

# Relative Age Effects among Malaysian Elite Adult Field Hockey Players

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**Abstract** Relative age effect (RAE) has been identified as a contributing factor that could affect the chances of an individual attaining elite athletic level. The aim of this study was to identify the presence of RAE among adult Malaysian field hockey players. Birth dates of both men (n=270) and women (n=197) players were obtained from the official website of the 2020 national hockey competition and analyzed for significant differences in the distribution of their birth months using Chi Square Goodness of Fit test. Players' birth months were distributed according to four quartiles. Presence of RAE was found for both men and women categories. Similar results were shown among the men's semifinalists and those who were selected to the national team. However, no RAE was found in the women's semi-finals teams as well as those who were selected to the national team. Suggested reason for the absence of RAE among the more skillful women players could be a lack of competition for places in the team and possibly due to a high turnover of players. Another reason posited was that the relatively younger players were able to persevere and overcome the selection bias, more with their technical and tactical skills than physical advantage.

**Keywords** Relative Age Effects, Malaysian Field Hockey, Successful, Adults

## **1. Introduction**

Researchers have suggested several factors influencing the achievement of a high level of proficiency in the domain of sport, such as genetic and environmental influences [1]. A secondary or indirect factor affecting the development of elite athletes that has been increasingly examined is the relative age effect. Relative age effect (RAE) has been shown to become one of the factors that could either enhance or suppress the opportunity of an individual be an athlete [2]. RAE occurs when relatively older players are being preferred to rather than their relatively younger peers although they are in the same age category [3].

Two popular theories have been proposed for the phenomenon. First, the maturation theory where relatively older athletes tend to be physically taller, heavier, and stronger than relatively younger athletes due to their earlier attainment of biological maturation (i.e., accelerated growth due to hormonal changes on the onset of puberty). [4]. The physical advantage tends to lead to greater success in athletic performance, particularly in sports that allow physical contact, such as soccer, rugby and ice hockey. Second, relatively older athletes are more likely to be identified by coaches as "talented" and get selected and stay longer in teams [5, 6]. The combination of these two hypotheses further promotes the relatively older athletes to invest in physical and psychological training, thus expanding their likelihood of staying in the sport [7].

Research among Russian elite ice hockey players demonstrated a prevalence of RAE among the players [8]. The study examined 2245 players' birth date that played in the National Hockey League (NHL) from 1998 until the 2018 seasons. The number of players born in the first half of the year (65.5%) was higher than the players born later (34.5%) in the year. They also found the presence of RAE was pronounced among Russian hockey academies as well as their junior teams but not in the elite adult teams, where a reverse RAE was found with a high number of players born in the fourth quartile. The reverse situation was due to the early specialization in the sport, as well as the selection process was not based on physical advantage only [8]. Researchers have attempted to examine the relative age effect among athletes competing in international competitions. The study examined the birthdates of players competing in the 2019 World Rugby Under 20 Championship [9]. Results showed that in the overall players' position and among the teams that are qualified for semis category (successful teams), there were significantly more players born in the first quarter of the year. There was also a high number of players born in the first three months who played in the backline positions compared to the forwards. This situation could be due to the players in those positions were selected more for their playing experience and tactical skills rather than their physical advantage.

On the other hand, a study aimed to find if the RAE may specifically affect the early, but not the late phase of senior career in elite team sports [10]. Birthdates of 3319 players from various sport (rugby, basketball, soccer, volleyball & water polo) in Italy were collected. These players were elite senior players. The study found that the players who were born in the first few months, were more likely to be chosen to the first and second division of the Italian rugby, basketball, soccer, volleyball and water polo competition. RAE was present in the early born in all sports. The authors interpreted the preference for the early born players due to their physical maturation, which is related to muscular strength and physical advantage. These endowments are favorable for invasion team sports [10]. Another nation-wide study on RAE among its athletes was conducted in Switzerland [11]. Among the sports was field hockey and the study found medium sized RAE among its development squad ( $n=95$ ) and national teams ( $n=49$ ) among the male players and no data were provided on the female hockey players. However, field hockey is not a major sport in that country, therefore caution is warranted when interpreting the findings.

There are limited RAE studies conducted among Malaysian athletes. For example, Shaza et al [12] investigated the prevalence of RAE among the Malaysian national schools' athletes competing in three age groups U12, U15 and U18. The sports were netball, cricket, tennis, sailing, softball, artistic and rhythmic gymnastics, archery, football, chess, golf, handball, volleyball, *sepak takraw*, hockey, squash, cross country, rugby, table tennis, athletics, tenpin bowling, badminton and aquatic. The study found a

significantly higher amount of players born in the first quarter (Jan-March) rather than those born in the last quarter of the year. The authors suggested that the disproportionate distribution could be due to the selection of players more on their physical advantages (i.e., taller and stronger) as a result of attaining puberty earlier which accelerated growth among the age group athletes rather than technical skills [4,5]. Whilst the study examined the prevalence of RAE among children and adolescents, another study examined the adult athletes who represented Malaysia in the South East Asian (SEA) Games [13]. The researchers found a prevalence of RAE among the men but not among women athletes. An absence of RAE among the women could be due to the selection of women athletes were based on technical skills of the players and not the physical stature. Apart from that, less competitiveness among this gender was suggested. Other reasons posited were women athletes who were chosen from young age and the effects of prolonged training that could have resulted in injury, burn out and also boredom [13].

To the best of the authors' knowledge, no studies have been attempted examining the Malaysian adult hockey players. The Tun Abdul Razak Cup (TARC) is the oldest national level hockey tournament [14]. It is the largest local competition at the adult's level (comprising of 15 teams for the men's and 11 teams for the women's). The annual inter-state competition provided an optimal opportunity for such study as it was confined to only Malaysian born players and served as a platform for the coaches to select the national senior team.

The objectives of this study were firstly, to investigate the presence of RAE among the players in the competition. Secondly, to investigate the presence of RAE among the teams who are qualified for the semifinals (deemed successful teams). The final objective was to examine whether players selected to both the men's and women's national team were influenced by the RAE. The tournament served as a selection platform for the national hockey team to participate in major competitions. It was predicted that RAE would be present for both genders but none for the more skillful players.

## 2. Methods

Fifteen men's and 11 women's teams participated in the 2020 TARC tournament. A total of 497 players (270 men and 197 women with their mean age of 22.9 years and 20.9 years accordingly). The data of the players were collected from the official tournament website [15]. The players' birthdate, team placing, and list of players selected to national team were then transferred to Microsoft Excel. The players' birth month was distributed into four quartiles. The cut-off date used to classify the players' birth month is 1<sup>st</sup> January, the date used in all Malaysian sports competition rules. First quartile (Q1) consisted of players who were born between January until

March, second quartile (Q2) April until June, third quartile (Q3) July until September and the fourth quartile (Q4) October until December as used in related studies [10,11,12,13].

### 3. Data Analysis

Chi square goodness-of-fit test, was used to compare the birth month among the hockey players with the team achievement (teams qualified for semis) and players selected to national team [16]. The function of chi-square goodness-of-fit test was to find the frequency of hockey players born in each quartile as well as to measure the difference between the observed and expected distribution of the birth date. The test is most used in RAE studies [17]. The expected frequency of birth was assumed to be homogenous and set at 25% per quartile. Standardized residuals (SRs) were used as the post-hoc test for finding the statistical significant in Chi square goodness-of-fit analysis. The standardized residuals calculation;  $SR = (F - G) / \sqrt{G}$ , observed (F), expected (G). The value in indicating an overrepresentation was set at  $\geq 1.96$ , while a value of  $\leq -1.96$  indicated an underrepresentation in

relation to the relative age distribution [18]. Statistical Package for Social Sciences (SPSS) version 23.0 was used and the significant level was set at of .05.

### 4. Result

#### Demographic data

Birth dates from 270 men ( $M = 22.9$  years;  $SD = 4.99$ ) and 197 women ( $M = 20.9$  years;  $SD = 5.13$ ) hockey players who participated in the tournament were collated for analysis. Figure 1 below indicates the distribution of both men and women according to the birth quartiles. There were significant differences in the distribution of both men and women players according to their birth months. More men ( $n = 93$ ) and women ( $n = 62$ ) were born the first three months of the year than those born in the last quarter (men = 40; women = 32).

Chi square goodness-of-fit test showed a significant relative age effect  $\chi^2 (3, N = 270) = 27.99, p < .001$  and presence of relative age effect on distribution among the men, as well as the women players  $\chi^2 (3, N = 197) = 13.21, p = .004$ .

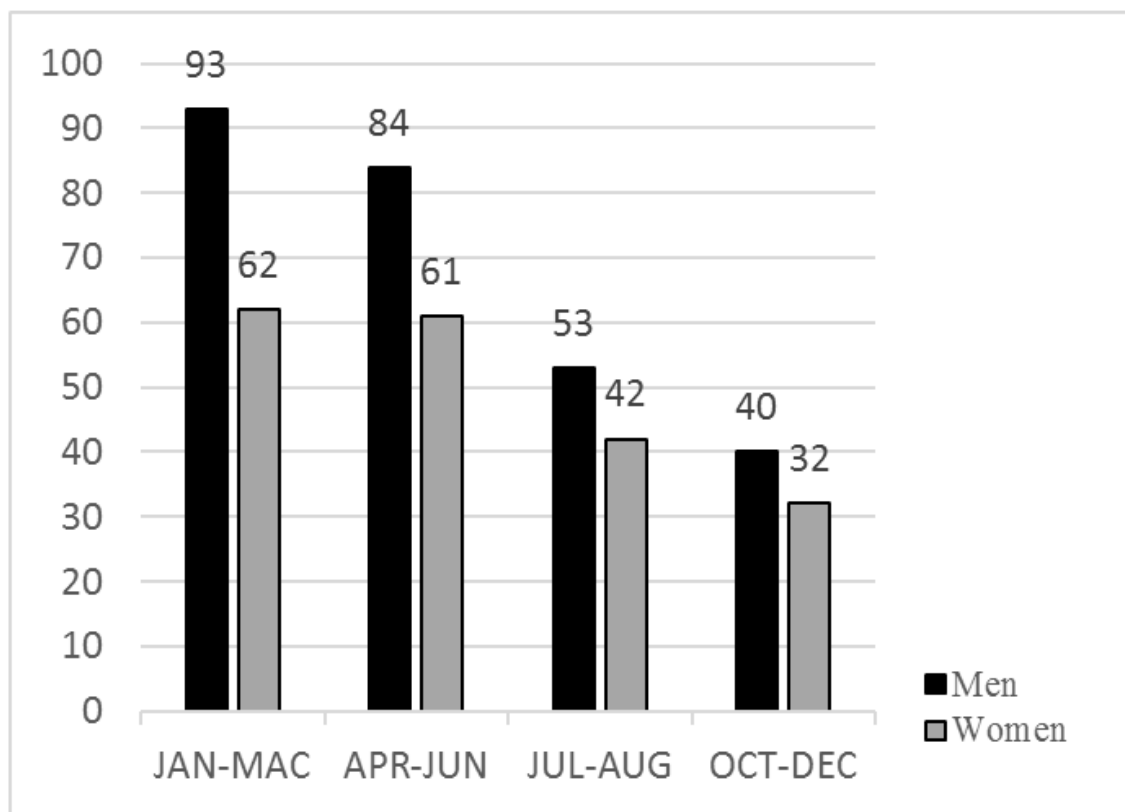
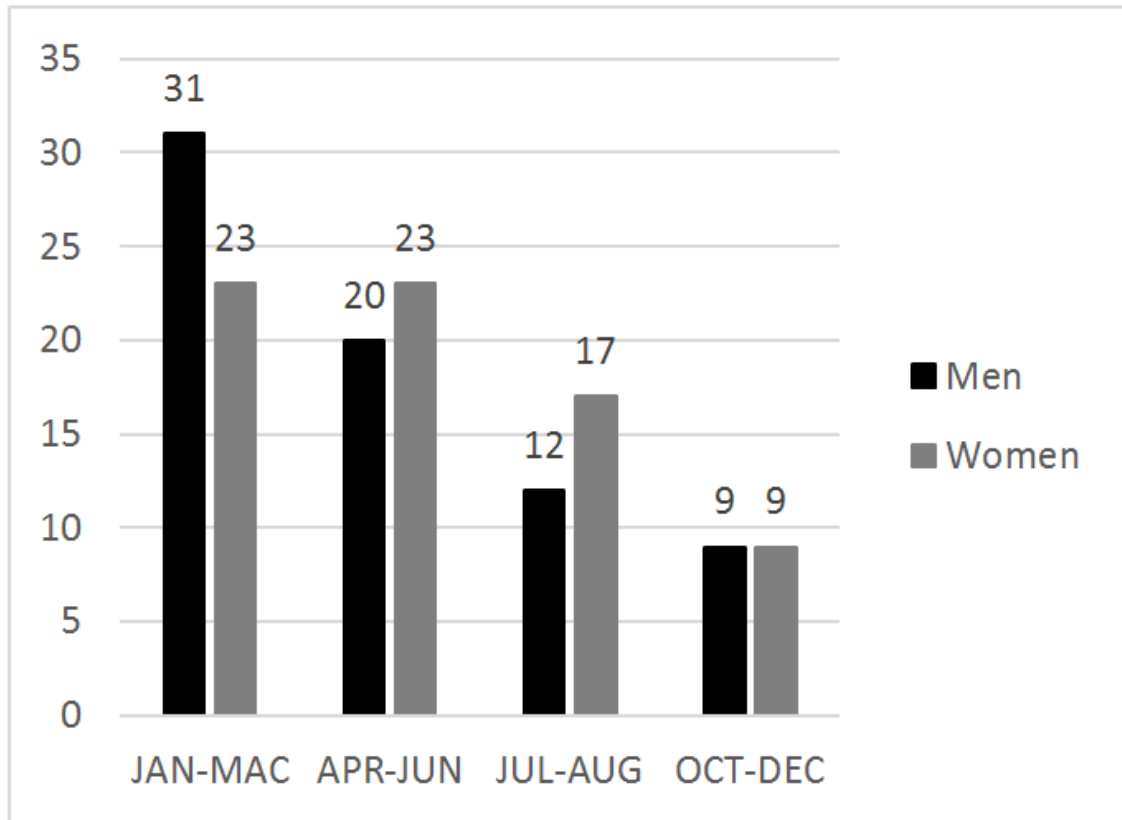


Figure 1. Overall distribution of players of both gender according to birth quartiles.

**Table 1.** Post-hoc analysis using Standardized Residuals of the distribution of both men and women players born according to birth quartiles

Quartile	Observed		Expected		SR	
	M	W	M	W	M	W
1	93	62	67.5	49.3	3.10*	1.81
2	84	61			2.01*	1.67
3	53	42			-1.76	-1.04
4	40	32			-3.35*	-2.46*

\* significant difference between observed and expected

**Figure 2.** Distribution of birth quartile among the teams that qualified for semifinals

Post-hoc test using Standardized Residual (SR) indicated that there were overrepresentations of the male hockey players born in the first and second quartiles Q1 (Jan-Mac) & Q2 (Apr-Jun) where a positive standardized residual (SR= 3.10, 2.01) and significant underrepresentation in Q4 (Oct-Dec; SR= -.3.35) were found (Table 1). However, an underrepresentation of players was only found among the women players who were born in Q4 where a negative standardized residual (SR=-2.46).

Further analyses were conducted on the players from the teams that qualified for the semi-finals of the competition. The reason being to investigate if there was a presence of RAE among players from the better teams. Result of chi-square goodness of fit test showed a significant relative age effect  $\chi^2$  (3, N = 72) = 16.11, p = .001 for the men's (Figure 2). However, no RAE was

found in the distribution of women's teams,  $\chi^2$  (3, N = 72) = 7.33, p = .062.

**Table 2.** Post-hoc analysis using Standardized Residuals of the distribution of the semi-finals men's team players born according to birth quartiles

Quartile	Observed	Expected	SR
1	31	18	3.06*
2	20		0.47
3	12		-1.41
4	9		-2.12*

\* significant difference between observed and expected

Post hoc analysis on the men's semi-finalists teams showed players born in the first quartile were significantly

over represented (SR=3.06) while those born in the last quartile were significantly under represented negative standardized residual (SR= -2.12).

As the national competition served as a platform for the selection for the Malaysian national teams for both men and women, the authors analyzed the birthdate of 34 men and 29 women players shortlisted by the national selection panel.

Figure 3 showed a significant relative age effect  $\chi^2$  (3, N = 34) =13.765, p = .003 among the players shortlisted for the national men’s hockey team and similar to the second analysis on the semifinalists in the women’s category, no RAE was shown among the shortlisted women players,  $\chi^2$  (3, N = 29) =2.59, p = .46.

**Table 3.** Post-hoc analysis using Standardized Residuals of the distribution of the players shortlisted for the men’s national team born according to birth quartiles

Quartile	Observed	Expected	SR
1	17	8.5	2.92*
2	7		0.51
3	8		-0.17
4	2		-2.23*

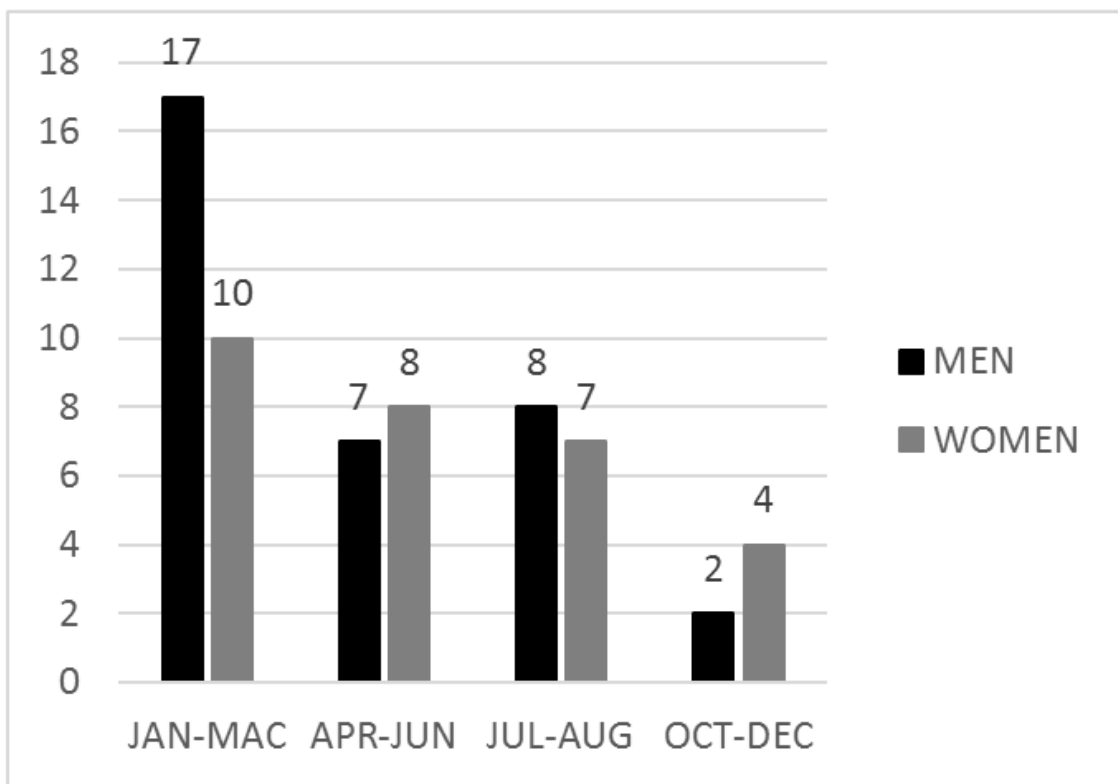
\* significant difference between observed and expected

Similar to the analysis on the men’s semi-finalists teams, the shortlisted national players showed those born

in the first quartile were significantly over represented (SR=2.92) compared to those born in the last quartile were significantly under represented (SR= -2.23). No significant differences were shown in the other two quartiles as shown in Table 3.

### 5. Discussion

The Tun Abdul Razak Cup is the oldest hockey tournament in Malaysia and has been held every year since 1962. The purpose of this study was to investigate the prevalence of RAE among the adult field hockey players in Malaysia. A presence of relative age effect was found in both men and women players from the competing teams. Overall, the current result supported the findings on the field hockey players in Switzerland [11] where the presence of RAE was detected. Reasons suggested behind the presence of RAE in this study are due to the selection process as the athletes chosen were identified as “talented” by the coaches [5, 6]. Accumulated experience in the sport and early exposure to the sport itself may explain why the athletes were seen as “talented” athletes. Relatively older players had more opportunities to gain more experience in the sport as they were often selected from an early age due to their advanced physical advantage as a result of biological maturation [4].



**Figure 3.** Distribution of birth quartile among the shortlisted national men and women’s team

The study also examined the presence of RAE among the teams that are qualified for the semifinals. The reason for this was to examine if the better players were affected by the RAE or not. Previous studies [e.g., 19, 20] have shown that more skilled and successful athletes were later born as they were able to circumvent the physical bias with their superior technical and decision making skills. The results revealed contrasting findings of RAE between men and women teams. A presence of RAE was found among the men in the semifinals teams. The result supported the findings on the successful teams in World Rugby under 20 [9]. However, no RAE was shown among the women players. This finding concurred with the study among the elite female players in soccer, basketball and handball teams North America and Europe [21]. Goldschmied [21] suggested that, although the relatively younger female players were not physically strong as their older counterpart in the early part of their career, they managed to persevere and remain competitive in their sport.

The final objective of this study also found presence of RAE among the men players selected to national team, but not among the women players. According to the study on Malaysian athletes selected for the 2017 SEA Games [13], the advantages of the relatively older male athletes selected could be influenced by having early exposure to the sport itself. They may have been playing the sport since young, being selected to higher levels of competition such as representing the state or the country, thus acquiring more playing experience. The authors argued that decline in structured sport participation in tandem with the increase in age among adolescent and adult women contributed to the even distribution of birth months of the female hockey players. This argument was supported in the longitudinal study in sport participation in adolescent girls [22]. This factor would then lead to another social reason where a lack of competition for places in a team was suggested to be related to the absence of RAE [23].

Another suggested reason for the presence of RAE among the men's hockey players could be due to the popularity of the sport. The Malaysian men's hockey team is ranked 11<sup>th</sup> in the world [24] and it is considered as the highest ranked Malaysian team sport. Its success in international level generates substantial interest among the youth to participate in the sport. The same could not be accorded to the women's game. They are ranked 22<sup>nd</sup> in the latest world ranking and have not achieved much success at the international platform.

## 6. Conclusion

This study showed an evidence of overrepresentation of relatively older athletes among the Malaysian adult field hockey players. Similar result was also shown in the list

of men's semifinal teams and those selected to the national lineup. The uneven distribution of relatively older male players in the tournament could be due to their playing and match-play experience over the relatively younger players, thus contributed to their advantages over the relative younger players. As it was an adult level competition, the physical advantage such as height did not come into play as compared to similar studies among age group athletes, thus relegating the physical advantage hypothesis. Another suggestion would be the popularity of the sport among Malaysians. There are artificial playing turfs throughout the country for the players to train and compete.

Meanwhile, no uneven distribution among the women semi-finalists teams and shortlisted national players are suggested due to social factors where the participation of girls in sport would decline with age. This eventually led to lack of competitiveness among the women players and more relatively younger players were selected more for their technical and tactical skills. However, caution is warranted when interpreting the results on the women's teams, especially the national selected players as the sample size was relatively small.

There are some limitations in this study, such as the sample size was limited to the players who participated in the competition. There could be other active adult players who were not involved, but the numbers are deemed negligible as the tournament was open to only Malaysian citizens as compared to other competitions where foreign players were allowed to participate.

Physical assessments and in-depth investigation on the players' participation history and coaches could be conducted in future studies to provide more insight on the presence of RAE among the players. Cross-sectional studies could attempt to examine the prevalence of RAE among the age group players. Future studies might consider to examine the psychological aspect of the players as it might be a contributing factor to be selected into the team.

This paper extends the current knowledge in relative age effects in field hockey and provides an insight to its influence in Malaysian sports. It is hoped that the coaches and administrators would take heed of the RAE influence and pay attention to the relatively later-born players who may have dropped out in their career pathway towards elite sport attainment.

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