BRIEF NOTE

Relative age effect in Olympic Judo athletes:
A weight category analysis

L'effet de l'âge relatif sur les athlètes Olympiques de Judo: une analyse des catégories de poids

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Received 11 May 2012; accepted 21 September 2012
Available online 29 March 2013

KEYWORDS
Relative age effect; Combat sports; Weight categories

Summary
Introduction. — In the relative age effect (RAE) literature, several papers have shown differences in the relative effect of age on different play positions; however, combat sports, such as Olympic Judo, use weight categories.
Objective. — This study aimed to investigate the RAE in different weight categories of judo athletes.
Methods and subjects. — The study sample consisted of 1738 athletes who had competed in the Olympic Games.
Results. — The present study showed that the RAE occurs in heavy athletes.
Conclusion. — In conclusion, the RAE in combat sports, such as Olympic Judo, needs to be investigated in separate weight categories for a better analysis of the results.
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MOTS CLÉS
Effets de l'âge relatif ;
Sports de combat ;
Catégories de poids

Résumé
Introduction. — Dans la bibliographie sur l'effet de l'âge relatif, certaines études montraient des différences dans l'effet de l'âge relatif en position de jeu. Cependant, dans les sports de combat c'est la catégorie de poids qui était utilisée.
Objectif. — Cette étude visait à étudier l'effet de l'âge par de catégories de poids chez les athlètes de judo.

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http://dx.doi.org/10.1016/j.scispo.2012.09.004
1. Introduction

Traditionally, relative age effect (RAE) has been used to refer to the age differences between individuals who have been grouped together in a sports competition. Several studies have reported that the RAE exists in many kinds of sports. However, to the best of our knowledge, only one study investigated this topic in combat sports [1].

In team sports, Ashworth and Heyndels [2] demonstrated that there are differences in play position among soccer players. The differences can be explained by Van Rossum’s [3] hypothesis: Van Rossum [3] argued that the absence of the RAE could be explained by the more important role of technical skills (forwards in soccer) relative to the physical demand of soccer (goalkeepers and defenders in soccer). In combat sports (e.g., taekwondo and judo), there are different categories and each of them is defined according to the athlete’s weight. Height and strength are considered more advantage for heavier athletes, than lighter ones. Thus, the aim of this study is to investigate the RAE by comparing athletes in different weight categories in Olympic Judo.

2. Methods

2.1. Data collection

As described previously in other studies [1], the names and birthdates of the Olympic Judo athletes were collected from an online source[1]. Data from a total of 1738 Olympic Judo athletes were collected.

2.2. Procedure

Several athletes participated in many editions of the Olympic Games and in some cases they have competed in different weight categories. In this study, we chose to use the information regarding the athletes’ first participation in the Olympic Games so as not to repeat the data.

In addition, all judo athletes were divided into seven weight categories:

- extra-light;
- half-light;
- light;
- half-middle;
- middle;
- half-heavy;
- heavy.

The month of birth of each athlete was categorized into quarters (Q). It was used the calendar year from January 1st to December 31st and assigned January, February, and March to Q1, April, May, and June to Q2, July, August, and September to Q3, and October, November, and December to Q4.

2.3. Statistical analyses

Chi² tests were conducted on the birthdates of each athlete within the four quarters to determine whether there were significant deviations from the expected number of births in each quarter. Similar to other studies [1] on RAE, the sample was composed of international (different cultural and environmental zones) athletes, and the expected values were calculated based on the assumption of an even distribution of birth throughout each quarter of the year. Statistical significance was set at \( p \leq 0.05 \). In multiple comparison test, the alpha levels were adjusted using the Bonferroni method \((0.05/6 = 0.008)\). So, in multiple comparisons test, the statistical significance was set at \( p \leq 0.008 \).

The effect size analysis of the \( \chi^2 \) was calculated with the following equation:

\[
\omega = \sqrt{\frac{\chi^2}{n}}
\]

3. Results

The distribution of birth dates for all athletes \((n = 1738)\) were not statistically different \((\chi^2(3) = 4.789; \ p = .188)\) from the expected distribution per quarter.

Table 1 shows the distribution of birth dates by age categories. The Chi² goodness-of-fit test shows that the observed distributions were statistically different from the expected distribution by Half-Heavy \([\chi^2(3) = 13.731; \ p = .003, \ \omega = 0.21]\) and Heavy \([\chi^2(3) = 11.889; \ p = .008, \ \omega = 0.23]\). For the Half-Heavy athletes, a strong over-representation in third quarter and a under-representation in fourth quarter \((p < .001)\) were found. The results in Heavy athletes reflect a classical effect with an over-representation of players born in Q1, and an under-representation of athletes born in Q3 and Q4 \((p < .005)\).

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Table 1 Chi² values and relative probabilities between observed and expected age by weight categories.

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Total</th>
<th>( \chi^2 )</th>
<th>( p )</th>
<th>Multiple test^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL</td>
<td>44 (19.82%)</td>
<td>57 (25.68%)</td>
<td>55 (24.77%)</td>
<td>66 (29.73%)</td>
<td>222</td>
<td>4.414</td>
<td>.220</td>
<td>N/A</td>
</tr>
<tr>
<td>HL</td>
<td>60 (22.14%)</td>
<td>62 (22.88%)</td>
<td>78 (28.78%)</td>
<td>71 (26.20%)</td>
<td>271</td>
<td>3.081</td>
<td>.379</td>
<td>N/A</td>
</tr>
<tr>
<td>L</td>
<td>80 (29.30%)</td>
<td>68 (24.91%)</td>
<td>57 (20.88%)</td>
<td>68 (24.91%)</td>
<td>273</td>
<td>3.879</td>
<td>.275</td>
<td>N/A</td>
</tr>
<tr>
<td>HM</td>
<td>68 (29.82%)</td>
<td>49 (21.49%)</td>
<td>64 (28.07%)</td>
<td>47 (20.61%)</td>
<td>228</td>
<td>5.860</td>
<td>.119</td>
<td>N/A</td>
</tr>
<tr>
<td>M</td>
<td>75 (26.88%)</td>
<td>65 (23.30%)</td>
<td>69 (24.73%)</td>
<td>70 (25.09%)</td>
<td>279</td>
<td>.728</td>
<td>.867</td>
<td>N/A</td>
</tr>
<tr>
<td>HH</td>
<td>63 (25.30%)</td>
<td>59 (23.69%)</td>
<td>84 (33.73%)</td>
<td>43 (17.27%)</td>
<td>249</td>
<td>13.731</td>
<td>.003</td>
<td>Q3 ≠ Q4</td>
</tr>
<tr>
<td>H</td>
<td>73 (33.80%)</td>
<td>58 (26.85%)</td>
<td>43 (19.91%)</td>
<td>42 (19.44%)</td>
<td>216</td>
<td>11.889</td>
<td>.008</td>
<td>Q1 ≠ Q3/Q1 ≠ Q4</td>
</tr>
</tbody>
</table>

EL: Extra-light; HL: Half-light; L: Light; HM: Half-middle; M: Middle; HH: Half-heavy; H: Heavy; N/A: Not Applicable. \( p \leq .05 \).

^a With Bonferroni correction (0.05/6 = 0.008).

4. Discussion

The aim of this study was to investigate the RAE in Olympic Judo athletes in different weight categories. The present study showed a skewed view about RAE in heavy weight athletes. In addition the present results demonstrated that in Half-Heavy athletes the third quarter showed over-representation when compared with fourth quarter.

In 2012, Albuquerque et al. [1] found no RAE in Taekwondo athletes in the Olympic Games. The major hypotheses used by Albuquerque et al. [1] to explain the absence of a RAE in combat sports was the relationship between appropriate criteria (age, level or belt and weight) for grouping youth participants into competitive categories [1]. The present study rejects the hypothesis proposed by Albuquerque et al. [1].

To date, the major hypothesis used to explain RAE is based on physical maturity. RAE has been observed in sports where physical attributes such as weight, height, and strength are very important. Similarly, Van Rossum [3] concluded that the absence of RAE could be explained by a greater role of technical skills relative to physical demand.

However, some team sports combine these two characteristics (physical demand and technical skills). For instance, Ashworth and Heyndels [2] investigated individual playing positions in soccer and demonstrated that in some positions it is more important to have technical skills rather than physical rigor, for example, forwards in soccer [2]. On the other hand, the positions of goalkeepers and defenders in soccer are more physically demanding [2].

Unlike team sports, combat sports (such as taekwondo and judo) have athletes that are separated into weight categories. Almansba et al. [4] found a difference between the lightweight and the heavyweight groups in the types of techniques employed during combat. This difference was explained by anthropometric differences between lightweight and heavyweight athletes. So, the results of the present study can be explained by the physical demand in heavy categories.

The major limitation of the present study is relation to the sample that was came from variety of different countries. Because this, other expected distribution cannot be used. This adjusted is important, because the births are never evenly distributed of the year and affect by environmental zones and cultural factors. However, this methodological approach is acceptable when international sample are used [1].

In conclusion, the RAE in combat sports needs to be investigated in separate weight categories for a better analysis of the results. In addition, these findings suggest that is necessary to further investigate the role of RAE in combat sports, mainly in youth categories and even more specifically in weight categories separately.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

Acknowledgment

The authors thank the two anonymous reviewers whose suggestions served to strengthen the manuscript.

This study was supported by Instituto Nacional de Ciência e Tecnologia de Medicina Molecular (INCT/CNPq/MCT, FAPEMIG).

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