

Analysis intelligent quotient with handball game performance: Study case of athletes POPDA Bandung City

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Abstract

Sports achievement is influenced by many factors, such as physical condition, technique, tactics, and psychology. An athlete's Intellectual Ability/intelligence quotient (IQ) influences playing performance in a match. The research aims to determine the level of relationship between IQ and performance ability in playing handball. This research uses a quantitative approach using correlative descriptive methods. The sample in this study used a purposive sampling technique which resulted in 40 subjects with an age range of 16-18 years with $\text{std} \pm 7.178$. Using two research instruments, namely collecting data for intellectual intelligence results in collaboration with psychological practitioners and using Game Performance Assessment Instrument (GPAI) analysis for handball games. Data analysis was processed using SPSS version 26 software, using the MANOVA method. Multivariate research results ($p < 0.05$) show that each component of the handball game includes decision-making ($0.928 > 0.05$), skill execution ($0.082 > 0.05$), support ($0.892 > 0.05$), guard ($0.327 > 0.05$), and game performance ($0.207 > 0.05$). Therefore, there is no significant relationship between intellectual intelligence and playing handball, but there is a positive average result of the highest relationship between intellectual intelligence and execution skills. From the findings, the game of handball must improve the execution skill/technical skill component.

Keywords: Intelligent Quotient, GPAI, Game Performance Assessment Instrument, Handball.

INTRODUCTION

Invasion team games in Indonesia are very diverse, and their development is closely related to individual development, impacting team performance. One of the invasion sports is handball (Anira et al., 2017). Handball is a popular game in Europe, similar to football and basketball (Insanistyo & Pujianto, 2022). Handball has the characteristics of a team sport game with fast ball movement (Laver et al., 2018; Setiawan & Rahmat, 2018). The athletes in handball consist of seven athletes in different positions, such as two wing runners, three backcourt players, one pivot player, and one goalkeeper (Edwards, 2016). All players aim to put as many balls into the opponent's goal as possible, preventing them from going to their own goal (Setiawan & Rahmat, 2018).

Handball athletes must master basic attacking techniques such as catching, passing, shooting, dribbling, feint movement, offensive and defensive movement, and goalkeeper's technique (Karcher & Buchheit, 2017) (Kumar, 2018). The practical and efficient technical abilities of each individual greatly influence game performance in team games during the match (Murdiansyah, 2015; Rohmansyah, 2017). The better the game performance score means the athlete is closer to achieving achievement in that sport (Juravich & Babiak, 2015).

Achieving sporting achievements is influenced by many factors, such as physical, technical, tactical, and mental conditions (Komarudin, 2018). One of the factors supporting the success of athletes' achievements is psychological factors (Rahayu & Mulyana, 2015). According to Komarudin (2018) the psychological condition of athletes during competitions and training greatly influences their

achievement. Athletes who can control themselves well will have a good intellectual function (Irwanto & Romas, 2019).

Intelligence can be used effectively in planning athlete training programs (Connor et al., 2022). An athlete's intellectual intelligence can be seen clearly from the way the athlete understands (Juravich & Babiak, 2015). Intellectual intelligence/intelligence quotient (IQ) has a 20% influence on success factors in life (Ahmed, 2015). IQ includes the ability to process information, solve problems, and make decisions (Juwantara, 2019). IQ is one of the pillars of success for individual athletes (Widohari et al., 2022).

Assessment of a team's success can be assessed by analyzing individuals who influence the game within a team. This research refers to the effectiveness of attack and defense in one match. Research developed by Stephen A. Mitchell, Judith L. Oslin (1998) as a general template that can be adapted according to the type of game to measure player performance in tactical understanding and the player's ability to solve problems by selecting and applying skills appropriate to the game situation.

At this time, the level of analysis of each individual's game, which impacts the team's game, continues to be developed to improve playing abilities (Salafi, 2022). The ability to play sports is influenced by the intelligence of each individual (Minarni et al., 2019). In the handball game, with different intelligence, each individual will produce various game performance analyses in each match. This research shows the diversity of game performance aspects in matches related to IQ.

METHOD

This study uses a quantitative approach with a correlative descriptive method. The research was carried out during the Provincial POPDA Handball Championship. West Java takes place. This form of research analyzes the playing skills of Bandung City Boys against other districts/cities and analyzes the level of intellectual intelligence of Bandung City Handball athletes.

Participant

The population in this study was 48 people. This research used a purposive sampling technique on male Bandung City handball athletes who were registered in entry by name with an age range of 16-18 years and had participated in selection and training for approximately six months before going to the match. So, the total sample during the championship was 40 athletes.

Research Instrument

The instrument in this research used two stages, namely, 1) Collecting IQ data using the CFIT test tool in collaboration with the UPI Center for Applied Psychology, and 2) Collecting handball game analysis data using the Game Performance Assessment Instrument (GPAI), which comes from external observations which systematically uses standard study tools and match observations.

Using the four assessment components in GPAI, namely 1) decision making, as making decisions when carrying the ball, passing the ball, and shooting the ball, 2) skill execution: when carrying the ball and completing what happens whether it is successful or not, such as shooting at the goal or passing to a friend when the opponent is guarding him, 3) support: as providing support to a teammate such as receiving a pass and helping free a friend from the opponent, 4) guard/mark: a situation of being on defense.

Table 2. Game Performance Assessment Instrument

	Decision Making		Skill Execution		Support		Guard/Mark	
	A	IA	E	IE	A	AE	A	AE
Player's Raw Score								
Analysis								
Indices (%)	$DMI = A/(A+IA)$		$SEI = E/(E+IE)$		$SI = A/(A+IA)$		$GMI = A/(A+IA)$	
Player's GP (%)	$GP = (DESICION\ MAKINGI + SEI + GMI + SI) / 5$							

Note: A = appropriate, IA = inappropriate, E = effective, IE = ineffective, GP = game performance
 1) Decision-making index (DMI) = Number of appropriate decisions made / (Number of appropriate decisions made + number of inappropriate decisions made).

- 2) Skill execution index (SEI) = number of efficient skill executions / (number of efficient skill executions + number of inefficient skill executions).
- 3) Guard or Mark index (GMI) = number of appropriate guarding or marking movements / (number of appropriate guarding or marking movements + number of inappropriate guarding or marking movements).
- 4) Support index (SI) = number of appropriate supporting movements / (number of appropriate supporting movements + number of inappropriate supporting movements).
- 5) Game Performance = (DMI + SEI + GMI + SI) / 4.

Data Analysis

Data analysis in this study uses SPSS 26 statistical analysis to calculate frequency, mean, standard deviation, and P value. SPSS processing uses MANOVA to find relationships between variables using an error value of $\alpha = 0.05$. In addition, scatter and r values are used to see the close relationship between IQ and each component variable of the handball game.

RESULTS AND DISCUSSION

Result

The results of IQ data collection were based on Raymond B. Cattell's theory using the CFIT (Culture Fair Intelligence Test) test tool and validated by Farhan Zakariyya, M. Psi, with SIPP 1486-20-2-2 practice permit.

Tabel 3. Norms Intelligent Quotient

Tingkat IQ	Klasifikasi	N
<65	Mental defective	0
65-79	Borderline	0
80-90	Dull normal	4
91-110	Average	32
111-119	Bright Normal	4
120-127	Superior	0
>127	Very Superior	0

It is known from the level of intellectual intelligence in the research subjects in Bandung City POPDA athletes the average research subject at the IQ level is at an average value of 32 subjects. Below the average, there are 4 subjects, and above the average, there are 4 subjects.

Table 4. Handball Game Analysis Results

N = 40	Mean	SD	P Value
<i>Decision Making</i>	0,91	0,081	0,928
<i>Skill Execution</i>	0,70	0,148	0,082
<i>Support</i>	0,90	0,070	0,892
<i>Guard</i>	0,83	0,149	0,327
<i>Game Performance</i>	0,84	0,064	0,207

Based on the data, the mean \pm standard deviation (SD) results show each component of the handball game, namely decision making (0.91 ± 0.081), skill execution (0.70 ± 0.148), support (0.90 ± 0.070), guard (0.83 ± 0.149), and game performance (0.084 ± 0.064).

The probability value (P.value) shows the significance level of the MANOVA analysis results. A lower p-value is usually considered stronger evidence that the difference between groups is statistically significant. The significance level value has been determined ($p=0.05$), then if ($p<0.05$), it can be concluded that there is a significant difference between groups of handball game variables. The P.Value values in each variable are decision-making ($0.928>0.05$), skill execution ($0.082>0.05$), support ($0.892>0.05$), guard ($0.327>0.05$), and game performance ($0.207>0.05$). So, it was concluded that none

of the variables had a significant difference ($p < 0.05$). However, the one with the lowest value is Skill Execution, with a value of 0.082.

The correlation between IQ and handball, when viewed from the specific data distribution between Intelligent Quotient and Decision Making, Intelligent Quotient with Skill Execution, Intelligent Quotient with Support, Intelligent Quotient with Guard, and Intelligent Quotient with Game Performance, produces data like the following.

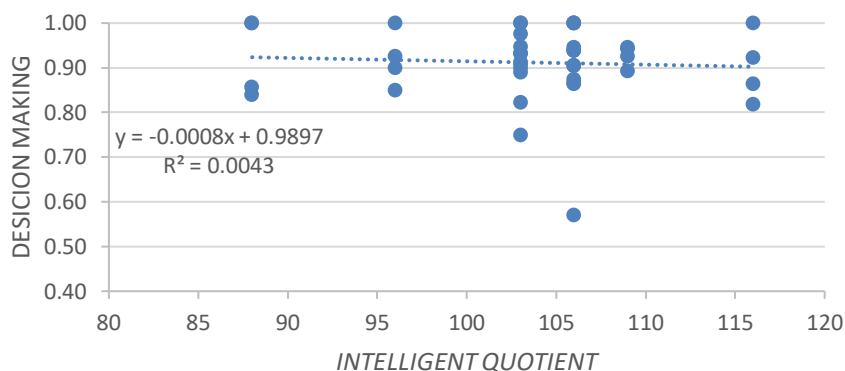


Figure 1. Correlation test of decision-making with Intellectual Intelligence

Figure 1. Correlation test of Decision Making with Intellectual Intelligence. Based on Figure 1. IQ level with Decision Making in this study found that (p -value 0.928 $>$ 0.05) and $r^2=0.0043$ there is a very weak and negative significant relationship between Intelligent Quotient with Decision Making.

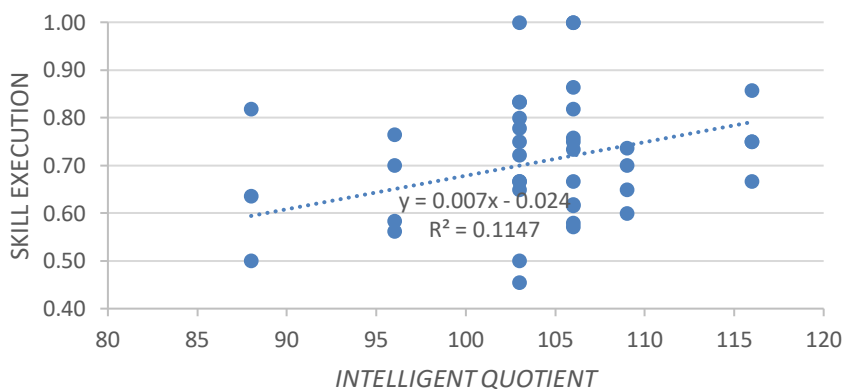


Figure 2. Correlation Test of Execution Skills with Intellectual Intelligence

Based on Figure 2. IQ level with Skill Execution in this study, it was found that (p -value $0.082 > 0.05$) and $r^2=0.1147$ there is a positive and weakly significant relationship between intelligence quotient and Desire Making.

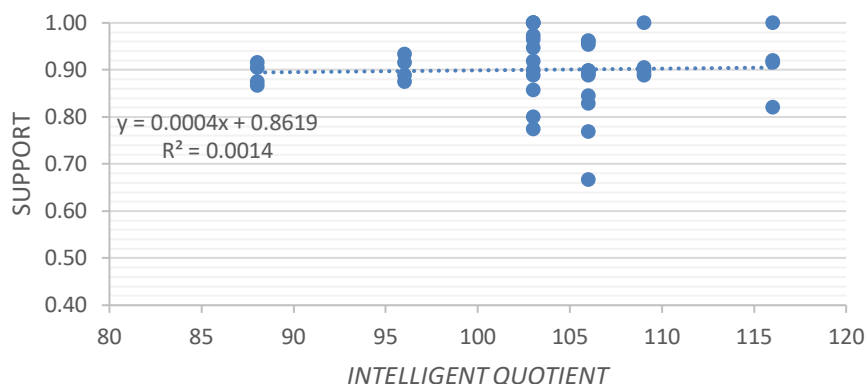


Figure 3. Support correlation test with Intellectual Intelligence

Based on Figure 3. IQ level with Support, this research found that (p -value $0.892 > 0.05$) and $r^2=0.00014$ there is a very weak positive and significant relationship between Intelligent Quotient and Support.

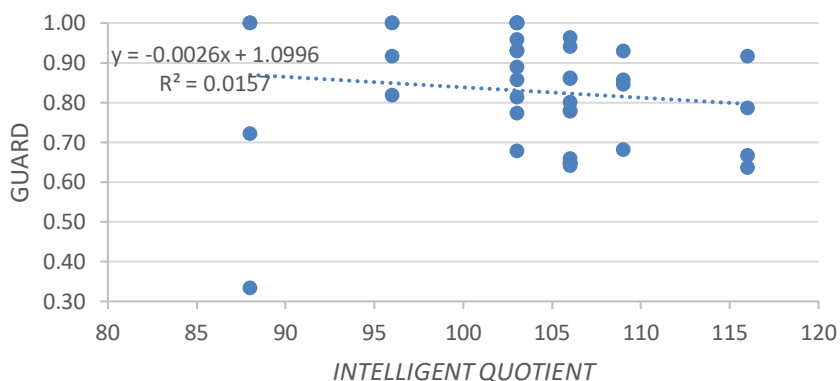


Figure 4. Guard correlation test with Intellectual Intelligence

Based on Figure 4. IQ level with Guard in this study, it was found that (p -value $0.327 > 0.05$) and $r^2=0.0157$ there is a negative and very weakly significant relationship between Intelligent Quotient and Guard.

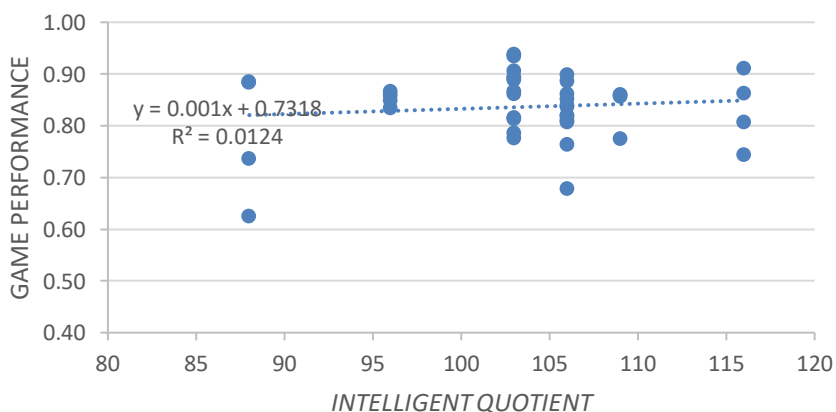


Figure 5. Correlation test between Game Performance and Intellectual Intelligence

Based on Figure 5. IQ level and Game Performance In this study, it was found that (p -value $0.207 > 0.05$) and $r^2=0.0124$, there is a very weak positive and significant relationship between intelligence quotient and Game Performance.

Based on all the correlation values of IQ with the Handball Game (Decision Making, Skill Execution, Support, Guard, Game Performance), there is no significant relationship. However, the correlation value between IQ and Skill Execution has a stronger relationship compared to Decision Making, Support, Guard, and Game Performance.

Discussion

1) Intelligent Quotient vs Decision-Making

For an athlete, events that occur on the field can be predicted beforehand or suddenly. This forces the athlete to make decisions quickly (Ferdiansyah et al., 2020). An athlete's understanding of situations that occur on the field requires a good IQ level because an IQ level is very necessary to think quickly in making decisions and act quickly (Rahmania & Fitri Ayuni, 2016). The average IQ in the team will influence each game situation. For example, decision-making is influenced by the athlete's level of skill and understanding (Araújo et al., 2023).

Based on data from Figure 1. The resulting data is positive and has weak significance between Intelligent Quotient and Decision Making. This can happen because many other factors influence decision-making. According to (Laborde & Raab, 2013) interference from positive or negative moods influences athletes' decision-making on the field.

Not only that, the sample for this research is school athletes who are in the amateur athlete class, which can be an insignificant factor in IQ and decision-making. According to (Amrizal, 2021), a professional athlete can make decisions more quickly and accurately than less experienced players. A lot of training and coaching of athletes up to the professional class is needed to maximize all their potential.

2) Intelligent Quotient vs Skill Execution

Skill execution is a component of skill and execution, where skill is a skill in understanding and mastering basic techniques, while execution is a continuation of skills that have been given or carried out in situations in the field (Peter M McGinnis, 2013). Skill execution, which is a sustainable component of decision-making, is closely related to IQ because every incident that occurs in the field is based on previously learned techniques. However, skills that have been learned during training can disappear when under psychological pressure (Cabral et al., 2013). Therefore, there is a need for more shooting practice methods in game simulation situations aimed at increasing efficiency (Fiorilli et al., 2017).

3) Intelligent Quotient vs Support

Support is a form of shared goals in the team (Araújo et al., 2020). Every athlete with a good level of cooperation will produce effectiveness in cooperation (Juravich & Babiak, 2015). Every athlete who prioritizes everything within himself for the team is the most extraordinary thing to achieve success (Ahmed, 2015). Both defeats and successes in the team are achieved by everyone together. Therefore, the cohesiveness or cooperation of each individual will significantly influence the state of this team game (Murdiansyah, 2015).

If the IQ is high, then the level of social intelligence is also high, which greatly impacts the level of understanding to quickly adapt to the surrounding environment (Rangga Munggaran, 2022; Widayati & Ristiyana, 2019). In team sports, the higher the athletes express their abilities, the more help a team can achieve their goals (Handayani, 2019). The collectiveness of individuals in a team greatly influences the quality of each effective match (Kamaluddin et al., 2021). Even though there is only a slight relationship between IQ and Support, it is necessary to increase the individual characteristics of athletes in understanding each other in the team.

4) Intelligent Quotient vs Guard

Guards in handball must have good internal components, such as having to remain agile when guarding and thinking quickly to take guard action, starting from moving to the right or left and taking effective action to avoid violations (Siti Nurr Arviyani, 2017). Guarding your opponent requires a lot of physical and mental energy (Fatahillah, 2018). Facing directly with an opponent requires athletes to

think and move quickly. IQ in defensive decisions against opponents is still poor for Bandung City athletes, this happens because the foundation for defending is still poor. There is a need to increase physical training, as stated by (Subarjah, 2013), that physicality is very important in all sports. If athletes are used to being faced with physical and mental fatigue, they will continue to be strong in guarding their opponents. The spirit of an athlete who does not want to lose in defense will lead the team to success (Komarudin, 2018).

5) Intelligent Quotient vs Game Performance

The games on the field result from hard work within the team, including the coaches (Juravich & Babiak, 2015). Coaches provide the best possible direction to create maximum results on the field (Lisinskiene et al., 2019). Athletes with high IQ can process commands and game plans according to the directions given by the coach, both during practice and competition (Vella et al., 2013).

Each player position in team sports has different physiological and psychological demands in each position (Irwanto & Romas, 2019). However, the involvement of one or another is very influential in-game performance. There must be thorough and long preparation to achieve optimal peak performance (Adi, 2016). Athletes who have good psychological awareness will produce the best match play (Yanti et al., 2022).

Athletes' intellectual awareness and improvement must continue to be trained, not only physically and technically but also by providing opportunities in the thought process for developing their intellectual abilities (Anidar, 2017). Judging from the level of complex motor movements during a match, it requires a high level of intelligence to process fast movement skills (Cabral et al., 2013).

CONCLUSION

Based on the research results, the researcher concluded that (1) there is a weak relationship between IQ and decision-making, (2) there is a very weak relationship between IQ and Support, (3) there is a very weak relationship between IQ and guard, (4) there is a very weak relationship between IQ and game performance, and (5) there is a weak relationship between IQ and Execution Skill. This research has the potential to have broader implications in understanding the relationship between IQ and game components in other sports. The involvement of IQ in the world of sports has not been revealed much, and this research will provide a basis for further research in improving athlete performance.

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