Deanship of Scientific Research

The Relative Age Effect in Handball: Its Existence and Influence on Playing Position for Youth and Junior Asian National Teams

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Abstract

There was significant RAE for the Asian national handball players (X^2 (3) = 44.511, *p* <.001), youth teams (X^2 (3) 30.189, *p*= <.001), and junior level (X^2 (3) = 15.000, *p*=.002) with a greater proportion of players born in Q1. For Asian national players, goalkeepers (X^2 (3) = 8.937, *p* =.03), backs (X^2 (3) = 26.797, *p* <.001), and wings (X^2 (3) = 10.628, *p* =.014), were significantly affected by RAE. For youth teams, backs (X^2 (3) = 17.520, *p* =.001) and wings (X^2 (3) = 14.556, *p* =.002) were significantly affected by RAE. For junior goalkeepers (X^2 (3) = 10.040, *p* =.018) and backs (X^2 (3) = 10.625, *p* =.014) were significantly affected by RAE. The results of the current study agree with other than handball literature confirming the benefits athletes experience for being born in the first quarter of the year and demonstrates that RAE has a significant impact in Asian national youth and junior handball teams.

Keywords: Relative age effect, RAE, handball, birth date, talent, maturation, playing position

تأثير العمر النسبي في كرة اليد: مدى وجوده، وتأثيره في تحديد مراكز اللعب في منتخبات كرة اليد في قارة آسيا لفئتي الناشئين والشباب

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ملخّص

يُعَبِّرُ العمرُ النسبي (relative age effect) في المجال الرياضي عن الفروقات الفرديّة التي تظهر بين لاعبي الفئة السنيّة الواحدة نتيجة لتباين شهر الميلاد. وتشير الدراسات السابقة غلى أنّ العمر النسبي عامل مهمّ من عوامل النجاح والتميز في المجال الرياضي. ففي كرة اليد أظهرت بعض الدراسات العالمية وجود هذا التأثير في عملية اختيار المواهب الرياضيّة في كرة اليد الأوروبيّة على مستوى المسابقات المحليّة، ولكن ليس على مستوى النخب والمنتخبات الوطنيّة. ونظرًا إلى عدم وجود الدراسات التي تبحث تأثير العمر النسبي في لاعبي كرة اليد في قارة آسيا، هدفت هذه الدراسة إلى بحث مدى وجود تأثير العمر النسبي في عملية اختيار لاعبي المنتخبات السنيّة في قارة آسيا ومدى تأثيره أيضًا في عمليّة تحديد مراكز اللعب. وبعد تحليل بيانات المنتخبات الوطنيّة المشاركة في البطولات الآسيويّة لفئتي الناشئين والشباب وجدت الدراسة أنّ هنالك دلالة إحصائيّة مهمّة تظهر تأثير العمر النسبي في عمليّة انتقاء لاعبي المنتخبات الوطنيّة الآسيويّة وفي عمليّة تحديد مراكز اللعب. وقد أظهرت نتائج هذه الدراسة أهميّة العمر النسبيّ في عمليّة انتقاء المواهب الرياضيّة في مجال كرة اليد وفي عمليّة تحديد مراكز اللعب.

الكلمات الدالة: العمر النسبي، النضج، كرة اليد، الانتقاء.

Introduction

Team handball is a high-intensity, physical, and fast-based Olympic sport played across the world. To succeed in handball, players must develop multiple characteristics such as strength, speed and aerobic fitness (C. Karcher & Buchheit, 2014), as well as technical and tactical skills (Karcher, Ahmaidi, & Buchheit, 2014). However, these characteristics have been shown to be increasingly decisive when it comes to selecting children to play handball (Cobley, Baker, Wattie, & McKenna, 2009).

In many sports, including basketball (Delorme, Chalabaev, & Raspaud, 2011; Ibáñez, Mazo, Nascimento, & García-Rubio, 2018), ice hockey (Baker & Logan, 2007), track and field (Brazo-Sayavera, Martínez-Valencia, Müller, Andronikos, & Martindale, 2018), swimming (Buhre & Tschernij, 2018), tennis (Gerdin, Hedberg, & Hageskog, 2018), rugby and soccer (Helsen et al., 2012; Till et al., 2010), an athlete's date of birth has been found to be a significant determinant for success. This previous research has discussed the so-called "relative age effect" (RAE) which refers to the difference in age between athletes in the same age group. RAE provides relatively older athletes (i.e., born in first quarter of the year) advantages over younger athletes (Cobley et al., 2009). These deceptive advantages influence the selection processes negatively, as most national clubs and associations build their selection and ranking systems in early stages of children's life, in which youth athletes are physically, psychologically, and mentally developing at different rates. Due to the RAE, younger athletes have less opportunity to become professional athletes (Baker, Schorer, & Cobley, 2010; Pizzuto, Bonato, Vernillo, La Torre, & Piacentini, 2017), have less self-efficacy (Thompson, Barnsley, & Battle, 2004), and are more likely to have poor sport experience and dropout of sports earlier than older athletes (Delorme, Boiché, & Raspaud, 2010; Delorme et al., 2011).

From the research (Gil, Gil, Ruiz, Irazusta, & Irazusta, 2007; Lago-Peñas, Casais, Dellal, Rey, & Domínguez, 2011), as well as from a practical point of view, various playing positions in team sports (e.g., team handball) are characterized by different physiological, technical, tactical, psychological and anthropometric profiles. Recently, studies have examined the relationship between RAE and playing position in team sports (Ibáñez et al., 2018; Romann & Fuchslocher, 2011, 2013a, 2013b; Schorer, Cobley, Büsch, Bräutigam, & Baker, 2009). In handball, a greater stature is generally considered a physical advantage for technical skills such as stealing, throwing, and handling of the ball in a direct duel with an opponent (Matthys et al., 2011). Therefore, players who are biologically older (i.e., born in the first quarter of the year) have more advantage to hold their positions in handball due to the maturational advantages; thus the selection process and playing positions in handball could be influenced by RAE. Camacho-Cardenosa et al. (2018) found statistically significant differences in anthropometric profiles and throw speed between youth (age = 13.26 years) handball players born in the first and second semester of the year. Cobley et al. (2009) showed that this is especially true in sports with high demands on strength and power; in such sports, youth athletes who are above average in height and weight compared to non-athletes of the same age are favorably selected. In team handball literature, RAE has been shown in youth (ages = 13 – 15) German players (Schorer, Baker, Büsch, Wilhelm, & Pabst, 2009), youth (U19, U21) Danish national players (Wrang et al., 2018), and Spanish children, youth, and junior players (Rivilla-García, Quintana, Sancho, & Rodríguez, 2012), in which they found that players born in the first quarters of the year have higher probabilities of playing handball. In contrast, sports with less physical demands, like shooting (Delorme & Raspaud, 2009), would be less affected by RAE.

With reference to playing position, the majority of the adolescent wing-players are born in the first quarter of the year (Gómez-López, Granero-Gallegos, Molina, & Ríos, 2017; Gómez López, Angosto Sánchez, Ruiz Sánchez, & Pérez Turpin, 2017). Rivilla-García et al. (2012), for instance, showed that most adolescent handball wing-players were born in the first and second quarters, while most backs were born in the third quarter. Another study found that the majority of those born in the second and third quarter are center-backs and wing-players, while those born in final quarter are pivots and goalkeepers are in the first and fourth quarters (Schorer, Cobley, et al., 2009). On the other hand, Rivilla-García et al. (2012) found back and pivot players were mostly commonly born in the third quarter, while the goalkeepers mostly born in the first. Although RAE appeared to influence playing positions, we could not draw a conclusion about which position is highly affected due to the inconsistency of playing level and age in the limited handball-RAE literature.

The international handball federation (IHF) has structured the youth (U19) and junior (U21) tournaments with fixed, two-year age groups based on their chronological age (Gutiérrez Aguilar, Saavedra García, & Fernández Romero, 2017). This two-year age group leads to greater biological age differences between players of the same competition category. Grouping young players according to their ages creates inequality in training and a decisive factor in the selection process (Gómez López et al., 2017). Therefore, this grouping system makes team handball more prone to RAEs, meaning those biologically older players, who possess greater physical, motor, and psychological abilities will compete against or with younger players, and, consequently, will likely demonstrate superior performance. Thus, although IHF and those continental federations that follow it build their grouping system with the intention of creating homogenous groups within the competition system, they unfortunately create a structure that enhances the emergence of RAE in national handball.

The previous handball literature has demonstrated that RAE exists. Although these handball studies have investigated the RAE from different perspectives, there is need for further investigation of RAE in handball. To our knowledge, RAE studies have not been conducted in Asian handball, especially at the national level. Therefore, this study aims to determine the existence of RAE in Asian national handball teams for youth and junior levels as well as to analyze the impact of RAE on playing positions. Based on previous studies, we hypothesize that RAE would exist in both youth and junior Asian national teams. In addition, positions like backs and pivots would be most influenced by RAE.

Method

Participants

To evaluate the prevalence of the RAE in Asian handball a dataset was obtained from the Asian handball federation. The dataset included date of birth and playing positions, as well as height, weight, and BMI for all players (Table 1). The sample consisted of male (*n = 446*) youth (U18 = 281) and junior (U20 = 165) national players from 15 Asian countries (i.e., Bahrain, Iran, Iraq, Saudi Arabia, Syria, Lebanon, Jordan, Oman, UAE, Qatar, India, S. Korea, N. Korea, Japan, China, China Tipi, and Yamen) that participated in the 8th Asian Men's Youth Championship 2018 and the 16th Asian Men's Junior Championship 2018. In Asian Handball Championships, the cut-off date for youth and junior levels is January 1st. The players were categorized into four relative age quarters (Q) according to their birth month (i.e., Q1 = January to March; Q2 = April to June; Q3: July to September; and Q4: October to December). For playing positions, left- and right-wing players were categorized as wings and left-back, right-back, center-back players were categorized as backs due to the similarities in their characteristics and roles in the game.

Statistical Analysis

Statistical analyses were completed via SPSS 25.0 software (Armonk, NY). A Chi-square goodness-of-fit test (x^2) was computed to evaluate whether there was a skewed birthdate distribution in selection to Asian national youth and junior handball teams, and in selection to playing positions. Statistical significance level was set at p = 0.05.

Results

Table 1. *Descriptive statistics for Asian youth and junior national handball players*

Variables	Youth	Junior	All
N	281	165	446
Height (cm)	183 ± 7.1	181 ± 7.9	182 ± 7.5
Weight (kg)	79 ± 13.5	80 ± 11.2	80 ± 12.7
BMI (kg/m^2)	23 ± 2.8	24 ± 2.83	24 ± 3.3
N (%)	(63%)	(37%)	100%
Goalkeeper (GK)	13%	15%	14%
Pivot (PV)	14%	17%	15%
Wing (W)	29%	29%	29%
Back (B)	44%	39%	42%

All teams: the results show in figure 1 significant RAE for the Asian national handball players (X^2 (3) = 44.511, *p* <.001) with a greater proportion of players born in Q1. For playing positions, the results show that goalkeepers (X^2 (3) = 8.937, *p* =.03), backs (X^2 (3) = 26.797, *p* <.001), and wings (X^2 (3) = 10.628, *p* =.014), were significantly affected by RAE (Figure 2).
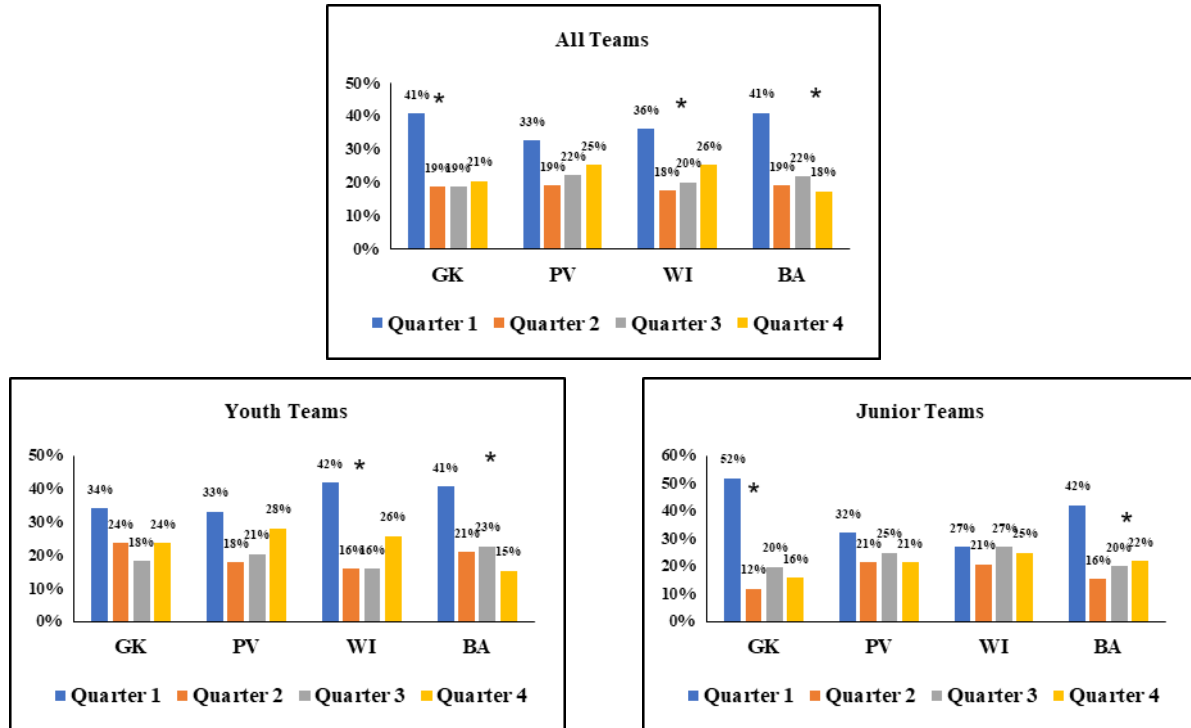

Figure 1: Distribution of quarter of birth for Asian national youth and junior teams

Youth teams: Chi^2 test showed significant RAE on youth national teams (X^2 (3) 30.189, *p*= <.001) with a greater proportion of players born in Q1 (Figure 1). For playing positions, significant RAE was found on backs (X^2 (3) = 17.520, *p* =.001) and wings (X^2 (3) = 14.556, *p* =.002) for youth national teams (Figure 2).

For junior: Chi^2 test (Figure 1) revealed significant RAE at the junior level (X^2 (3) = 15.000, *p*=.002) with a greater proportion of players born in Q1. For playing positions (Figure 2), significant RAE was found among goalkeepers (X^2 (3) = 10.040, *p* =.018) and backs (X^2 (3) = 10.625, *p* =.014).
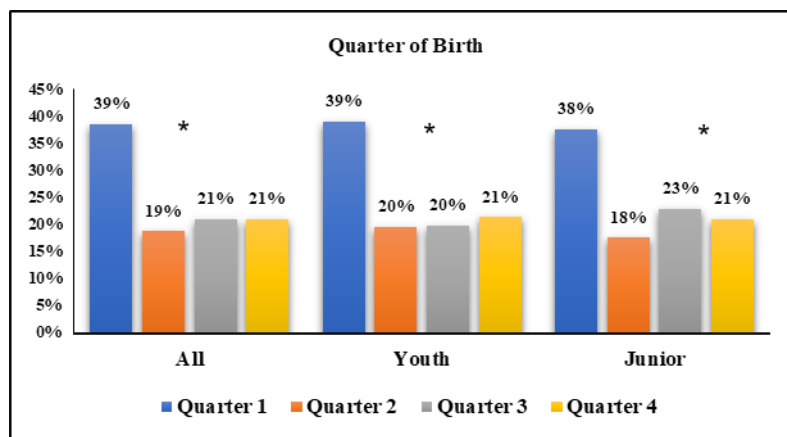

Figure 2: Distribution of playing position based on quarter of birth for all, youth, and junior handball teams (GK = Goalkeeper; PV = Pivot; WI = Wings; BA = Backs)

Discussion

To the best of our knowledge, this is the first study to investigate the RAE in Asian handball players, and particularly on national handball teams. The aims of this study were to examine the existence of RAE in Asian youth and junior handball national teams, as well as to analyze the impact of RAE on playing positions. Among 446 national handball players, the present study found that 39% of players were born in Q1, 19% in Q2, 21% in Q3, and 21% in Q4. Backs, wings, and goalkeepers were significantly affected by RAE. Relatively, results showed that 39% of youth players were born in Q1, 20% in Q2, 20% in Q3, and 21% in Q4. Youth backs and wings were significantly affected by RAE. In addition, 38% of juniors were born in Q1, 18% in Q2, 23% in Q3, and 21% in Q4. Junior backs and goalkeepers were significantly affected by RAE.

The results of the current study agree with other than handball literature confirming the benefits athletes experience for being born in the first quarter of the year (Baker & Logan, 2007; Brazo-Sayavera et al., 2018; Buhre & Tschernij, 2018; Delorme et al., 2011; Gerdin et al., 2018; Helsen et al., 2012; Ibáñez et al., 2018; Till et al., 2010). The results also confirmed previous findings about the existence of RAE in handball (Rivilla-García et al., 2012; Schorer, Wattie, & Baker, 2013; Wrang et al., 2018). This study adds to the literature that relative age effect (RAE) has a significant impact in Asian national youth and junior handball teams. Previous handball-related studies have mostly focused on local teams in specific countries, primarily European. However, this study included national youth and junior handball players from 15 Asian countries which indicates the existence of RAE not only at national levels, but also in local handball leagues in those countries.

Selected for national youth or junior teams means that national players are exposed to better coaching environments in the early stages of their handball careers. The results of this study indicate that the Asian national handball youth and junior players might be exposed to better coaching environments in their local clubs due to earlier maturation having been born in the first quarter of the year. Because of their early maturation, we expect that they would outperform their counterparts and receive better coaching which in turn would offer them superiority in performance over their younger counterparts and a greater chance of being selected for national teams.

In addition, these advantages associated with RAE in Asian handball favor older players which propels their national careers, assisting them in reaching the senior national teams. Delorme and Raspaud (2009), for instance, found that the registered youth French basketball players were skewed towards relatively older players. Thus, younger Asian handball players who were not selected early for national youth or junior teams would have a lower chance of being selected for senior national teams. On the other hand, some studies have found opposite RAE benefits, such as in the senior national level of British rugby and cricket which shower a greater representation of younger British players (McCarthy & Collins, 2014; McCarthy, Collins, & Court, 2016). Likewise other studies suggest that younger German handball (Schorer, Baker, et al., 2009) and French soccer (Carling, Le Gall, Reilly, & Williams, 2009) players may be discriminated during youth, but show better success in the transition from the youth to senior level than their older peers. In addition, compared with older athletes, the relatively younger athletes in team sports could be the most valuable players and the most award winning (Ford & Williams, 2011), endure the longest career and earn significantly higher wages (Ashworth & Heyndels, 2007; Gibbs, Jarvis, & Dufur, 2012). While the RAE is often a phenomena at the younger levels of sport, the effect is dismissed among adults (Schorer, Cobley, et al., 2009; Wrang et al., 2018). Thus, children who at certain point do not demonstrate optimal biological development will have less chance to be selected for team handball, despite showing potential for future success.

From a practical point of view, it appears that a reverse RAE could not, or is unlikely to, emerge in Asian handball society. First, RAEs reduce the efficiency of the early selection processes (i.e., from schools or recreational centers to handball clubs) by choosing the most mature kids who are taller, stronger, and faster, etc. Those players who are selected first will, unfairly, be exposed to a better coaching environment than those who were not selected and, therefore, will continue playing and improving. Secondly, after years of playing handball under a better coaching environment those players will have greater chance of being selected for national teams where they will be exposed to even greater coaching

and competing experience, while unselected players (i.e., late mature or born in the last quarter of the year) will continue receiving coaching of an inferior quality at local clubs. In addition, those national players will return to their local clubs with superior abilities compared with their clubs' teammates. Therefore, the skewness of birth toward the first quarters for handball players who will play at men national teams will, to a large extent, continue in the same direction and the senior national team coaches draw from a skewed population of handball players (Wrang et al., 2018).

Thus, due to the RAE, younger handball players may experience less self-efficacy (Thompson et al., 2004) and may be more likely to have poor handball experience, and possibly face increased barriers on their way to the senior level (Collins & MacNamara, 2012). Moreover, the chance of being dropped from handball earlier would be greater than older athletes (Delorme et al., 2010; Delorme et al., 2011). Therefore, unlike previous findings (Carling et al., 2009), current junior and youth Asian national players would have a greater possibility of becoming professional handball players or reaching senior national teams (Baker et al., 2010; Pizzuto et al., 2017). Current results suggest that relatively older handball players are more likely to be re-selected for senior national players. On the other hand, the likelihood of handball dropout for handball players who are not selected for national teams may be increased.

Regarding the playing positions, this study found that most goalkeepers, backs, and wings were born in the first quarter of the year. For youth, back and wing players were overrepresented in Q1; for junior, goalkeepers backs were overrepresented in Q1. Similar to these current findings, the handball literature shows the majority of the wing-players are born in the first quarters of the year (Gómez-López et al., 2017; Gómez López et al., 2017). Rivilla-García et al. (2012) found that most adolescent handball wing-players were born in the first and second quarters. In addition, our findings coincide with others (Rivilla-García et al., 2012; Schorer, Cobley, et al., 2009) suggesting that goalkeepers are more represented in the first quarters of the year. In contrast, most back players in the current study were born in the Q1 while the above mentioned studies found backs to be more represented in second and third quarters. These contrasting results may be due to the age level differences between those studies. Back players (i.e., center, left, right) are the most important players in team handball, and the anthropometric demands of these positions at youth, junior, and senior levels are greater than the first line positions (i.e., wing and pivot). Thus, as mentioned earlier, the selection processes in handball is always based on anthropometric profile and for that reason the RAE serves as an identification tool for the most talented and handball coaches select players from first quarters of birth as they mature sooner.

The most reasonable explanation for the existence of RAE in Asian youth and junior national handball teams is the processes of selection and identification. Rather than general motor skills and handball-related technical skills, most coaches targeted the physical abilities as indicators for handball success. Early mature athletes, naturally, have performance advantages (Malina, 2009) in sports such as team handball compared to younger peers. As mentioned earlier, team handball requires cognitive, physical, and psychological abilities. If the selection processes continue to be based on physical appearance only, then younger handball players will always be ignored for the key game positions in local and national competitions; will have less playing time; and will have access to lower quality coaches, equipment and medical care (Silva, Barreiros, & Fonseca, 2016).

In addition, the two year band grouping system structured by IHF for its international competitions (Aguilar, García, & Romero, 2017) strongly influenced the grouping system in regional and local handball competitions. The local competitions grouping system in most, if not all, 15 Asian countries whose teams participated in this study is similar to the IHF version (U13, U15, 17, U19, and senior). Thus, most local teams, aiming to win high levels of competition, focus on kids who mature early and exhibit greater physical characteristics. These early selections to local handball clubs automaticlly influence the selection process of national teams from youth to senior level. Based on the results of the current study, it is important to raise awareness in Asian coaches and talent ID specialists in charge of recruiting handball players for local handball clubs to the consequences of selecting players based on their current maturity level while ignoring other factors. They should keep in mind that late mature handball kids can catch up to, or even surpass, their early maturing counterparts in anthropometric characteristics and physical performance.

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