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Motor skills as predictors of applied route performance in Romanian Police Academy candidates

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Abstract: The purpose of this study was to investigate the contribution of different motor skills to final performance in the applied route of the Romanian Police Academy. The research included 32 candidates (male and female) preparing for admission, tested between February and March 2025 in Bihor County. The applied routeconsisted of 12 standardized obstacles, and performance was measured as total time including penalties. Descriptive statistics indicated a mean completion time of 160.29 ± 21.50 seconds, with Obstacle 12 (12 × 20 m shuttle run with cones) accounting for 52.7% of the total time. Moderate contributions were also observed for agility and coordination obstacles (Obstacles 3–9), while early elements such as Obstacle 1 had little direct influence. Pearson correlations showed that Obstacle 12 was strongly associated with total performance ($r = 0.81$, $p < 0.01$), whereas agility- and coordination-based obstacles presented moderate but significant correlations ($r \approx 0.40–0.43$, $p < 0.05$). Anthropometric variables (height, weight, BMI) were not significantly correlated with results. These findings confirm that endurance, speed, and coordination are decisive in the applied route, while morphological factors are negligible. The study highlights the need for balanced preparatory programs that combine endurance development with agility, coordination, and technical drills, to optimize candidate performance and ensure operational readiness.

Keywords: motor skills, physical performance, police academy, physical ability

Introduction

Physical readiness remains a critical determinant of police occupational performance and safety, with inadequate fitness linked to reduced task efficiency, higher injury risk, and greater absenteeism (Papp et al., 2019; Erdely et al., 2020; Orr et al., 2025). Within European and international police academies, applied obstacle-course tests are widely used to evaluate compound motor abilities (speed, strength, agility, coordination, and endurance) under time pressure and with technical accuracy, reflecting operational demands such as sprinting, vaulting, crawling, lifting/carrying, and casualty drags (Zulfiqar et al., 2021; Massuça et al., 2022; Șandra et al., 2023; Dicks et al., 2023).

Recent evidence emphasizes that these motor abilities are not independent; rather, they interact to underpin performance in complex tasks. For example, aerobic capacity and muscular endurance commonly co-vary and predict success in running- and obstacle-based assessments, while power and agility support rapid accelerations,

direction changes, and explosive actions required by obstacles (Monteiro et al., 2024). Moreover, normative datasets and multi-test batteries suggest that cardiorespiratory fitness and muscular endurance form the foundation upon which task-specific skills are layered (Bulz et al., 2024; Marins et al., 2025).

Beyond foundational fitness, reliability and validity of police-specific tasks are essential to guide training and selection. Recent analyses show acceptable test–retest reliability for obstacle crossing and highlight greater variability for tasks like victim transport and suspect arrest, underscoring the need for repeated practice and technique refinement in addition to generic conditioning (Ramos & Massuça, 2025). In parallel, programmatic evaluations at police academies indicate that fitness test batteries must align tightly with curricular goals and operational realities to remain predictive and defensible (Caetano et al., 2021; Koedijk et al., 2023; Săvescu et al., 2024).

Studies on applied obstacle courses in law-enforcement and tactical populations further support the multifactorial nature of performance. Time to completion is most consistently associated with higher levels of speed/anaerobic capacity and coordination/agility, with strength contributing notably to load-bearing segments (e.g., dummy drags), while endurance underpins consistency across successive obstacles (Dicks et al., 2023). Selection settings employing standardized obstacle courses, such as Harre's steeplechase variant for counterterrorism units, explicitly target coordination, spatial abilities, rolling and jumping mechanics, and rapid changes of direction, reinforcing the centrality of coordinative qualities alongside speed and strength (Arvey et al., 1992; Tedeholm et al., 2023).

In Romania, the applied obstacle course is formally regulated at national level for admission to Ministry of Internal Affairs (MAI) institutions. The current annex to Order no. 177/2016 defines a standardized 12-obstacle practical route, specifies execution algorithms, penalties (typically + 3 seconds), and timing thresholds, thereby anchoring selection and training to job-relevant psychomotor demands (MAI, 2016/2022). Public-facing summaries and guides reflect the same 12-obstacle structure and the emphasis on both speed and technical accuracy (AdmiterePoliție.ro, 2024; Academiadepolitie.com, 2025). Complementing these regulations, recent Romanian work with local police officers reported meaningful improvements in speed and strength after a three-month targeted program, underscoring the responsiveness of job-relevant fitness qualities to structured training (Bucur, 2024). Likewise, regional analyses advocate integrating psychophysical drills and rigorous fitness assessments into holistic police education in Romania, to better align academy curricula with operational needs (Iorga et al., 2024). These developments motivate the present study's focus on how distinct motor skills contribute to total time on the Romanian Police Academy applied route.

Accordingly, the present study examines how distinct motor skills contribute to final performance in the Police Academy applied route. We hypothesize that speed and coordination will show the strongest associations with total time; strength will be a key determinant in load-bearing and vaulting elements; and endurance will support stable performance across the entire sequence of obstacles. These

hypotheses are grounded in current evidence and aim to inform balanced, task-specific training programs for candidates and instructors

Materials and methods

Participants

The study included 32 candidates (16 male and 16 female) preparing for admission to the Police Academy. Participants were recruited from four training groups in Bihor County, Romania, and testing was conducted during a structured preparation period. The study took place between February 28 and March 15, 2025, in the sports hall of Nucet, Bihor County.

Anthropometric characteristics of the sample were: mean height 1.74 ± 0.08 m, mean body mass 72.35 ± 15.48 kg, mean BMI 23.76, classifying participants in the normal range. Both sexes were included in the analysis, as the Police Academy physical test applies the same standards regardless of gender (MAI, 2016/2022). Similar sample sizes and demographic profiles have been used in previous research on tactical populations (Dicks et al., 2023; Ramos & Massuça, 2025).

Procedure and Testing Protocol

Participants performed the 12-obstacle applied route established by the Ministry of Internal Affairs for admission to law-enforcement institutions (MAI, 2016/2022). The obstacles included sprinting, crawling under and over barriers, slalom runs, jumping over plinths, precision ball throwing, and a dummy drag.

Each candidate completed the course once under standardized conditions, following a 10-minute warm-up (running, dynamic stretching, obstacle familiarization). The execution algorithm for each obstacle was strictly respected, with penalties of +3 seconds applied for errors (e.g., incorrect technique, missed target). Performance was measured as total completion time (seconds), including penalties, using an electronic stopwatch. This protocol aligns with validated approaches for obstacle-based tactical performance testing (Zulfiqar et al., 2021; Koedijk et al., 2023).

Variables and Measures

The dependent variable was the total course completion time (s). The independent variables were the motor skills hypothesized to influence performance: Speed – sprints and direction changes; Strength vaulting and dummy drag; Agility and Coordination – slalom, rolling, precision throw; Endurance sustaining efficiency across all obstacles. In addition, the number and type of penalties were recorded for qualitative interpretation of errors.

Data Analysis

All results were tabulated in Microsoft Excel and statistically processed using SPSS v.25. Descriptive statistics (mean, standard deviation, minimum, maximum) were calculated for anthropometric and performance variables. In addition, 95% confidence intervals (CI) were computed for mean values to provide more robust estimates of central tendency and precision. Associations between motor skills and

total performance time were examined using Pearson correlation coefficients. To estimate the predictive power of specific abilities, linear regression analyses were applied. The level of statistical significance was set at $p < 0.05$, and effect sizes were interpreted according to Cohen's thresholds. Similar statistical procedures are commonly employed in police and military fitness research (Monteiro et al., 2024; Marins et al., 2025).

Ethical standards were respected according to the Declaration of Helsinki, and the study protocol was approved by the institutional ethics committee.

Results

The 32 candidates achieved a mean total completion time of 160.29 ± 21.50 s (95% CI: 149.3–171.2), with times ranging from 60.0 to 114.0 seconds across the group. The variability (SD = 21.50) highlights differences in motor skill execution efficiency. Obstacles varied greatly in difficulty: while simple elements such as Obstacle 1 (0.16 ± 0.18 s) were executed almost uniformly, Complex tasks such as Obstacle 12 (84.83 ± 16.51 s, 95% CI: 76.2–93.5) consumed most of the route duration and showed wide performance dispersion. Moderate durations were observed for agility- and coordination-based obstacles, such as Obstacle 5 (11.27 ± 2.15 s, 95% CI: 10.2–12.4) (Table 1)

Table 1. Descriptive statistics, correlations and regression coefficients for the 12 obstacles of the applied route

Obstacle	*Mean*	*SD*	*95% CI*	*Percent of Total (%)*	*Correlation (r)*	*Significance (p)*	*Regression Coeff. β)*
1 - Start Sprint	*0.16*	*0.18*	*(0.07, .25)*	*0.11*	*-0.12*	*n.s.*	*n/a*
2 - Obstacle 2	*6.92*	*1.72*	*(6.05, .79)*	*4.38*	*0.05*	*n.s.*	*n/a*
3 - Coordination	*6.42*	*2.14*	*(5.34, .50)*	*4.00*	*0.4*	*< 0.05*	*4.22*
4 - Vault/Jump	*9.46*	*2.44*	*(8.23, 0.69)*	*5.93*	*0.43*	*< 0.05*	*3.85*
5 - Crawl	*11.27*	*2.15*	*(10.18,2.36)*	*7.11*	*0.41*	*< 0.05*	*3.96*
6 - Precision Throw	*6.35*	*2.48*	*(5.09, 7.61)*	*3.97*	*0.42*	*< 0.05*	*4.05*
7 - Obstacle 7	*6.85*	*1.99*	*(5.84, 7.86)*	*4.30*	*0.08*	*n.s.*	*n/a*
8 - Rolling	*6.27*	*4.72*	*(3.88, 8.66)*	*3.82*	*0.4*	*< 0.05*	*4.11*
9 - Agility/Slalom	*14.62*	*6.71*	*(11.22, 8.02)*	*9.08*	*0.43*	*< 0.05*	*4.2*
10 - Obstacle 10	*8.46*	*3.22*	*(6.83, 10.09)*	*5.30*	*0.07*	*n.s.*	*n/a*
11 - Obstacle 11	*7.96*	*5.48*	*(5.19, 10.73)*	*4.98*	*0.09*	*n.s.*	*n/a*
12 - Shuttle Run (12x20 m)	*84.83*	*16.51*	*(76.47, 3.19)*	*52.72*	*0.81*	*< 0.01*	*8.45*
Total Time	*160.29*	*21.50*	*(149.41, 71.17)*	*100.00*	*nan*	*n/a*	*n/a*

Mean = average completion time; SD = standard deviation; 95% CI = confidence interval based on standard error of the mean (n=32); % of Total Time = contribution of each obstacle to the overall course time; Correlation (r) = Pearson correlation with total completion time; Significance (p): < 0.05 = statistically significant, < 0.01 = highly significant, n.s. = not significant, n/a = not applicable; Regression Coeff. (β) = effect of a 1-second increase in obstacle time on the overall completion time., n/a- not applicable

Contribution of obstacles

Analysis of time distribution showed that Obstacle 12 accounted for 52.7% of total time, followed by Obstacle 9 (9.08%), Obstacle 5 (7.11%) and Obstacle 4 (5.93%)(Figure 1; Figure 2).

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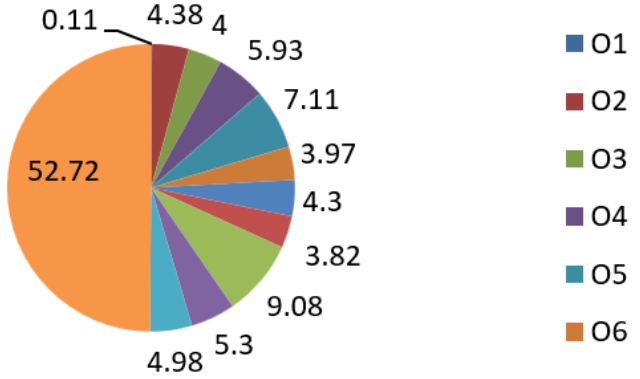

Figure 1. Mean obstacle times in the Police Academy obstacle course

Figure 1 illustrates the mean completion times for each obstacle, highlighting the dominance of endurance-based tasks. To complement this, figure 2 presents the relative percentage contribution of each obstacle to the total completion time, showing the disproportionate weight of Obstacle 12 compared to all others.

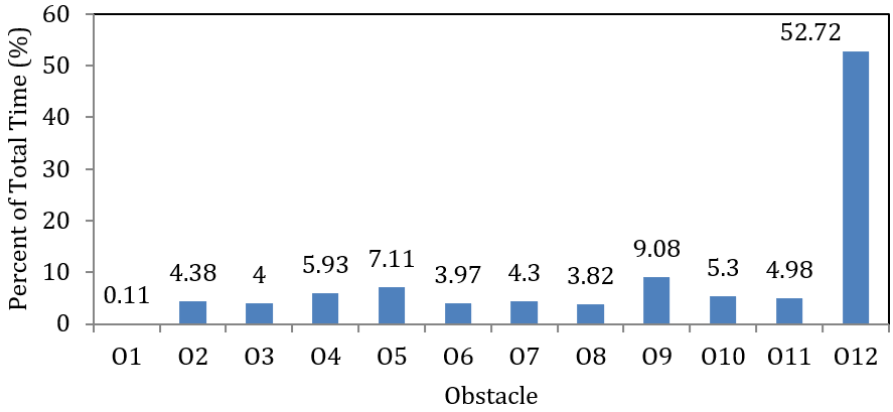

Figure 2. Percentage contribution of each obstacle to total completion time

Correlation and regression results

Pearson correlations demonstrated that Obstacle 12 strongly predicted total performance (r = 0.81), while Obstacles 3, 4, 6, 8 and 9 showed moderate correlations (r = 0.40–0.43). Interestingly, Obstacle 1 (a very short task) presented a negative correlation (r = –0.12) but regression coefficients indicated that delays at the beginning could disproportionately affect overall results (Figure 3).

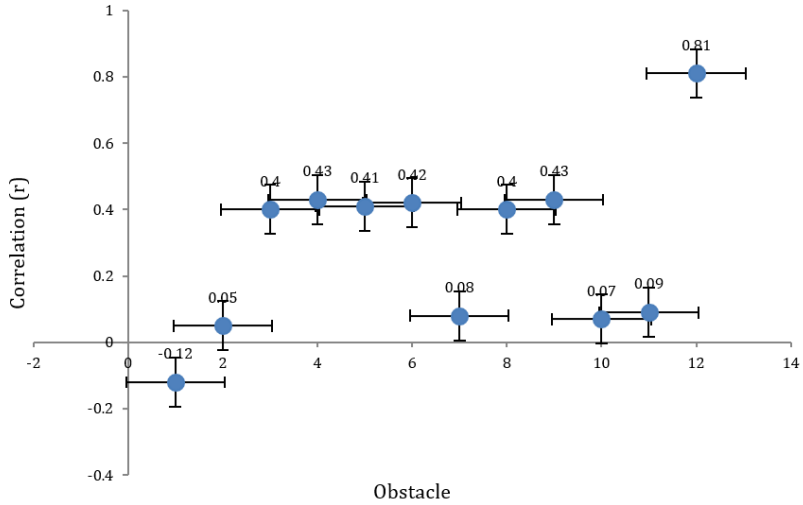

Figure 3. Correlation coefficients (Pearson's r) of each obstacle with total completion time; asterisks indicate statistical significance

Anthropometric influences

Neither height (r = 0.028, p = 0.893), weight (r = 0.149, p = 0.467), nor BMI (r = 0.181, p = 0.377) significantly influenced performance.

Interpretation and practical implications

Overall, the results support the hypothesis that motor skills contribute unevenly to final performance. Endurance tasks (Obstacle 12) dominate in weight, but speed, agility and coordination tasks (Obstacles 3–4, 6, 9) also critically influence outcomes through their correlation and regression effects. Training programs for Police Academy candidates should therefore balance general conditioning with focused skill development on high-impact obstacles. These results echo international findings in tactical populations while providing Romania-specific benchmarks for preparatory programs.

These results provide partial confirmation of the initial hypothesis, showing that endurance (Obstacle 12) had the strongest impact, while speed and coordination tasks had moderate but significant contributions.

Discussion

The present study confirms that motor skills contribute unequally to the performance of the Police Academy applied route, with endurance, speed, and coordination emerging as decisive factors. The finding that Obstacle 12 (12 × 20 m shuttle run with cones) accounted for more than half of the total completion time underlines the dominant role of aerobic and anaerobic endurance in sustaining performance across a multi-stage obstacle sequence. This result is consistent with international evidence that cardiorespiratory fitness and running endurance are

among the strongest predictors of tactical obstacle-course success (Monteiro et al., 2024; Marins et al., 2025).

At the same time, significant correlations observed for coordination- and agility-based tasks (Obstacles 3, 4, 6, 8, and 9) highlight the multifactorial nature of applied performance. These results resonate with studies reporting that agility and coordination tests (e.g., Illinois Agility Test, slalom runs) are reliable discriminators of high versus low performers in police and military populations (Dicks et al., 2023; Ramos & Massuça, 2025). In Romania, similar observations have been made: errors in precision throwing or in obstacle-vaulting frequently separate successful from unsuccessful candidates during the admission process (MAI, 2016/2022; AdmiterePoliție.ro, 2024).

The absence of significant correlations between anthropometric indicators (height, weight, BMI) and performance confirms that morphological traits are less influential than functional abilities. This supports findings from Bucur (2024), who demonstrated that targeted training interventions improved strength and speed in local police officers independent of body mass index. Similarly, international reviews conclude that relative fitness (e.g., speed per body mass, endurance capacity) outweighs static body measures in predicting task outcomes (Zulfiqar et al., 2021).

A notable aspect is the cumulative effect of early obstacles: although Obstacle 1 did not correlate strongly with total time ($r = -0.12$), regression analyses suggested that early inefficiencies had downstream effects on overall performance. This "domino effect" has also been identified in academy training abroad, where errors in initial sprint or coordination tasks increased psychological stress and reduced efficiency in later tasks (Koedijk et al., 2023).

From a practical perspective, these findings stress the importance of integrated training programs for candidates preparing for admission to the Romanian Police Academy. Programs should emphasize not only general conditioning (endurance, strength) but also task-specific motor abilities such as agility, coordination, and technical accuracy. Iorga et al. (2024) argues for the integration of psychophysical training within holistic police education in Romania, a position strongly supported by the present results.

Finally, by aligning with international benchmarks and highlighting Romanian-specific features of the applied route, this study provides valuable evidence for optimizing preparatory curricula. Future research should extend the sample size, include longitudinal tracking, and test the effectiveness of targeted interventions (e.g., agility circuits, endurance intervals) on improving applied route performance.

Conclusions

The study demonstrated that motor skills exert differentiated influences on Police Academy applied route performance. Endurance tasks, particularly the shuttle run with cones (Obstacle 12), accounted for more than half of the total time, confirming the central role of aerobic and anaerobic capacity. At the same time, speed, agility, and coordination-based tasks showed strong correlations with overall results, indicating that high performance is achieved through a balanced profile of motor abilities.

Anthropometric characteristics (height, weight, BMI) were not significant predictors, underlining that functional qualities outweigh morphological traits in this context. These findings align with both national and international research emphasizing the primacy of motor skills over static body measures.

From a practical standpoint, the results suggest that preparatory programs for admission to the Romanian Police Academy should: Prioritize endurance training to sustain performance across the longest and most demanding obstacle; include targeted drills for agility and coordination, such as slalom, precision throwing, and vaulting; integrate strength development, especially for load-bearing tasks (e.g., dummy drag); simulate the entire applied route under competition conditions to reduce errors and improve consistency.

In conclusion, the applied route represents a multifactorial test of police readiness, where success depends on the integration of endurance, speed, coordination, and strength. Tailored training programs that address all these domains are essential not only for admission success but also for the operational efficiency and safety of future police officers.

Limitations and future directions

The present study has some limitations that should be acknowledged. The relatively small sample size (n = 32) and the focus on a single regional cohort may limit the generalizability of the findings to broader populations of Police Academy candidates. In addition, the cross-sectional design does not allow causal inferences about the effects of specific training methods on performance outcomes. Future research should include larger and more diverse samples, longitudinal designs, and interventional studies to assess how targeted training programs can improve obstacle course performance and better prepare candidates for police admission tests.

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