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Relative Age Effect (RAE) Analysis on Elite Pro Academy (EPA) Players at Persib Bandung Academy 2025

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ABSTRACT

Elite Pro Academy (EPA) is a prestigious football competition for young athletes, requiring athletes with high-quality performance. Athlete selection can be conducted using the Relative Age Effect (RAE) method, a phenomenon of unequal distribution of athletes' birth months that can affect their selection opportunities and performance. This study aims to analyze the RAE of EPA players at Persib Bandung Academy in 2025. The method used is a quantitative descriptive analysis approach with data collection through a survey that includes birth month identity. The study sample consisted of 22 people, aged 16 to 18 years, from Persib Bandung Academy. The analysis was conducted through manual data collection from the ileague.id website and statistical analysis using the Chi-square test and odds ratio. The results of the manual analysis showed that the distribution of players' birth months tended to be highly concentrated in the first quarter (Q1, January–March) at 41%, dominated by players aged 20 years, and lowest in the fourth quarter (Q4, October–December) at 10%. However, the results of the Chi-square test and odds ratio showed that the RAE was not significant because the sample size used was too small. It can be concluded that a larger sample size is needed to test RAE, as this phenomenon has potential implications for the EPA player recruitment process. Furthermore, it is important to consider RAE factors in youth development to optimize the potential of all players, facilitate the identification of athlete talent, and develop football player abilities.

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1. INTRODUCTION

Besides improving physical fitness and health, sports also serve as a means of recreation, strengthening a sense of community, and playing a role in promoting goodwill (Hikmah et al., 2018). Many people enjoy sports because they provide important benefits to life, both in maintaining physical health and as a means of achieving success. Therefore, sports have become an inseparable part of everyday life. Various sports such as volleyball, soccer, badminton, and others are very popular in Indonesia and are sought after by people from all walks of life.

Football is the world's most popular sport, played in nearly every country and a universal language that unites diverse cultural, linguistic, and social backgrounds. In Indonesia, football has continued to develop since the inauguration of the Indonesian football curriculum, known as Filanesia, in 2014 (curriculum citation). Through youth development and tiered competitions, from national to international, achievements have been achieved, such as a rise in Indonesia's football rankings within the FIFA class.

In the process of *talent* identification or player selection, coaches must be smart in seeing the potential and performance of athletes on the field so that they get players who fit the criteria and needs of the team which will later be useful for the national team and when the children are at professional age. One way is we can see from RAE. RAE is a grouping of players based on chronological age. Morgan (2024) All participants were divided into four quartiles: January to March (BQ1), April to June (BQ2), July to September (BQ3), and October to December (BQ4). Players born in the early months of the year usually have cognitive, motoric, physical differences compared to players born at the end of the same month, this is caused by movement experience and others.

RAE in many individual sports including swimming (Costa et al., 2013; Medic et al., 2009), athletics (Romann and Cobley, 2015), and winter sports (Müller et al., 2015; Romann and Fuchslocher, 2014). This phenomenon has also been identified in team sports, particularly those assessed in physical strength sports such as soccer (Augste and Lames, 2011; Diaz Del Campo et al., 2010; Helsen et al., 2012; Romann and Fuchslocher, 2013), basketball (Delorme and Raspaud, 2009; Schorer et al., 2011), handball (Delorme et al., 2009; Karcher et al., 2014), and hockey (Hancock et al., 2013; Stenling and Holmström, 2014). Furthermore, RAE has been observed in volleyball, a non-contact team sport (Nakata and Sakamoto, 2011)

RAE is not only in the world of sports but also in the world of education. Gonzales (2023) RAE occurs in various fields and is more evident in sports and schools . In football, one of the many branches that have been studied, along with volleyball, rugby, basketball, and other sports. Lupo et al. (2019) studied the presence of RAE in basketball, rugby, soccer, volleyball, and water polo. RAE can be used in children from young to adolescents, Gonzales (2023) showed that RAE is more likely to occur in male athletes between the ages of 15 and 18 who compete in the most popular sports. Recent research by Morgan (2024) found that the Relative Age Effect (RAE) already occurs in children aged 6 to 12 years in hockey, soccer, and alpine skiing. This suggests that age biases typically associated with adolescent or adult athletes actually appear from an early age in the sports development system.

The development of RAE in Indonesia has not been particularly rapid, as evidenced by the limited research on the subject, particularly in football, despite football being the most popular sport in the country. The Indonesian Football Association (PSSI), as the football association, has 38 provincial associations (Asprov), 18 League 1 clubs, 24 League 2 teams, 18 League 3 clubs, and League 4 clubs in each city and district. This represents approximately 67,000 players out of Indonesia's 250 million population. Because RAE significantly influences talent identification in young players, further research, particularly in Indonesia, is needed to improve youth football development outcomes.

The low RAE in Indonesia is an interesting finding that deserves further study. This is thought to be related to the relatively similar physical characteristics of Indonesian players, a talent search system that still relies on grassroots competitions *that* have not been standardized, and a technical approach that prioritizes individual speed and technique over physical excellence (body size) in young players. Furthermore, limited infrastructure and training centers make selection less stringent than in Europe, thus providing room for physically smaller but talented players to still be monitored. This study aims to analyze the Relative Age Effect (RAE) of the physical characteristics of Epa Akademi Persib Bandung 2025 players, which *refers to the phenomenon of unequal distribution of athletes' birth months that can affect selection opportunities and performance*.

2. METHOD

The research method used to analyze the Relative Age Effect (RAE) profile of Elite Pro Academy (EPA) players of Persib Bandung Academy 2025 is descriptive quantitative with a cross-sectional approach, where the birth month data of all EPA players (population) in 2025 is collected *census* and classified into birth quarters (Q1: Jan-Mar, Q2: Apr-Jun, Q3: Jul-Sep, Q4: Oct-Dec) according to the selection year (usually calendar or academic), then the distribution is analyzed statistically using the Chi-Square *Goodness of Fit test* to test whether there is a significant difference from the expected even distribution (25% per quarter), and calculating the odds ratio (OR) with a 95% confidence interval to strengthen the picture of the strength of RAE.

2.1. Research Subjects

The subjects in this study were Persib Academy athletes U-16, U-18, and U-20 who participated in the Elite Pro Academy (EPA) 2025. The population in this study amounted to 22 players, namely all EPA participants in the tournament. According to Sugiyono (2022:81), a sample is part of the number and characteristics possessed by a population, so that samples taken from the population must be truly representative or represent the population being studied. Based on this, this study used a saturated sampling technique because the entire population was used as a sample. As stated by Sugiyono (2022:85), a saturated sampling technique is a sampling technique in which all members of the population are used as samples.

2.2. Research Procedures

This study aims to examine *the relative age effect* of each athlete. The data used in this article is based on Elite Pro Academy players aged 20, 18, and 16, who come from various local teams in Bandung, West Java, and Indonesia. In this study, the author focuses only on players developed by the Persib Bandung Academy. This data was taken from the official website of the Indonesian league, www.ileague.id, which provides data on everything from elite teams to academy teams. Ileague.id provides a wealth of information, club data, and player analysis. and others. Through this data, the author can obtain player data related to the date, month, and year of birth of each player. After the data was collected, it was organized into Excel, then the data was separated to suit the research needs. In addition, the data analysis that will be used is Chi-Square and odds ratio. Overall, there are 22 Persib Bandung academy players with age limits of U20 (7 players), U18 (11 players), and U16 (4 players).

All players will be grouped based on their birth month:

1. players born in the first quarter of the year (January, February, March) (Q1)
2. players born in the second quarter of the year (April, May, June) (Q2)
3. players born in the third quarter of the year (July, August, September) (Q3)
4. players born in the first quarter of the year (October, November, December) (Q4)

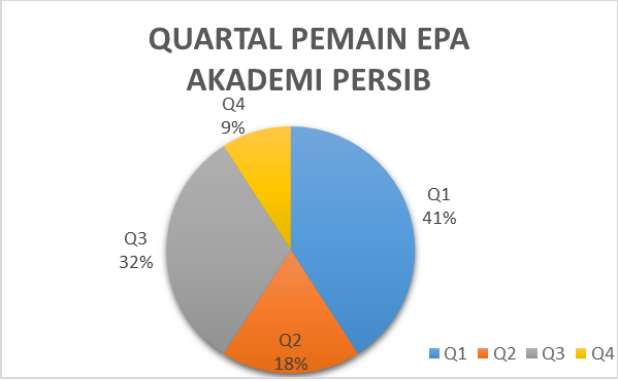
3. RESEARCH RESULTS

3.1 *Relative Age Effect* (RAE)

Of the 107 players participating in the EPA, 22 were trained by the Persib Bandung Academy, comprising 7 U20 players, 11 U18 players, and 4 U16 players. This study aims to analyze the profiles of these players. ***Relative Age Effect (RAE)*** Elite Pro Academy (EPA) Persib U-20 U-18 U-16 players who are players from the Persib Bandung Academy. The results obtained are that 41% (9 players) were born in Q1, 18% (4 players) were born in Q2, 32% (7 players) were born in Q3 and 10% (2 players) were born in Q4. We can see the analysis of the prevalence of RAE significantly dominates players born in Q1 compared to players born in Q4. The results can be seen in the image below:

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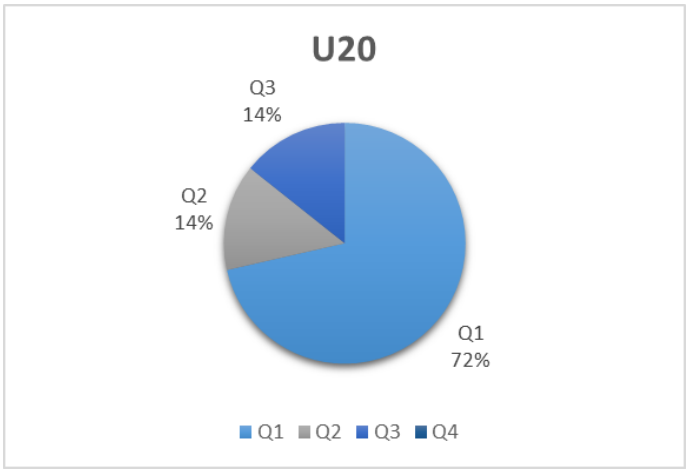
Figure 1. EPA Player Quarter, Persib Academy



Relative Age Effect phenomenon, where players born at the beginning of the year (especially Q1) have a much higher chance of representation compared to those born at the end of the year (Q4), which has the potential to influence the selection process, talent development, and playing opportunities in the academy.

If the research results are based on age groups, they can be seen in the graph below:

Figure 2. Persib Academy EPA Player Quarter Based on Age U20

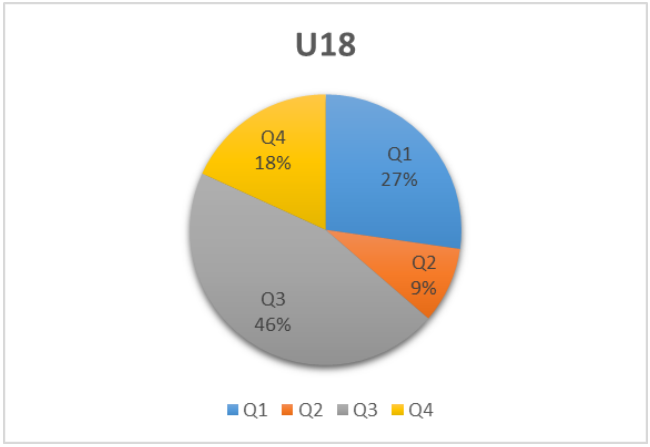


Based on the bar and pie charts in Figure 2, it can be concluded that the inequality of player distribution based on birth quarter reaches a very extreme level in the under 20 age group (U20), where the first quarter (Q1) dominates absolutely with a very high proportion of 72% of the total players, while the second quarter (Q2) and third quarter (Q3) each represent only 14%, and the fourth quarter (Q4) is not even visible in the diagram (0%), indicating that the Relative Age Effect (RAE) not only occurs but has become a very determining factor in the selection and/or retention process of young players in the academy, where players born in the early months of the year (January-March) have an extraordinary chance of staying or being selected up to the U20 category compared to players born in the later quarters, especially those born at the end of the year (October-December) who are not represented at all, thus potentially eliminating many potential talents born in the second half of the year and creating a systemic bias in the long-term talent development in the academy.

In addition, the test results for U18 can be seen in the graph below:

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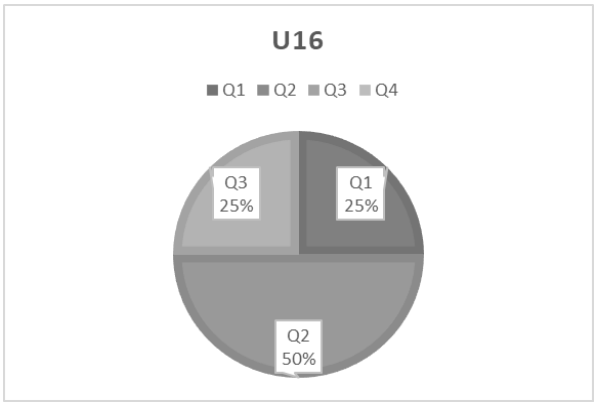
Figure 3. Persib Academy EPA Player Quarter Based on Age U18



Based on the data on the distribution of birth quarters in the U18 age group, it can be concluded that the Relative Age Effect pattern seen in the overall data of Persib Academy EPA players experiences significant variations and shifts in this group, where the dominance of the first quarter (Q1) which is very prominent in the aggregate data (41%) and the U20 group (72%) does not occur in the U18, with Q1 representation of only 27% (3 players); on the contrary, the third quarter (Q3) appears as the most dominant birth period with the highest proportion of 45% (5 players), followed by Q4 at 18% (2 players), and Q2 at 9% (1 player), indicating that in this younger age group (U18), the impact of relative age may be less influential or there are other factors such as selection policies, more even physical development, or the successful identification of talents born in the final quarter of the year, thus creating a more balanced distribution with a tendency to concentrate in the middle of the year (Q3) rather than absolute dominance at the beginning of the year as seen in other groups.

Based on the test results in the U16 age group, it can be seen in the graph below:

Figure 4. Persib Academy EPA Player Quarter Based on Age U16



An analysis of the quarterly birth distribution of the U16 group—with 25% in Q1, 50% in Q2, 25% in Q3, and 0% in Q4—reveals that the Relative Age Effect pattern that is so prominent at the academy level in general (with Q1 dominating) does not apply to this young age group; instead, the pattern is reversed, with the second quarter (Q2) accounting for half of the players, while the first quarter (Q1) represents only a quarter, and most significantly, the complete absence of players born in the fourth quarter (Q4). This suggests that while the relative age effect appears to be lower compared to the U20 group (where Q1 reaches 72%), there remains a systematic bias towards players born in the second half of the year—particularly Q4—who have been excluded or excluded from selection at an early age. Thus, the selection process at the U16 level is still not completely free from the influence of birth month, albeit with a different distribution configuration than in more mature age groups.

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It can be concluded from all the results of the Relative Age Effect (RAE) test that all players are categorized into 4 quarters from January to December starting from Q1, Q2, Q3, Q4 as shown in Figure 1. Based on the table above with a total of 22 players who have different birth months from January - December there are 4 quarters, consisting of Q1 (January-March) as many as 9 people, Q2 (April-June) as many as 4 people, Q3 (July-September) as many as 7 people and Q4 (October-December) as many as 2 people. If we look at each age group there are differences in each quarter in U20 with a total of 7 players, namely Q1 as many as 5 people, Q2 as many as 1 person, and Q3 as many as 1 person. The U18 age group with a total of 11 players, namely Q1 as many as 3 people, Q2 as many as 1 person, Q3 as many as 5 people, and Q4 as many as 2 people. In the U16 age group with 4 players, namely 1 Q1, 2 Q2, and 1 Q3. It can be concluded that the distribution of birth months of 22 players indicates the presence of a Relative Age Effect (RAE).

3.2 Results of Chi-Square and Odds Ratio Tests Relative Age Effect (RAE)

Based on the observed data from 22 players, there are initial indications of a relative age *effect (RAE)* , characterized by an uneven distribution of players' birth quarters. A total of 40.9% (9 players) were born in the first quarter (Q1), while the last quarter (Q4) only contributed 9.1% (2 players). Statistical analysis (Chi-Square Goodness of Fit, Odds Ratio, and Confidence Interval) is needed to test the significance and strength of this pattern association, in order to distinguish whether the pattern is a real phenomenon or simply random variance due to the limited sample size. The following data on the number of players categorized by quarter can be seen in the table below:

Table 1. Data on the number of players Q1 – Q4

Quarter	Number of Players	Percentage
Q1	9	40.9%
Q2	4	18.2%
Q3	7	31.8%
Q4	2	9.1%
Total	22	100%

Source: Data processed by Penlusi, 2025

The next step was to conduct testing using Chi-square and odds ratio analysis to determine the significance of the variables and their associations. The Chi-Square *Goodness of Fit test* yielded a χ^2 value of 5.273 with 3 degrees of freedom (df) and a p-value of 0.153. This result indicates insignificance ($p>0.05$), thus concluding that there is insufficient statistical evidence to suggest the existence of RAE at the overall population level. Meanwhile, the Odds Ratio analysis (Q1 vs. Q4) yielded an OR of 4.50, meaning the odds of selecting a player from Q1 are 4.5 times higher than those from Q4. However, the 95% confidence interval ranges from 0.65 to 31.14, and the wide CI reflects high estimation uncertainty due to the small total sample size and the very small number of cases in Q4 (only 2 players). Since the interval includes a null value of 1, this result is not statistically significant. Although descriptively, the differences in proportions appear striking, the data from these 22 players do not provide sufficient statistical evidence to conclude a significant Relative Age Effect (RAE). Consequently, the observed effect is imprecise and likely due to sampling variation due to the small sample size.

4. DISCUSSION

The results of this study reveal two important phenomena in the EPA squad of players developed by the Persib Bandung Academy. A tendency toward the Relative Age Effect (RAE) in team composition was identified.

RAE (*Relative Age Effect*) has been widely studied in Europe, America, and countries with advanced football. RAE (*Relative Age Effect*) has previously been observed in football in many countries, including several European countries (Augste and Lames, 2011; Horn and Okumura, 2011; Romann and Fuchslocher, 2013; Salinero et al., 2014). However, this research is very limited in Indonesia, only a few studies, one of which is a study on the 2024 Liga 1 team on "Analysis of the Effect of Relative Age Effects on the Performance of Foreign Players in the Persik Kediri Team" (Maliki, 2024) which highlights RAE in foreign players in the Persik Kediri team in 2021-2024, all players were born in the first quarter.

The distribution of players' birth months is uneven, with 9 in Q1 (January-March), 4 in Q2 (April-June), 7 in Q3 (July-September), and 2 in Q4 (October-December). According to various studies in the field of football, RAE is most pronounced in elite young male footballers (under 18 years old), and can significantly impact the future careers of these young players (Bezuglov, 2023). In German football, considered one of the most competitive in the world, "early-born" players have a greater chance of developing into professional players (Bezuglov, 2023). If we look at each age group there are differences in each quarter in the U20 with the number of players 7 people Q1 5 people, Q2 1 person, and Q3 1 person, in the U18 with the number of players 11 people Q1 3 people, Q2 1 person, Q3 5 people, and Q4 2 people, in the U 16 with the number of players 4 people Q1 1 person, Q2 2 people, and Q3 1 person , is a strong indication of the presence of RAE. This phenomenon is in line with the RAE theory proposed by Morgan (2024), which states that in the same age group, children born earlier (such as in Q1 and Q2) tend to have advantages in physical, cognitive, and emotional maturity compared to their peers who were born younger. It is not surprising that older youth soccer players biologically have a physical advantage. Unfortunately, this advantage is often misinterpreted as superior talent. Therefore, in the selection, players born earlier in the year (Q1) are more often selected. Their dominance in the team suggests a relative age bias in the selection process, which risks overlooking talented players born later in the year (Bezuglov, 2023).

From the results of the Chi-Square statistical test, it is not significant, there is not enough statistical evidence to state the existence of RAE at the overall population level. For the Odds Ratio test (Q1 vs. Q4) the odds of selecting a player from Q1 are 4.5 times higher than Q4, the observed effect is not precise and may be due to sampling variation (the sample size is too small). It can be concluded from the statistical test that 40.9% in Q1 vs. 9.1% in Q4 observed in the data from These 22 players not statistically significant. This difference is very likely due to chance *in* a small sample size. To detect a true RAE, studies with a larger sample size are highly recommended.

Problems that often occur when conducting selection are very common in Indonesia, the solution is a gradual, continuous selection process by providing Rae understanding to coaches, players, parents and everyone involved in this process, with a good coaching process and creating intelligent players not only physically reliable.

5. CONCLUSION

Based on the research results, it can be concluded that there is a strong indication of the Relative Age Effect (RAE) phenomenon in the EPA of players trained by the Persib Bandung Academy. This is evident from the uneven distribution of players' birth months, with 9 players from Q1 (January-March), 4 from Q2 (April-June), 7 from Q3 (July-September), and 2 from Q4 (October-December). This pattern is consistent with the RAE theory proposed by Barnsley et al. (1985), where individuals born earlier in the selection year (in this case the first and second quarters) have a physical and cognitive maturity advantage, thus having a greater chance of being selected for the sports program. The dominance of players from this early quarter confirms that relative age bias also influences the selection process and team composition, potentially overlooking potential talents born later in the year.

Based on this research, the implications that can be put forward are as follows:

1. For coaches and federations, developing RAE from a young age is crucial for player identification and selection, as well as conducting biological tests. Furthermore, coaches and federations need to evaluate youth competitions and introduce RAE to athletes and parents.
2. In relation to the research that has been conducted, it is recommended that more research be conducted discussing Rae with larger samples and populations from young ages, female players, to the National Team with more in-depth studies.

6. AUTHOR'S NOTES

Conflict of Interest Statement: The author declares that there are no financial or non-financial conflicts of interest that may influence the research process, results, or publication of the article entitled " Analysis of *Relative Age Effect* (RAE) on Elite Pro Academy (EPA) Players at Persib Bandung Academy 2025".

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