hibbs et al., 2008).

4. Endurance

Orienteering's intermittent intensity (60–90% VO_2max) necessitates both aerobic base and anaerobic resilience (Murakoshi, 1986). Traditional long-distance running inadequately prepares athletes for stop-start demands; instead, Fartlek training (variable-pace running) improves terrain-specific endurance by 19% (Liang, 2011). Physiological adaptations include: Capillary density: +14% in trained athletes, enhancing oxygen delivery. Lactate threshold: Delayed by 22%, enabling prolonged high-intensity efforts (Shi & Zhang, 2009). Mountain repeats and weighted pack runs further simulate competition demands, boosting hill-climbing efficiency by 15% (He, 2000).

5. Principles And Methods of Sport Training Program Development

Specificity: Simulating orienteering's cognitive-physical duality. Example: Navigation drills under fatigue (Bompa & Haff, 2009). Progressive overload: Incrementally increasing map complexity and elevation gain (Stone et al., 2007). Periodization: Aligning peak endurance (weeks 5–6) with pre-competition technical refinement (Kellmann, 2010). These principles counterbalance the sport's dual demands—e.g., combining VO_2max intervals with post-exhaustion decision tasks to mimic race-induced fatigue.

6. Physical Fitness Training for Orienteering Components and Tests

Orienteering involves map reading, compass use, route selection, and high-intensity running (Luo, 2018). Athletes must develop core strength, endurance, speed, flexibility, and agility (Wang, 2009). Aerobic and anaerobic endurance are essential for adapting to variable-speed running (Murakoshi, 1986). Core exercises like planks, sit-ups, and Russian twists improve stability and efficiency (Zhao, 2021). Endurance training includes running, swimming, and biking. Testing methods include the 1-minute sit-up test and 1000m run (Ministry of Education, 2014). Scientific training enhances performance, stability, and endurance in complex race environments.

7. Orienteering Performance

How to test

Performance can be assessed using) Field Patrol Test – Measures speed and efficiency in navigating checkpoints. .2) Field Checkpoint Layout Test – Evaluates accuracy in placing checkpoints on a map (Guangdong Provincial Social Sports and Training Competition Center, 2023).

How to train

To enhance performance, Orienteering training focuses on four key skills:1)Map Reading – Strengthens memory-based navigation using visual and simplified memory techniques (Shan, 2011).2)Route Selection – Trains decision-making for efficient travel, prioritizing paved routes and high-ground navigation.3)Checkpoint Capture–Enhances attack point selection through simulation exercises.4)Distance Judgment–Uses step measurement, practical drills, and visual estimations to improve accuracy (Yuan & Yan, 2023).

8. Training Program Construction

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This 8-week program enhances sports vision, core strength, endurance, and orienteering skills, conducted 4 times per week for 2 hours per session. The 8-week duration aligns with established training principles, as physiological adaptations such as aerobic endurance improvements, neuromuscular coordination, and strength gains typically require 6-8 weeks of consistent training (Bompa & Haff, 2009). Training frequency ensures a balance between overload and recovery, optimizing performance while minimizing the risk of overuse injuries (Mujika & Padilla, 2000). The program is divided into four phases: Basic Training (Weeks 1-2): Establishes fundamental skills, movement patterns, and endurance. Intensive Training (Weeks 3-4): Increases complexity, intensity, and specific skill application. Special Training (Weeks 5-6): Focuses on advanced navigation, endurance, and competition-level performance. Comprehensive Training (Weeks 7-8): Simulates race conditions, reinforcing adaptability and decision-making.

Adaptation to variability is critical in orienteering due to unpredictable terrain and environmental changes. Training programs incorporating variability improve athletes' ability to adjust to new stimuli, enhancing cognitive and physical adaptation (Issurin, 2008). Orienteering requires continuous decision-making under physical strain, making structured yet flexible training essential for optimal performance (Seiler & Tønnessen, 2009).

9. Summaries

This study integrates sports vision, core strength, endurance, and Orienteering skills into a college training program, addressing gaps in existing research on the combined development of these attributes. While Orienteering techniques such as map reading, compass use, and route selection are well-documented (Shan, 2011), few studies integrate sports vision training, which enhances visual tracking, peripheral vision, and depth perception (McLeod, 2019). Additionally, conventional training often lacks a structured approach to improving core strength and endurance, key factors for stability and sustained performance (Hibbs et al., 2008; Bassett & Howley, 2000). This study proposes an 8-week regimen (Ward, 2022) based on specificity, progression, overload, and recovery (Bompa & Haff, 2009), utilizing standardized tests (Ministry of Education, 2014) to evaluate effectiveness. By bridging these gaps, this program offers a comprehensive model for Orienteering training in college settings.

Conceptual Framework

input	Process	output
1. Principle of training 2. Sports vision, Core strength, Endurance, and Orienteering skills training program 3. Orienteering skills indicators 4. Test and evaluation 5. Construct a training program	1. Collection of information 2. Expert IOC assessment 3. Try out 4. The experimental group and the control group were trained and tested 5. Data collection and analysis	1. Training Quality outcomes 2. Sports vision and Physical fitness test results 3. Orienteering skills test results 4. The program evaluation

Figure 1 Conceptual Framework

Methodology

Population

The study population consisted of 60 male sophomores and juniors, aged 20-21, from the Orienteering Club of Guangdong Eco-Engineering Polytechnic. The decision to include only male

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participants was made to ensure a homogenous sample and to control for potential physiological differences between genders, which could introduce confounding variables.

Sample

Screening: All 60 athletes underwent baseline testing (sports vision, 1-minute sit-ups, 1000m run, orienteering skills). Ranking & Exclusion: Participants were ranked from lowest to highest based on their composite score (equally weighted across tests). This ranking prioritized addressing performance gaps in lower-tier athletes while maintaining a representative spread. Systematic Allocation: The top 40 athletes were alternately assigned to Group A (experimental) and Group B (control) to balance baseline capabilities. For example:

Group	Sort of scores																			
A	1	4	5	8	9	12	13	16	17	20	21	24	25	28	29	32	33	36	37	40
B	2	3	6	7	10	11	14	15	18	19	22	23	26	27	30	31	34	35	38	39

Exclusion Criteria: Attendance <90% of training sessions. Failure to complete tests within the stipulated timelines. Medical contraindications (e.g., injuries). Voluntary withdrawal.

Research design

There were two groups, the A group (experimental group) and the B group (control group). The three tests were conducted before the experiment,4 weeks later, and after the experiment:

Experimental group	O1	T1	O2	T1	O3
Control group	O1	T2	O2	T2	O3

O1 = Test of the experimental group and control group before the experiment. O2 = Test of the experimental group and control group after four weeks. O3=Test of the experimental group and control group after the experiment. Experimental group training program, T2=Control group training program.

Research Instrument

1. Expert interviews: Structured interviews were conducted with five authoritative coaches from the Guangdong Orienteering Team and college clubs to validate the training program.

2. Item-Objective Consistency Index (IOC): The IOC value was determined to be 0.90, confirming the scientific rigor and validity of the study.

3. Training program: The experimental group participated in an integrated training protocol encompassing sports vision enhancement, core strength development, endurance conditioning, and orienteering foundational skills. In contrast, the control group received a routine orienteering training. The intervention spanned eight weeks, with sessions conducted four times weekly (Monday, Wednesday, Thursday, Friday) at a fixed duration of 120 minutes per session (16:00–18:00 daily).

4. Test

1) Sports Vision test: FITLIGHT Trainer ™ reaction time (milliseconds).
2) Physical Fitness test: One-minute sit-ups (core strength) and 1000-meter running (endurance).
3) Orienteering skills test: Field patrol test and Field checkpoint layout test.

Data collection

1. Literature review to establish theoretical foundations.
2. Expert validation of training plans and test content.
3. IOC evaluation with five experts to assess test validity.
4. Initial testing and data collection.
5. Implementation of the 8-week training program with data collection at pre-, mid-, and post-experiment intervals.
6. Administration of a satisfaction questionnaire to the experimental group to assess training effectiveness and applicability.

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Data Analysis

Descriptive Statistics: Utilized to summarize test scores, training participation satisfaction, and IOC evaluation results.

Inferential Statistics: An independent samples t-test was conducted to compare technical performance differences between the experimental and control groups. A repeated measures ANOVA with Bonferroni post hoc analysis was employed to assess within-group differences across multiple time points.

Research Process

Step 1: Conduct a comprehensive literature review to analyze the components of physical fitness, training principles, and methodologies relevant to orienteering.

Step 2: Develop test indicators and training programs based on expert consultation and validation.

Step 3: Implement a one-week trial phase to refine the training protocol based on expert feedback and preliminary observations.

Step 4: Conduct initial testing and apply systematic sampling to assign participants to groups in a controlled manner.

Step 5: Execute the structured 8-week training program according to the predefined schedule.

Step 6: Collect data and perform statistical analyses on pre-, mid-, and post-test results to assess training effects.

Step 7: Interpret findings, formulate conclusions, and compile the final research report.

Results

Table 1 Characteristics of sample group (M = Mean; SD = Standard Deviation)

Variable	Experimental group	Control group	t	p
	M±SD	M±SD		
Age (year)	20.35±0.49	20.65±0.49	0.31	0.761
Height (cm)	171.65±5.09	173.33±4.46	-0.64	0.527
Weight (kg)	65.20±4.76	67.35±3.98	-0.89	0.381
BMI	22.10±0.67	22.41±0.58	-1.68	0.101

Table 1 presents the baseline characteristics of the experimental and control groups. Independent samples t-tests confirmed no statistically significant differences between the groups in age (t = 0.31, p = 0.761), height (t = -0.64, p = 0.527), weight (t = -0.89, p = 0.381), or BMI (t = -1.68, p = 0.101). All variables exhibited p-values > 0.05, supporting the assumption of baseline comparability (α = 0.05). These results validate the systematic allocation method and ensure that observed post-intervention differences can be attributed to the training program rather than pre-existing disparities.

Table 2 Comparison of the pertest on the Sports vision test, Physical fitness test, and Orienteering skills test between the experimental and control group with t-test independent

Variables	Experiment group	Control group	95% Confidence Interval of the Difference		t	p
	M±SD	M ± SD	Lower	Upper		
Sports vision test 1 min (reps/min)	62.55 ± 3.10	63.65±2.80	-2.99	0.79	-1.18	0.25
Sit-ups 1 min test (reps/min)	46.60±2.70	45.05±3.36	-0.40	3.50	1.61	0.12
1000m test (sec)	213.95±9.74	211.15±9.16	-3.25	8.85	0.94	0.35
Field patrol test (score)	85.90 ± 5.42	85.75 ± 5.20	-3.25	3.55	0.089	0.929
Field checkpoint layout test (score)	78.80 ± 4.88	78.80 ± 5.22	-3.34	3.24	0.001	1.000

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From table 2, it was found that: These results (p > 0.05 for all comparisons) confirm baseline equivalence between groups before the intervention, ensuring that subsequent performance differences can be attributed to the experimental training program.

Table 3 Comparison of the posttest on Sports vision test, Physical fitness test, and Orienteering skills test between the experimental and control groups with t-test independent

Variables	Experiment group	Control group	95% Confidence Interval of the Difference		t	p
	M±SD	M± SD	Lower	Upper		
Sports vision 1-minute test (reps/min)	80.45±5.46	63.25±4.72	13.93	20.47	10.65	.001*
Sit-ups 1-minute test (reps/min)	55.80±7.28	48.66±2.653	3.74	10.76	4.19	.001*
1000m test (sec)	189.60±7.91	204.60±9.40	-20.56	-9.44	-5.46	.001*
Field patrol test (score)	98.55 ± 1.91	89.55 ± 7.80	5.36	12.64	5.01	<0.001*
Field checkpoint layout test (score)	98.05 ± 2.76	86.60 ± 6.14	8.60	14.30	8.14	<0.001*

*P<.05

Table 3 shows that the experimental group demonstrated substantial improvements in sports vision acuity, core strength, endurance, and orienteering skills compared to the control group, with standardized effect sizes (d > 1.30) indicating clinically meaningful enhancements. These findings underscore the efficacy of the integrated training protocol in optimizing multidimensional performance metrics critical to competitive orienteering.

Table 4 Mean and standard deviation of Sports vision test, Physical fitness test, and Orienteering skills test of experimental group (n=20) and control group (n=20)

Variables	Experimental group			Control group		
	Pretest	Mid test	Post test	Pretest	Mid test	Post test
	M± SD	M±SD	M± SD	M±SD	M± SD	M±SD
Sports vision 1-minute test (reps/min)	62.55±3.10	71.00±3.71	80.45±3.71	63.65±2.80	63.55±3.52	63.25±4.72
Sit-ups 1 minute test (reps/min)	46.6±2.70	54.40±3.80	61.40±3.41	45.05 ±3.36	47.70±3.87	48.85±3.12
1000m test (sec)	213.65±10.42	203.15±11.04	189.60±10.64	211.15±9.16	206.45±9.89	204.60±9.40
Field patrol test (score)	85.90 ±5.42	93.95 ±4.71	98.55±1.91	85.75±5.20	87.90±5.79	89.55 ±7.80
Field checkpoint layout test (score)	78.80 ±4.88	92.35±4.28	98.05 ±2.76	78.80±5.22	84.70±4.87	86.60 ±5.65

Table 4 shows that repeated measures revealed nonlinear gains in the experimental group, peaking at weeks 5–8: accelerated improvements in sports vision (+8.45→+9.45 reps/min) and 1000m run (-10.50→-13.55 sec), sustained sit-up growth (d=1.32), and orienteering skill consolidation (checkpoint gains +13.55→+5.70, nearing ceiling [98.05/100]), aligning with skill mastery models.

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Table 5 Within-Group Longitudinal Comparisons of Experimental Group Performance Using Repeated Measures ANOVA with Bonferroni Correction

Dependent variables	Test		Bonferroni			M ± SD	F	p
			Mean Difference	Std. Error	p			
Sports vision 1 minute test (reps/min)	Pretest	Mid test	-8.45	1.33	.001*	62.55±3.103	90.34	＜.001*
		Post test	-17.90	1.33	.001*			
	Mid test	Pretest	8.45	1.33	.001*	71.00±3.71		
		Posttest	-9.45	1.33	.001*			
	Post-test	Pretest	17.90	1.33	.001*	80.45±5.46		
		Mid test	9.45	1.33	.001*			
Sit-ups 1 minute test (reps/min)	Pretest	Mid test	-7.80	1.06	.001*	46.60±2.70	98.50	＜.001*
		Post-test	-14.80	1.06	.001*			
	Mid test	Pretest	7.80	1.06	.001*	54.40±3.80		
		Post-test	-7.00	1.06	.001*			
	Post-test	Pretest	14.80	1.06	.001*	61.40±3.41		
		Mid test	7.00	1.06	.001*			
1000m test (sec)	Pretest	Mid test	10.50*	3.13	.001*	213.65±10.42	29.75	＜.001*
		Post-test	24.05*	3.13	.001*			
	Mid test	Pretest	-10.50*	3.13	.001*	203.15±11.04		
		Post-test	13.55*	3.13	＜.001*			
	Post-test	Pretest	-24.05*	3.13	＜.001*	189.60±7.91		
		Mid test	-13.55*	3.13	＜.001*			
Field patrol test (score)	Pretest	Mid test	-8.05*	1.36	.001*	85.90±5.42	44.61	＜.001*
		Post-test	-12.65*	1.36	.001*			
	Mid test	Pretest	8.05*	1.36	.001*	93.95±4.71		
		Post-test	-4.60*	1.36	.001*			
	Post-test	Pretest	12.65*	1.36	.001*	98.55±1.91		
		Mid test	4.60*	1.36	.001*			
Field checkpoint layout test (score)	Pretest	Mid test	-13.55*	1.30	.001*	78.80±4.90	117.74	＜.001*
		Post-test	-19.25*	1.30	.001*			
	Mid test	Pretest	13.55*	1.30	.001*	92.35±4.28		
		Post-test	-5.70*	1.30	.001*			
	Post-test	Pretest	19.25*	1.30	.001*	98.05±2.76		
		Mid test	5.70*	1.30	.001*			

*P<.05

Table 5 shows that repeated measures ANOVA with Bonferroni correction demonstrated significant improvements in the experimental group across sports vision ($F = 90.34$, $\eta^2 = 0.83$), sit-ups ($F = 98.50$, $\eta^2 = 0.85$), 1000m run ($F = 29.75$, $\eta^2 = 0.62$), and orienteering skills (checkpoint layout: $F = 117.74$, $\eta^2 = 0.84$; $p < 0.001$). Greenhouse-Geisser correction ($\varepsilon = 0.75$–0.89) confirmed large to very large effect sizes ($\eta^2 = 0.62$–0.84), validating the scientific efficacy of the training program in integrating multidimensional physical and technical capacities.

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Table 6 Training participation satisfaction (average score of 20 subjects in the experimental group,1 = very poor, 2 = poor, 3 = average, 4 = good, 5 = very good)

No	Issues	Moderate training intensity	Scientific training methods	The training effect is obvious	Training interest	Overall Rating
1	Sports vision training (such as eye movement training, visual tracking, environmental adaptation)	4.1	4.2	4.6	4.3	4.6
2	Core strength training (such as planks, sit-ups, squats)	4.0	4.3	4.6	4.1	4.2
3	Endurance training (such as jogging, interval running, cycling, swimming)	4.3	4.5	4.2	4.4	4.3
4	Orienteering skills training (such as map reading, route planning, and orientation)	4.0	4.7	4.5	4.4	4.5
5	Satisfaction with the overall training program	4.2	4.6	4.4	4.4	4.6

Table 6 shows that the training program received highly positive feedback (overall 4.6). Scientific methods (4.7) and effectiveness (4.6) were top-rated. Endurance and orienteering skills had the most engagement (4.4). Core strength training showed lower interest (4.1), suggesting room for improvement. Intensity was well-balanced across activities, the program was well-received, scientifically rigorous, and effective, with minor areas for potential engagement improvements.

Summary of research results

Sports Vision Enhancement: The experimental group exhibited statistically significant improvements in sports vision post-intervention ($p < 0.001$, $d = 3.41$), whereas the control group showed no meaningful changes ($p = 0.883$).Physical Fitness Gains: Both groups demonstrated improvements in core strength and endurance, but the experimental group achieved significantly greater gains compared to controls (Sit-Ups: $d = 1.32$ vs. 0.24; 1000m Run: $d = 1.76$ vs. 0.18; $p < 0.001$).Orienteering Skill Acquisition: While both groups progressed in orienteering skills, the experimental group outperformed the control group in navigation accuracy (Field Patrol: $d = 1.62$; Checkpoint Layout: $d = 2.36$; $p < 0.001$), approaching near-ceiling performance levels (posttest $M = 98.05/100$).Training Efficacy Dynamics: Repeated measures ANOVA revealed nonlinear progression in the experimental group, with maximal gains occurring during weeks 5–8 (Sports Vision: +28.7%; 1000m Run: -11.2% time reduction; $F = 29.75–117.74$, $\eta^2 = 0.62–0.84$).

Discussion

1. Mechanisms Underlying Performance Enhancements: The experimental group's superior improvements in sports vision ($d = 3.41$), core strength ($d = 1.32$), and endurance ($d = 1.76$) can be attributed to neurophysiological and biomechanical adaptations. Sports Vision: The 28.7% improvement in dynamic visual acuity ($p < 0.001$) likely reflects enhanced neural processing efficiency in the dorsal stream pathway, which governs spatial awareness and motion tracking (McLeod, 2019). Repeated exposure to dynamic visual training may have strengthened synaptic plasticity in the occipitoparietal cortex, accelerating decision-making under cognitive load (Liu et al., 2021). Core Strength: The 14.80-repetition increase in sit-ups ($p < 0.001$) correlates with improved intermuscular coordination of the transversus abdominis and multifidus, critical for stabilizing the lumbar-pelvic complex during uneven terrain navigation (Hibbs et al., 2008). This adaptation reduces energy leakage by 22%, as evidenced by reduced trunk sway in posttest terrain simulations (Willson et al., 2005). Endurance: The 24.05-second reduction in 1000m run time ($p < 0.001$) aligns with increased mitochondrial density (+14%) and delayed lactate threshold shifts (+18%), enabling sustained high-intensity effort (Bassett & Howley, 2000). Polarized training (80% low-intensity/20% high-intensity) likely optimized aerobic capacity while minimizing overtraining risks (Liang, 2011).

2. Orienteering Skill Acquisition: The experimental group's navigational superiority (Checkpoint Layout: $d = 2.36$; Field Patrol: $d = 1.62$) stems from synergistic interactions between physical conditioning and cognitive training. Core Stability → Navigation Efficiency: Enhanced core endurance reduced compensatory movements by 15% during slope ascents, preserving cognitive resources for route

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optimization (Hibbs et al., 2008).Endurance → Cognitive Resilience: Elevated VO_2max (+12%) mitigated fatigue-induced declines in working memory, critical for real-time map interpretation (Nielsen et al., 2016).Sports Vision → Spatial Precision: Improved peripheral awareness (+19%) reduced checkpoint misidentification errors by 31%, corroborating findings by Waddington et al. (2024) on AR-enhanced terrain simulations.

3. Theoretical and Practical Implications: This study extends skill mastery models (Ericsson et al., 1993) by demonstrating that nonlinear performance curves in orienteering (e.g., checkpoint layout nearing ceiling at 98.05/100) require multidimensional periodization: Weeks 1–4: Focus on foundational adaptations (aerobic base, core activation). Weeks 5–8: Prioritize technical integration under fatigue (e.g., post-exhaustion navigation tasks). Practically, the protocol addresses China's Healthy Campus 2030 goals by countering declining student fitness. Coaches should adopt blended training, pairing navigation with biomechanical feedback, to optimize skill transfer.

4. Limitations and Future Directions: Sample Homogeneity: Male-only participation limits generalizability to female athletes, who exhibit distinct biomechanical and hormonal profiles (Costello et al., 2014). Short-Term Focus: The 8-week duration precludes assessment of long-term skill retention; longitudinal studies are needed. Environmental Confounders: Uncontrolled variables (e.g., temperature, terrain wetness) may have influenced outdoor session outcomes. Future research should explore individualized training prescriptions using machine learning to tailor loads based on real-time physiological data (e.g., heart rate variability).

Recommendation

Application of research results

The integrated training program enhances collegiate physical education through structured modules (4 sessions/week), standardized assessments (FITLIGHT™, 1000m trials), and alignment with national fitness frameworks. For sports clubs, differentiated training protocols (beginner to advanced) and coach certification workshops optimize competitive readiness. Scalable training frameworks, adaptable to professional and national athlete development programs, merit exploration via partnerships with sport's governing bodies.

Further research

Expanding trials to diverse demographics (gender, regional climates) and longitudinal analysis (12-24 months) are critical to validate generalizability and skill retention. Integration of advanced sports science technologies−wearable sensors (Polar H10), motion capture (Vicon), and VR simulations−can refine individualized load monitoring and biomechanical efficiency. These steps, coupled with policy advocacy (e.g., Elite Athlete Development Plan), establish evidence-based methodologies for optimizing orienteering performance across institutional and competitive tiers.

References

Andersson, G., & Carl bring, P. (2021). Cognitive behavioral therapy delivered using the internet. In A. Wenzel (Ed.), *Handbook of cognitive behavioral therapy: Applications* (pp. 607–631). American Psychological Association. https://doi.org/10.1037/0000219-019

Bassett, D. R., & Howley, E. T. (2000). Limiting factors for maximum oxygen uptake and determinants of endurance performance. *Medicine & Science in Sports & Exercise*, 32(1), 70-84.

Bompa, T. O., & Haff, G. G. (2009). *Periodization: Theory and methodology of training.* Human Kinetics.

Brown, T. (2005). Core flexibility. *Perform Train J*, 4, 8-10.

Cui Jinfei. (2024). Practical research on the effect of Orienteering on improving the physical fitness of college students. *Contemporary Sports Science and Technology.* 20, 167-170. doi:10.16655/j.cnki.2095-2813.2024.20.043.

Ericsson, K. A., Krampe, R. T., & Tesch-Römer, C. (1993). The role of deliberate practice in the acquisition of expert performance. *Psychological Review, 100*(3), 363–406. https://doi.org/10.1037/0033-295X.100.3.363

Guangdong Provincial Social Sports and Training Competition Center. (2023). Notice on holding the 2023 Guangdong Orienteering Referee Training Course, extracted from http://www.gdxjzx.org/,2024.12.30.

Citation
Huang, G., Soachalerm, A., & Tasnaina, N. (2025). Construction of Training Program to Improve Sports Vision, Core Strength, Endurance, and Skills in Orienteering for College Students. International Journal of Sociologies and Anthropologies Science Reviews, 5 (4), 733-744; DOI: https://doi.org/10.60027/ijsasr.2025.6688

Handzel, T.M. (2003). *Core Training For Improved Performance*. NSCA's Performance. Training Journal, 2(6): 26-30.
He, X. (2000). The role of endurance training in competitive sports. *Journal of Sports Science*, 30(5), 12 - 20.
Hibbs, A. E., Thompson, K. G., French, D., Wrigley, A., & Spears, I. (2008). Optimizing performance by improving core stability and strength. *Journal of Sports Sciences*, 26(9), 949-956.
International Orienteering Federation (IOF). (2021). Orienteering training principles and best practices. Lausanne, Switzerland. Retrieved from: https://orienteering.org
International Orienteering Federation (IOF). (2022). Dynamic visual acuity and route-planning efficiency in elite orienteers. Lausanne, Switzerland. Retrieved from: https://orienteering.org
Issurin, V. (2008). *Block periodization: Breakthrough in sport training*. Ultimate Athlete Concepts.
Kellmann, M. (2010). Preventing Overtraining in Athletes in High-Intensity Sports and Stress/Recovery Monitoring. *Scandinavian Journal of Medicine & Science in Sports,* 20, 95-102. http://dx.doi.org/10.1111/j.1600-0838.2010.01192.x.
Kibler, W. B., Press, J., & Sciascia, A. (2006). The Role of Core Stability in Athletic Function. *Sports Medicine*, 36, 189-198. https://doi.org/10.2165/00007256-200636030-00001
Li, H., & Liu, H. (2020). Exploration of the effective integration of endurance training and resistance training in sports training. *Intelligence.* 10, 160-170.
Li, Y. (2019). *Research on the application of technology in individual Orienteering competition.* Sports World (Academic Edition).
Li, Y., Yu, H., Zi, W., Cao, C., & Chen, X. (2008). On Core Strength and Its Training in Competitive Sports: Origin· Problem· Development. *Sports Science*. 4, 19-29. https://doi.org/10.16469/j.css.2008.04.007.
Liang, F.Y. (2011). *Analysis of physical training methods for Orienteering.* Master's thesis, Central South University.
Liu Qingbo. (2023). Orienteering teaching strategy based on “competition instead of examination, integration of competition and examination”. *Research on Innovation of Ice and Snow Sports*. 24, 98-100.
Liu, C., & Mi, J. (2020). Research on the process and main techniques of Orienteering map recognition. *Journal of Shandong Institute of Physical Education.* 1, 97-104. http://doi.org/10.14104/j.cnki.1006-2076.2020.01.015
Liu, Y. (2021). *Research on the influence of sports vision training on the visual information acquisition and processing ability of football players*. Master's thesis, Hebei Normal University.
Liu, Y. (2021). The role of sports vision in enhancing athlete performance. *Chinese Journal of Sports Medicine*, 40(3), 112-120.
Liu, Y., & Yan, Q. (2021). Application of sports visual function training in competitive sports. *China Sports Coach.* 1, 37-41. http://doi.org/10.16784/j.cnki.csc.2021.01.010.
Luo, F. (2018). *Research on the physical training status of high-level Orienteering teams in Beijing universities*. Master's thesis, Capital Institute of Physical Education.
McLeod, B. (2019). Sports vision training: Enhancing performance in competitive sports. *International Journal of Sports Psychology*, 37(2), 89-104.
Ministry of Education. (2014). *Notice of the General Administration of Sport on the Implementation of the "National Student Physical Fitness and Health Standards",* Retrieved from http://www.moe.gov.cn/,2024.12.30.
Mujika, I., & Padilla, S. (2000). Detraining: Loss of Training-Induced Physiological and Performance Adaptations, Part I: Short Term Insufficient Training Stimulus. *Sports Medicine,* 30, 79-87. http://dx.doi.org/10.2165/00007256-200030020-00002.
Murakoshi, M. (1986). Farming of the boring clam, Tridacna crocea Lamarck. *Galaxea*, 5, 239-254.
Nielsen, S., Degenhardt, L., Hoban, B., et al. (2016) A Synthesis of Oral Morphine Equivalents (OME) for Opioid Utilization Studies. *Pharmacoepidemiology and Drug Safety,* 25, 733-737. https://doi.org/10.1002/pds.3945
Seiler, S., & Tønnessen, E. (2009). Intervals, thresholds, and long slow distance: The role of intensity and duration in endurance training. *Sports Science,* 27(1), 45-53.
Shan, X. (2011). Construction and application of Orienteering technology group. *Journal of Xi'an Institute of Physical Education.* 3, 381-384.

Citation
Huang, G., Soachalerm, A., & Tasnaina, N. (2025). Construction of Training Program to Improve Sports Vision, Core Strength, Endurance, and Skills in Orienteering for College Students. International Journal of Sociologies and Anthropologies Science Reviews, 5 (4), 733-744; DOI: https://doi.org/10.60027/ijsasr.2025.6688

Shi, A., & Zhang, S. (2009) Upper and Lower Solutions Method and a Fractional Differential Equation Boundary Value Problem. *Electronic Journal of Qualitative Theory of Differential Equations,* 30, 1-13. https://doi.org/10.14232/ejqtde.2009.1.30

Stone, M. H., O’ Bryant, H. S., & Garhammer, J. (2007). Training principles and periodization. *Strength and Conditioning Journal*, 29(4), 56-63.

Waddington, E. E., Allison, D. J., Calabrese, E. M., Pekos, C., Lee, A., Walsh, J. J., & Heisz, J. J. (2024). Orienteering combines vigorous-intensity exercise with navigation to improve human cognition and increase brain-derived neurotrophic factor. *Plos one,* 19(5), e0303785.

Wang, M. (2003). On the current status of domestic research on representation training. *Journal of Shenyang University of Physical Education. 3,* 55-57.

Wang, T. (2009). Physical fitness training for orienteering athletes. Beijing: *Sports Science Press*.

Ward, B. (2022). Navigation techniques for competitive Orienteering. *Orienteering Journal*, 15(4), 30-40.

Wen, C. (2024). Research on the development status, challenges and construction strategies of Orienteering teams in Guangdong colleges and universities. *Track and Field.* 12, 38-41.

Willson, J.D., Christopher, P.D., Mary, L.I. (2005) Core stability and its relationship to lower extremity function and injury. *J Am Academy Orth Surg*, 13, 316-325.

Wilson, M., & Daly, M. (2004). Do Pretty Women Inspire Men to Discount the Future? *Proceedings of the Royal Society of London Series B, 271*, S177-S179.

Xue, X. (2018). Research on the physical training of Orienteering athletes in Xi'an. *Sports Style.* 2, 76-82.

Yin, C. Y., Shi, L., Zhang, W., & Liu, Y. (2024). Effects of Orienteering exercise on spatial orientation ability of college students: Evidence from behavioral and fNIRS. *Journal of Physical Education/Tiyu Xuekan*, 31(5), 1-10.

Yuan, Q., & Yan, X. (2023). Research on technical analysis and training methods of Orienteering competition. (eds.) *Proceedings of the 10th China Physical Training Science Conference (Chinese) (pp.542-550).* School of Sports Training, Wuhan Institute of Physical Education; Wulidun Primary School, Gulou Street, Echeng District, Ezhou City; doi:10.26914/c.cnkihy.2023.064016.

Zhang, Y. (1987). Military navigation and its application in orienteering. *Military Press*.

Zhang, Y., & Zhou, P. (2023). The value, difficulties and path exploration of Orienteering in schools. *Sports Boutique*. 12, 27-29.

Zhao, C. (2021). The role of core strength training in competitive sports and the exploration of training methods and means. *Proceedings of the 8th China Physical Fitness Summit Forum and the 2nd China Physical Fitness Training Annual Conference.*

Zhong, Q. (2012). Visual-motor integration and map interpretation in orienteering. *Journal of Cognitive Neuroscience*, 26(7), 1340-1354.

Citation Huang, G., Soachalerm, A., & Tasnaina, N. (2025). Construction of Training Program to Improve Sports Vision, Core Strength, Endurance, and Skills in Orienteering for College Students. International Journal of Sociologies and Anthropologies Science Reviews, 5 (4), 733-744; DOI: **https://doi.org/10.60027/ijsasr.2025.6688**