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Identifying key factors for optimising performance in Kurash athletes: A focus on biomotor and psychological elements

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ABSTRACT

Background Problems: Kurash is a traditional martial art and sport that plays an important role in promoting physical culture and a healthy lifestyle among young people. However, the specific physical and psychological factors that influence performance in Kurash, a martial arts sport, remain unclear. **Research Objectives:** This study aims to identify the dominant physical and psychological elements affecting Kurash sport performance. **Methods:** A quantitative, descriptive correlational approach was employed, involving 12 coaches and 40 Kurash athletes from South Kalimantan. Physical indicators were measured using anthropometric data (e.g., height, arm length) and biomotor skills (e.g., muscle strength, flexibility, speed). Aerobic tests assessed physiological capacity, and validated questionnaires evaluated psychological factors such as anxiety, concentration, self-confidence, and motivation. Data analysis was conducted using Partial Least Squares (PLS). **Findings and Results:** The study's results revealed two main findings. First, the dominant physical factors in kurash sport include arm muscle strength, back and leg muscle strength, flexibility, balance, arm muscle explosiveness, speed, and aerobic capacity. Meanwhile, the main psychological factors are anxiety and self-confidence. Secondly, physiological, biomotor, and psychological aspects were shown to contribute 68.7% to kurash sport performance, while anthropometric data was deemed insufficient to determine the main factors affecting performance. Biomotor, physiological, and psychological variables had a significant influence on kurash sport. **Conclusion:** The findings demonstrate that biomotor, physiological, and psychological factors substantially affect the performance of Kurash athletes. However, certain constraints, such as the restricted sample size and lack of longitudinal assessment, affected the results. Future research should use larger samples and more comprehensive approaches to investigate the development of physical and psychological elements in Kurash.

Keywords: Physical; psychological; biomotor; kurash; martial art

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INTRODUCTION

Kurash, a traditional Central Asian martial art, has been instrumental in promoting physical culture and healthy lifestyles among young people (Baltabaevna, 2022). Recently, the inclusion of this ancient sport in the 2018 Asian Games in Jakarta, Indonesia, garnered international recognition (Ahmedov, 2023; Jalilov, 2021). With a history spanning more than 3.500 years, Kurash is deeply embedded in the cultural heritage of Uzbekistan and neighbouring regions, symbolising values like discipline, courage, and sportsmanship. These values resonate with the younger generation while also fostering peace and unity among nations. As the most popular national martial art in Uzbekistan, Kurash—meaning "to achieve the goal in an honest way" in Uzbek (Axmedov, 2023; Imomov, 2023)—is a combat sport where two opponents attempt to throw each other to the ground by leveraging specific grappling techniques (Habibie & Maulana, 2023; Jalilov, 2021).

Kurash bears resemblance to martial arts such as judo and wrestling (Cynarski, 2020; Juhanis et al., 2023; Kazakov, 2024; Khakmuradovich, 2021; Philippe, 2014), where a competitor secures victory by successfully bringing their opponent's shoulder to the mat (Ozodbek et al., 2019). However, Khaitov et al. (2020) and Sobirov et al. (2022) prohibit certain techniques such as allowing the knee to touch the ground, kicking, hitting, and choking. Three categories score points: halal, yombosh, and chala, with the fighter who reaches halal first emerging as the winner (Juhanis et al., 2023). To excel in Kurash, physical factors such as strength, speed, endurance, and flexibility are essential (Shavkat og, 2023; Dafer, 2020; Khaitov et al., 2020). Nonetheless, psychological elements, particularly anxiety during matches, pose significant barriers to athletic success (Singh et al., 2023; Sobirov et al., 2022). This emphasizes the critical influence of both physical and psychological factors on Kurash's athletic performance.

Previous research (Hadayani, 2019; Irianto & Lumintuarso, 2020; Rossi et al., 2022; Vysochina & Vorobiova, 2019) shows that psychological factors such as motivation, confidence, anxiety control, mental preparation, team emphasis, and concentration significantly influence athlete performance. Nisa and Jannah, (2021) found that self-confidence directly affects the mental toughness of martial arts student athletes. However, Umarova and Umarov (2021) identified unknown physical and pre-competition factors that aid young wrestlers in improving competition effectiveness. Cieśliński et al. (2021) and Dafer (2020) discovered that wrestlers' physical condition during competitions impacts their mastery of basic techniques, which in turn affects performance. Additionally, Sholicha (2020) reported no significant relationship between achievement motivation and mental toughness in Taekwondo athletes from East Java.

The gap in the literature is due to a lack of studies that specifically investigate the dominant physical and psychological factors in Kurash. Most prior research has focused on sports like judo and wrestling without specifically addressing Kurash. This study examined the unique factors affecting Kurash athlete performance, thereby filling this research gap and offering new insights into the sport's specific needs. Bompa and Buzzichelli (2009) and Setyawati et al. (2019) emphasise that athlete performance depends on various physical (physiological, biomotor, anthropometric) and psychological factors, including confidence, anxiety, motivation, and concentration. Anthropometric factors, correlating with speed, strength, and endurance, are crucial for improving athletes' effectiveness in competition (Ferdiana et al., 2023; Kostrzewa et al., 2020; Marques et al., 2019).

Given that Kurash is relatively new on the international stage, identifying the factors that influence performance is essential. This research aims to help coaches and athletes design more effective training programs while contributing valuable insights to the scientific literature. Kurash's distinctive characteristics, such as its reliance on specific anthropometric, physiological, and biomotor factors, are critical to achieving optimal performance. Additionally, psychological elements like motivation, self-confidence, and emotional regulation play key roles in performance (Amalia et al., 2019; Andrade et al., 2020; Nurjaya et al., 2020). This study aims to identify and analyse the physical and psychological factors that significantly influence Kurash athletes' performance, and to offer recommendations that coaches and athletes can implement to improve competitive outcomes.

METHOD

Research Design

This study employed a descriptive correlational design with a quantitative approach. The primary goal is to investigate the relationship between physical and psychological variables affecting performance in Kurash athletes, utilising the correlation coefficient to test how changes in one variable relate to others (Selviana et al., 2024). The study was conducted in two phases in South Kalimantan, involving validation of instruments and data collection.

Participants

The participants in this study were 12 Kurash coaches from various regions in South Kalimantan, including Banjarmasin, Banjarbaru, Banjar Regency, Tanah Laut, Tabalong, and Batola. In Phase II, 40 Kurash athletes representing each district in South Kalimantan participated.

Data Collection Procedures

An initial phase was conducted in Banjarbaru with the specific aim of validating the study instruments and questionnaires. To ensure content validity, twelve licensed Kurash coaches were evaluated at the national and provincial levels. The acquisition of physical and psychological data occurred during Phase II at the Prestasi Kencana Stadium in Tanah Laut, physical and psychological data were acquired. Anthropometric, biomotor, and physiological tests were conducted to assess the physical performance of the athletes, while psychological data were collected using standardised questionnaires.

Measurement Instruments

The measurement instruments used in this study cover several aspects. Anthropometrics include measurements of height, arm length, arm span, sitting height, leg length (with meters), and body weight (using scales). Researchers measured biomotor strength using the Push-Up Test (Hashim et al., 2018), back and leg strength (Back and Leg Strength Test) (Coldwells et al., 1994), flexibility (Sit and Reach Test) (Jones et al., 1998), balance (Standing Stork Blind Test) (Karimizadeh Ardakani et al., 2020), arm muscle power (Medicine Ball Test) (Stockbrugger & Haennel, 2001), and speed (30 m sprint test) (Barbero-Álvarez et al., 2010). We evaluated the physiological capacity using the multistage fitness test (Leger & Lambert, 1982), which measures aerobic capacity. The CSAI-2 (Sobirov et al., 2022) measured anxiety, the Grid Concentration Test (Greenlees et al., 2006) measured concentration, and expert-validated questionnaires measured self-confidence and motivation on the psychological side (Feltz & Chase, 1998).

Data Analysis

Three main steps led to the analysis of the data. Experts first tested the content validity using the Content Validity Ratio (CVR). Secondly, we conducted confirmatory factor analysis using SPSS to test the relationships of the data. Finally, the final model was tested using Partial Least Squares (PLS) techniques to analyse the influence of physical and psychological factors on performance in the sport of Kurash.

RESULTS AND DISCUSSION

This study divides its results into two stages: identifying variables and preparing each item. According to Bompa and Buzzichelli (2009) and Setyawati et al. (2019), athlete performance will depend on various physical (physiological, biomotor, anthropometric) and psychological factors of confidence, anxiety, motivation, and concentration. Physical includes anthropometric, biomotor, and physiological. Height, weight, arm length, arm span, sitting height, and leg length are all examples of anthropometsis. Biomotors include arm muscle strength, back and leg muscle strength, flexibility, balance, arm muscle power, and speed. Physiological: aerobic capacity. Psychological includes concentration, anxiety, confidence, and motivation. Consequently, we progress from the initial phase to the subsequent one. Experts in their respective fields conduct trials and validate the results.

Phase I Research Results

This study began with an exercise. Personal judgement served as the basis for the study (see Table 1).

Table 1. Measurement Indicators and Tests

Factor	Variables	Measurement Tools
Anthropometrics	Body Height	Meter
	Body Weight	Scales
	Arm Length	Meter
	Arm Span	Meter
	Sitting Height	Meter
	Limb Length	Meter
	Arm Muscle Strength	Push Up
	Back and Leg Muscle Strength	Back and Leg Strenght
Biomotors	Flexibility	Sit and Reach
	Balance	Standing Stork Blind
	Arm Muscle Power	Medicine Ballthrow
	Speed	Sprint 30 M
Physiological	Aerobic Capacity	Multistage Fitness Test
Psychological	Concentration	Grid Concentration Test
	Anxiety	CSAI-2
	Self-Confidence	Questionnaire
	Motivation	Questionnaire

Physical Measurement Tools

Data from twelve experts was processed in the content validity ratio (CVR). The CVR value obtained from each item was matched with the minimum value CVR table based on a significant test of $p < 0.05$ presented (Lawshe, 1975). The results of the CVR calculation obtained data that the value ranged from 0.56 to 1. The minimum CVR value of 0.56 for twelve panellists indicates that not all items can accurately represent the measurement domain. The CVR value for each item is as follows, as can be seen in Table 2.

Table 2. Content Validity Ratio Results (CVR)

Factor	Variables	Ne	N	CVR
Anthropometrics	Body Height	8	12	0.33
	Body Weight	11	12	0.83
	Arm Length	9	12	0.5
	Arm Span	11	12	0.83
	Sitting Height	7	12	0.16
	Limb Length	10	12	0.66
	Arm Muscle Strength	12	12	1
	Back and Leg Muscle Strength	12	12	1
Biomotors	Flexibility	10	12	0.66
	Balance	11	12	0.83
	Arm Muscle Power	12	12	1
	Speed	12	12	1
Physiological	Aerobic Capacity	12	12	1
Psychological	Concentration	12	12	1
	Anxiety	12	12	1
	Self-Confidence	12	12	1
	Motivation	1	1	1

Description:
Ne: Panelists who gave a rating of 4 very influential
N : Number of panellists

Table 3 illustrates how to generate some of the previously mentioned variables concerning the primary physical and psychological aspects of Kurash sport.

Table 3. Determination of Variables and Indicators of Physical Factors and Psychological Factors

Factor	Variables	Measurement Tools
Anthropometrics	Body Weight	Scales
	Arm Length	Meter
	Arm Span	Meter
	Limb Length	Meter
	Arm Muscle Strength	Push Up
	Back and Leg Muscle Strength	Back and Leg Strenght
Biomotors	Flexibility	Sit and Reach
	Balance	Standing Stork Blind
	Arm Muscle Power	Medicine Ballthrow
	Speed	Sprint 30 M
Physiological	Aerobic Capacity	Multistage Fitness Test
Psychological	Concentration	Grid Concentration Test
	Anxiety	CSAI-2
	Self-Confidence	Questionnaire
	Motivation	Questionnaire

Psychological Measurement Tools

Two sport psychologists were involved in the creation of this psychological measurement tool was created by two sports psychologists. The inclusion of these two specialists aimed to bolster the significance of the psychological factor-based constructs requiring assessment. The second phase of the study tested the validity and reliability of the developed expert judgement.

Phase II Research Results

In stage II, we tested all physical factors, which consist of three variables: anthropometric (X1), biomotors (X2), and physiological (X3). For the test of three variables, the value of the t-statistic can be seen. If the t-statistic value surpasses the t-table, we accept the hypothesis. Table 4 presents the inner weight result, which displays the t-statistic estimation results.

Table 4. Path Coefficients (Mean, STDEV, T-Values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Eror (STERR)	T Statistics (|O/STERR|)
Antropometics -> Performance	0.092	0.108	0.081	0.081	1.134
Biomotors -> Performance	0.209	0.208	0.106	0.106	1.970
Physiological -> Performance	0.316	0.299	0.140	0.139	2.260
Psychological -> Performance	0.311	0.311	0.126	0.125	2.477

Based on the table above, the research hypothesis can be tested. Hypothesis testing uses a significance level of 5% with a t table of 1.967 (N = 12).

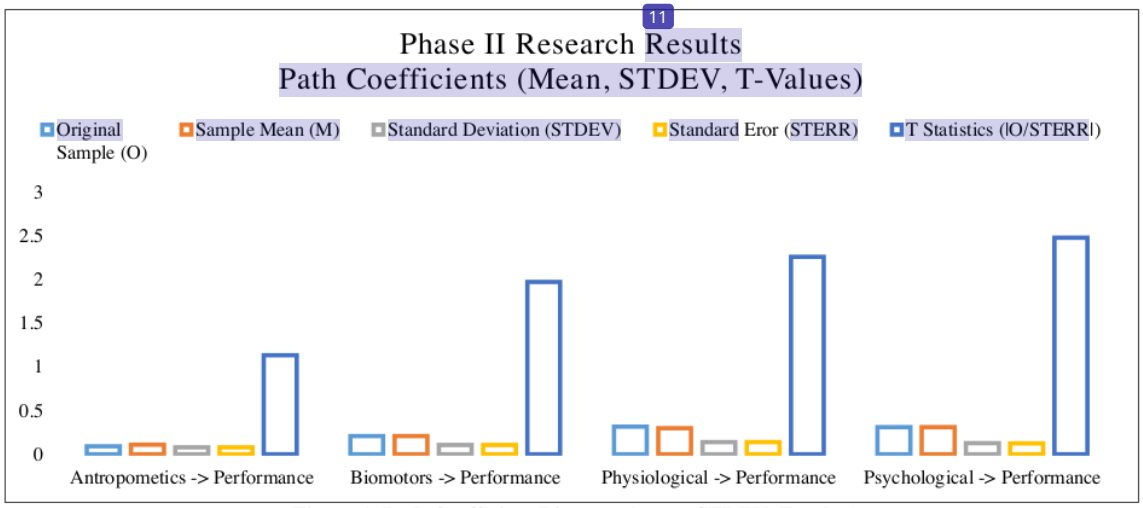

Figure 1. Path Coefficient Diagram (mean, STDEV, T-value)

Anthropometric to Performance

The results of the parameter coefficient test between anthropometrics and performance show a coefficient value of 0.092 and a t-test value of 1.134. At a significant level (α) = 0.05, the t-count value is smaller than the ttable value of 1.971. This shows that anthropometrics has no effect on performance.

Biomotor to Performance

The test results of the parameter coefficient between biomotor and performance show a value of 0.209 and a t-count value of 1.970. At a significant level (α) = 0.05, the t-count value is greater than the t-table value of 1.971. This shows that biomotorism has a positive effect on performance.

Physiological to Performance

The results of the parameter coefficient test between physiological and performance show a coefficient value of 0.316 and a t-count value of 2.260. At a significant level (α) = 0.05, the t-count value is greater than the t-table value of 1.971. This shows that physiological has a positive effect on performance.

Psychological to Performance

The results of the parameter coefficient test between psychology and performance show a coefficient value of 0.311 and a t-count value of 2.477. At a significant level (α) = 0.05, the t-count value is greater than the t-table value of 1.971. This shows that psychology has a negative effect on performance.

Phase III Research Results

At this stage, the influence of physical (biomotor, and physiological) and psychological instruments on the performance of Kurash athletes is analysed. The results of the t-statistic estimation can be seen in the results for inner weight presented in Table 5.

Table 5. Path Coefficients (Mean, STDEV, T-Values)

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Eror (STERR)	T Statistics (|O/STERR|)
Biomotors -> Performance	0.239	0.244	0.099	0.099	2.405
Physiological -> Performance	0.321	0.306	0.136	0.135	2.371
Psychological -> Performance	0.343	0.358	0.119	0.118	2.887

Based on the table above, the research hypothesis can be tested. Hypothesis testing uses a significance level of 5% with a t table of 1.971 (N = 12).

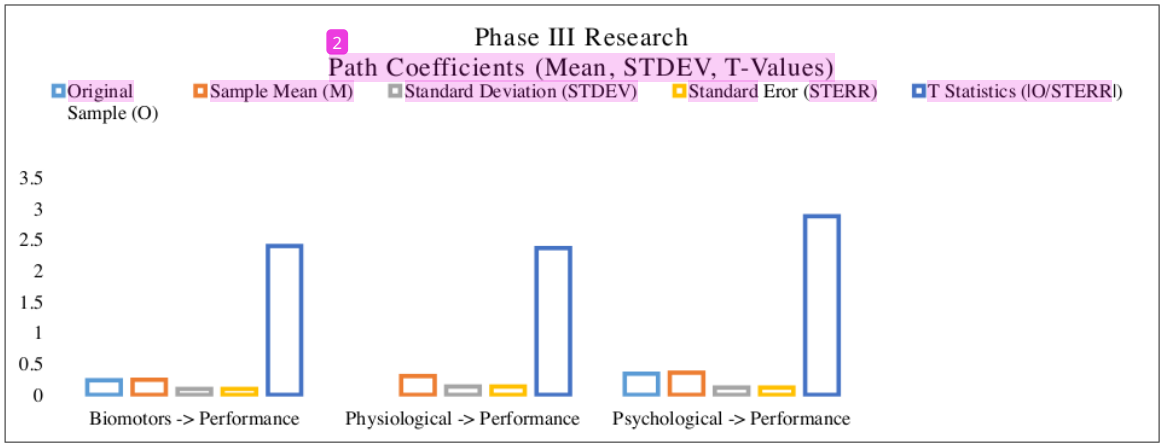

Figure 2. Path Coefficient Diagram (mean, STDEV, T-value)

Biomotor to Performance

The results of the parameter coefficient test between biomotor and showed a coefficient of 0.239 and a t-count value of 2.405. At the significance level (α) = 0.05 the t-count value > t-table 1.971. This indicates that biomotoris has a positive effect on performance.

Physiological to Performance

The results of the parameter test between physiology and showed a coefficient of 0.321 and a t-count value of 2.371. At the level of significance (α) = 0.05 the value of t-count > t-table 1.971. This shows that physiology has a positive effect on performance.

Psychological Performance

The results of the psychological test parameters and performance coefficient show a coefficient of 0.343 and t-count of 2.887. At the level of significance (α) = 0.05, the value of t-count > t-table 1.971. This indicates that psychology has a positive effect on performance.

Biomotor Physiological and Psychological Together on Performance

Based on the model test, it can be stated that physical (biomotor and physiological) and psychological factors jointly affect performance. Performance is influenced by 68.7%. The aim of this study was to identify key psychological and physical components of the Kurash sport. The first stage findings identified four anthropometric indicators—body weight, arm length, arm span, and leg length—in addition to six biomotor indicators, four psychological indicators, and one physiological indicator. From the psychological results after processing the CVR questionnaire, there are four indicators, namely motivation, confidence, anxiety, and concentration. This supports the view that athletes' psychological abilities, such as motivation, confidence, anxiety management, mental preparation, team focus, and concentration, can affect their performance (Irianto & Lumintuarso, 2020; Rossi et al., 2022; Setyawati et al., 2019). The results of this study also point to certain components of contemporary sport theory—anxiety and technical-tactical skills—as contributing factors to athlete success among Kurash athletes (Ahmedov & Abdulakhatov, 2023). This is consistent with the almost universally held belief that sport is 90% mind, meaning it is difficult to rule out psychological influences when examining the components that affect athlete success (Remiszewska etal., 2020).

Biomotor, physiological, and psychological factors influence performance in this second stage. The development of explosive power and strength endurance is essential when exercising for defensive reasons,

and one of the most important factors to consider is paying attention to the strength of the muscles of the lower extremities (Kostrzewa et al., 2020). Physical characteristics are necessary for competitive success in the sport of Kurash (Shavkat og, 2023). Therefore, to help Kurash athletes succeed in competition, Kurash should incorporate strength, speed, endurance, and flexibility training (Dafer, 2020; Franchini et al., 2011; Khaitov et al., 2020). One study suggests that the anaerobic energy system facilitates scoring movements that demand strength and power, while the aerobic energy system primarily functions in judo matches (Franchini et al., 2019). Each match requires Kurash athletes to perform a variety of manoeuvres, including approaches, grappling, strikes, defensive manoeuvres, and fundamental efforts. Medallists are required to complete 5-7 matches in a tournament (Julio et al., 2017; Khaitov et al., 2020).

The study's findings offer practical insights for coaches, emphasising comprehensive training that integrates both physical and psychological development to enhance athletic performance. Psychological resilience, particularly self-confidence and anxiety management, must balance physical attributes like power and speed for optimal performance under pressure (Stephen et al., 2022). Kurash programs should incorporate mental training methods like visualisation and mindfulness to enhance overall athlete outcomes (Kim & Lawlor, 2023). Additionally, recovery strategies addressing psychological well-being are vital, as stress can impede post-match recovery and future performance (Kujanpää & Olafsen, 2024). By balancing both physical and psychological training, Kurash athletes can optimise their performance in high-stress, multi-match competitions.

CONCLUSION

This study identified several dominant physical and psychological factors that influence Kurash athletes' performance. Physically, the key factors include arm muscle strength, back and leg muscle strength, flexibility, balance, arm muscle power, speed, and aerobic capacity. Psychologically, anxiety and self-confidence were found to be the most significant factors. In the second part of the study, it was demonstrated that physiology, biomotor abilities, and psychological aspects together explain 68.7% of the athletes' performance. These elements play a critical role in shaping athletic success in Kurash.

The findings of this study provide practical insights for coaches and athletes. For instance, coaches can design targeted training programs to enhance specific physical attributes such as arm, back, and leg strength, flexibility, and balance. Additionally, psychological interventions focused on reducing anxiety and boosting self-confidence could further improve athletes' performance. Such strategies can help athletes maintain peak performance levels and handle the pressures of competition more effectively.

While this study offers valuable insights, there are several limitations that should be noted. The results may have been influenced by the relatively small sample size, limited in-depth assessment of athletes' health conditions, and a lack of a longitudinal approach. A more comprehensive evaluation of injury history, as well as psychological factors during testing, might provide a clearer picture. Future research should address these limitations with larger sample sizes and more robust methodologies. Longitudinal studies that track the development of physical and psychological factors over time, as well as qualitative research exploring athletes' subjective experiences in competition, could offer deeper insights into the dynamics of kurash performance.

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CONFLICT OF INTEREST

The authors declare that this research has no conflict of interest with any party.

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