

KINESIOLOGY & COACHING

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Relative Age Effect Incidence within the Croatian National Youth Kickboxing Team

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Key words: RAE, competition, athletes, combat sports, WAKO

Abstract

Background. Selection processes in youth sports often appear to be stressful and unfair to many athletes. One of the reasons also lies in the Relative Age Effect (RAE). This study delves into the phenomenon of RAE in sport, particularly focusing on its potential implications within the realm of kickboxing by exploring its possible occurrence within the Youth Croatian national kickboxing team. **Problem and aim.** The research aims to shed light on any age-related biases that may exist and their impact on the success and performance of the Croatian national team at the last WAKO World Championships 2022.

Material and methods. The research involved 72 youth Croatian kickboxing national team members who were categorized by age and competitive success, with data collected from official sources and analyzed using the Chi-square test.

Results. The Croatian youth national kickboxing team does not exhibit RAE based on the obtained results. Despite some uneven quartile distribution, this difference diminishes when considering disciplines and success levels, and the team achieved notable success at the World Championships without the “assistance” of RAE.

Conclusion. This article is the first to examine the Relative Age Effect (RAE) in kickboxing. The study found a significant RAE presence in the Croatian national youth team, particularly in the first two quartiles, but further analysis showed no significance in the Semester division. The Croatian kickboxing organisation appears to be aware of RAE and employs fair selection processes, contributing to the team’s success, prompting the need for future investigations into RAE at the national and international levels.

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Background

Relative Age Effect (RAE) is already a well-inspected topic across the various sports communities, in team sports like football [Yague *et al.* 2018], futsal [Rodrigues *et al.* 2023], volleyball [De Oliveira Castro *et al.* 2022], rugby [Kelly *et al.* 2021] and basketball [Arrieta *et al.* 2016], as well as in individual sports like swimming [Lorenzo-Calvo *et al.* 2021] and combat sports [Albuquerque *et al.* 2016]. Competition systems were not spared from RAE either. Analysis of the Olympics [O'Neill *et al.* 2016] Youth Olympics [Muller *et al.* 2016] and various national and international championships suggest partial or evident RAE existence and its effect on final results. RAE is in fact a phenomenon in which biologically older individuals within the same (chronological) age group tend to be more awarded by coaches, through processes of initiation, detection, and selection. Further, RAE often occurs in absolute bodyweight and individual sports, with greater incidence in pre-pubertal and pubertal maturity stages, while more frequently found in male than female teams and competition systems [Babic *et al.* 2022]. Such specific incidence is surely significant in the context of amateur kickboxing, where the vast majority of competitors belong to the mentioned "RAE-occurring clusters".

Kickboxing is a relatively young, but famous combat sport practiced worldwide, especially in Eurasia and the Americas. Its popularity is such that in November 2018 the World Association of Kickboxing Organization (WAKO) was recognized by the International Olympic Committee [Dugonjic, Krstulovic, Kuvacic, 2019], and even became a full member in June 2021. It is characterized as an individual sport in which punches, kicks, and knees are allowed [Ambrozy *et al.* 2020]. There can be competitions from amateur to professional level [Ambrozy *et al.* 2020]. Kickboxing is divided into ring modalities (low kick, full contact, and K1) and tatami (point fight, light contact, and kick light) [Duarte *et al.* 2021; Hoelbling *et al.* 2023]. The main difference between the disciplines is that in the ring, strong blows are allowed with the intention of knocking out, and in the tatami, blows without force are allowed with the intention of scoring [Ouergui *et al.* 2021]. In WAKO kickboxing, the majority of competitors are underaged, and they compete in the mentioned tatami disciplines. However, continued fighting bouts (light contact and kick light) become available from cadet age, which is also the most numerous age category. As cadets belong to the prepubertal and pubertal age, RAE existence within them seems to be a logical assumption.

Combat sports in their nature favor the stronger and/or tactically superior competitors, dependable on specific sport and discipline within. Skeletal and muscle constitution, as well as psychological maturity levels, may play a decisive role in amateur kickboxing bouts. These problems have already been addressed in the majority of modern

combat sports, such as judo [Fukuda, 2015], taekwondo [Jeon *et al.* 2021], and wrestling [Latyshev *et al.* 2022]. Indeed, the rapid growth of kickboxing through the last decades is recorded, which implies the growth of organized events, championships, numbers of competitors...Therefore, the growth of kickboxing should be accompanied by scientific findings, because there are still many unobserved fields in kickboxing, especially in terms of its impact on health, elite performance, injury rehabilitation, etc. [Babic, Pobric, Cular, 2023]. However, there is no evidence about inspecting the RAE within kickboxing at all. As amateur kickboxing has many technical and tactical similarities with striking combat sports like karate and taekwondo, authors suspect that similar RAE evidence could be found in kickboxing. With a reduction of this problem, we would prevent talented, biologically stagnant children from giving up sports and competitions [Babic, Cular, Jelaska, 2021].

Problem & Aim

Therefore, the aim of this research is to investigate the possible RAE existence within the Croatian national kickboxing team. The hypothesis is that cadet athletes born earlier in the year will be more represented in the national team and achieve better results in the World Championships.

Material and methods

Sample and experimental approach

The sample of participants for this research consisted of $n=72$ youth (Y) Croatian kickboxing national team members, both male and female, who participated in the World (WC) WAKO kickboxing championships in 2022. The youth national team consisted of four age categories, as follows: children (CH)= 2; younger cadets (YC)= 6; older cadets (OC)= 26; juniors (J)= 38. For the purpose of research, participants were divided into three sub-divisions: a) champions/non-champions ($n= 11/n= 61$); b) medal winners/non-winners ($n= 28/n= 44$); and c) ring/tatami competitors ($n= 20/ n= 52$). The athletes were separated into four quarters of the year according to their month of birth (1st from January to March, 2nd from April to June, 3rd from July to September and 4th from October to December). Initial comparison analyzed the whole national team distribution within quarters. Second, sub-samples inside every sub-division were compared according to the distribution of the following (birth month) quarters. Such comparisons were targeted to clarify potential RAE existence within a Croatian youth kickboxing team.

The vast majority of participants were *a priori* national champions within a discipline, weight & age category they competed at EC and WC. Data were accessed through official e-mail communication with the Croatian

Kickboxing Federation (*Croat. HKBS*), and through the WAKO open-access database of finished championship events (wako.sport). Ethical approval for this research is obtained in advance through the scientific project IP-2020- 02- 3366 of the Croatian Science Foundation, approved by the Ethics Committee and following the Ethical codex of the Croatian Science Foundation. Research has been conducted in accordance with the principles expressed in the Declaration of Helsinki.

Statistical analysis

All statistical analyses were done using Chi-square tests under the null hypothesis that all observed frequencies are equal (i.e. uniform distribution). *Microsoft Excel for Mac Os Version 16.43.* and statistical analysis data system *Statistica 14, TIBCO Software Inc.* was used for calculation and graphical representation of obtained results. Type I error was set at 5%.

Results

As Table 1 presents, a certain RAE is occurring within the whole sample, as the first (Q1) and second quartiles (Q2) have a significantly greater number of national team members in regards to the second two quartiles (Q3 & Q4) ($p < 0,05$). However, that difference appears to disappear when the whole sample divides into Semesters (Sem 1 & Sem 2). Such obtained difference regarding quartiles is not too significant in practice, because the difference between the obtained and theoretical-expected frequencies appears to be light, apropos the quartile distribution seems to be relatively equal.

Table 1. Results of the Chi-square testing, differences between the expected and obtained frequencies regarding the whole Croatian national youth team ($n = 72$).

	F_e	F_o	df	X^2	p
Q1	18	20	71	100,250	0,013*
Q2	18	21			
Q3	18	15			
Q4	18	14			
Sem 1	36	41	71	28,00	0,999
Sem 2	36	31			

Legend: F_e = expected frequencies, F_o = observed frequencies, df = degrees of freedom, X^2 = Chi-square test results, Sem = semesters, p = significance level, * = significant value $p < 0,05$.

Speaking of subgroups within the Croatian national youth team, both Ring and Tatami athletes were relatively equally distributed following their quartile, as no significant differences were found (Table 2). Interestingly, looking at Table 2, there is also no significant difference among the Medalists and among the Champions within the team, while the rest of the team somehow had an unequal quartile distribution ($p = 0,000$; $p = 0,003$).

Table 2. Results of Chi-square testing on different subgroups within a total sample.

	X^2	df	p
Tatami	61,25	50	0,132
Ring	18,58	20	0,549
Medalists	29,08	28	0,408
Non-medalists	81,50	43	0,000*
World Champions 2022	7,08	10	0,717
Other national team members	91,83	59	0,003*

Legend: X^2 = Chi-square test results, df = degrees of freedom, p = significance level, * = significant value $p < 0,05$.

From the results presented in Tables 1 and 2, it can be concluded that the Croatian youth national kickboxing team does not have a problem with RAE. Regardless of the unequal quartile distribution found in the whole sample, it is a small difference in practice which disappears if subjects are separated into disciplines and success-dependent classes. Still, the following team managed to be pretty successful in the 2022 WAKO World Championships, with 10th place in overall order, 7th place in Tatami, and 11th place in Ring (wako.sport).

Discussion

Since there are unfortunately no articles regarding RAE in amateur kickboxing to this day, it is impossible to compare obtained results. Several studies, however, analyzed RAE in taekwondo, which besides the karate may be the closest relative to amateur kickboxing disciplines. Earlier studies conducted on Croatian taekwondo competitors revealed a significant presence of RAE within a Croatian cadet Championship [Babic *et al.* 2021], while there was absence of RAE within a Croatian junior national team [Kezic, Babic, Cular, 2021]. It seems that Croatian kickboxing and taekwondo both do have equally distributed junior national team members according to their quartile, which is surely significant and commendable. Youth World Champions and medalists in kickboxing from Croatia do not exploit the RAE advantages they might have, which gives a certain weight to their victories. Coaches need to be aware of this phenomenon, because it may occur in their clubs even before national selection, and can vary from generation to generation. Head coaches of other national teams can use this study to improve or control their teams in terms of RAE. On the other hand, club coaches have this study as evidence that fair success comes from the "work"- training, rather than biological age acceleration. To test the impact on senior career, the senior national team should be analyzed.

In a study of the Spanish Championships, a similar distribution was observed between the fourth quartiles of the year [Lorenzo-Couso *et al.* 2016]. This result is at odds with our findings, in which there were more players in the first two quartiles of the year. Perhaps one possi-

ble explanation for this is the larger sample size in this study [Lorenzo-Couso *et al.* 2016]. This highlights the need for more studies of RAE in kickboxing. Moving on to grappling combat sports, a study of Greco-Roman and freestyle wrestling at the World Championships and Olympic Games found that more athletes were selected in the first half of the year [Latyshev *et al.* 2022]. These results differ from our findings in that there was no difference between the semesters of the year. In judo, a similar number of athletes born in the first and second semesters of the year were selected for the Olympic Games [Albuquerque *et al.* 2015], which is similar to our findings. Such different results show a possible difference in the effect of relative age in different combat sports [De Almeida-Neto *et al.* 2023], which may be related to the different specific goals within sports. However, we recognize potential limitations, such as the fact that it is a relatively small sample. Small samples may distort the whole picture, due to the specific and intentional distribution. For the Croatian case, this is the whole sample but to get a wider and broader insight, larger national teams should be analyzed accordingly. To gain a full insight, all international competitions, such as this one should be analyzed, per age and weight categories, as well as disciplines. In the end, they are all Croatian caucasian kickboxing national team members. We recommend future studies with teams from other countries and with national and world championships, analyzing the relationship between winners and birth months (quartiles).

Conclusions

This is the first article to analyze the RAE in amateur (WAKO) kickboxing. First of all, the Croatian national youth team has a significant RAE presence because of the reinforced presence in the first two quartiles. However, that presence was barely significant, while there was no significance within the same sample in the Semester division. Further analysis revealed normal- theoretical distribution within the subgroups, among Tatami and Ring athletes, World Champions, and medalists. It can therefore be concluded that the Croatian kickboxing association (Croat. HKBS) and its selectors are aware of RAE and are doing relatively good and fair selection processes, which does not prevent a team from success. This is a good trace, which has its own logic. Kickboxing athletes may be “saved” from RAE because of weight divisions, which segregate biologically older ones into upper weight classes. However, this is just beginning of RAE research within kickboxing, but also a valuable insight into one of the top 15 youth kickboxing teams in World. Further investigations should explore the possible presence of RAE in the other youth national teams, senior teams and the constituent year effect within a Croatian kickboxing team.

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References

1. Albuquerque M.R., Franchini E., Lage G.M., Da Costa V.T., Costa I.T., Malloy-Diniz L.F. (2015), *The relative age effect in combat sports: an analysis of Olympic Judo athletes, 1964–2012*, “Perceptual and Motor Skills”, vol. 121, no. 1, pp. 300-308; doi: 10.2466/10.PMS.121c15x2.
2. Albuquerque M.R., Fukuda D.H., Da Costa V.T., Lopes M.C., Franchini E. (2016), *Do weight categories prevent athletes from the relative age effect? A meta-analysis of combat sports*, “Sport Sciences for Health”, vol. 12, pp. 133-139; doi: 10.1080/02640414.2013.809470.
3. Ambrozy T., Rydzik L., Kedra A., Ambrozy D., Niewczas M., Sobilo E., Czarny W. (2020), *The effectiveness of kickboxing techniques and its relation to fights won by knockout*, “Archives of Budo”, vol. 16, pp. 11-17.
4. Arrieta H., Torres-Unda J., Gil S.M., Irazusta J. (2016), *Relative age effect and performance in the U16, U18 and U20 European Basketball Championships*, “Journal of Sports Sciences”, vol. 34, no. 16, pp. 1530-1534; doi: 10.1080/02640414.2015.1122204.
5. Babic M., Cular D., Jelaska I. (2021), *Relative age effect among young Croatian taekwondo competitors*, “Acta Kinesiologica”, vol. 15, no. 2, pp. 86-89; doi: 10.51371/issn.1840-2976.2021.15.2.11.
6. Babic M., Macan I., Beslija T., Kezic A., Tomljanovic M., Subasic L., Cular D. (2022), *Relative age effect and gender differentiation within sport- a systematic review*, “Acta Kinesiologica”, vol. 16, no. 1, pp. 20-29; doi: 10.51371/issn.1840-2976.2022.16.1.3.
7. Babic M., Pobric I., Cular D. (2023), *Physiological response and biomarkers in kickboxing – systematic review*, “Physical Activity Review”, vol. 11, no. 2, pp. 120-137; doi: 10.16926/par.2023.11.27.
8. de Almeida-Neto P.F., Neto R.B., Medeiros I., de Oliveira F.C.S., de Oliveira Filho A.G., de Matos D.G., Dantas P.M.S., de Araujo Tinoco Cabral B.G. (2023), *Relative age effect in elite Brazilian athletes in different combat sports: an observational study*, “Sport Sciences for Health”, vol. 19, no. 1, pp. 113-121; doi: 10.1007/s11332-022-01007-x.
9. de Oliveira Castro H., da Silva Aguiar S., Figueiredo L.S., Laporta L., Costa G.D.C.T., Afonso J., Gomes S.A., de Oliveira V. (2022), *Prevalence of the Relative Age Effect in elite Brazilian volleyball: An analysis based on gender, the playing position, and performance indicators*, “Journal of Human Kinetics”, vol. 84, no.1, pp. 148-157; doi: 10.2478/hukin-2022-0093.

10. Duarte J.D.R.D.S., Rodrigues H.H.N.P., Cunha M.G., de Macedo A.F., Salinas J.A.R. (2021), *Dietary intake in kickboxing fighters*, "Brazilian Journal of Development", vol. 7, no. 4, pp. 42409-42424; doi:10.34117/bjdv7n4-620.
11. Dugonjic B., Krstulovic S., Kuvacic G. (2019), *Rapid weight loss practices in elite kickboxers*, "International Journal of Sport Nutrition and Exercise Metabolism", vol. 29, no. 6, pp. 583-588; doi: 10.1123/ijnsnem.2018-0400.
12. Fukuda D.H. (2015), *Analysis of the relative age effect in elite youth judo athletes*, "International Journal of Sports Physiology and Performance", vol. 10, no. 8, pp. 1048-1051; doi: 10.1123/ijsp.2014-0463.
13. Hoelbling D., Salmhofer A., Gencoglu C., Baranyi R., Pinter K., Ozbay S., Ulupinar S., Ozkara A.B., Grechenig T. (2023), *Judged: Comparison between kickboxing referee performance at a novel serious game for judging improvement and at world championships*, "Applied Sciences", vol. 13, no. 17, pp. 1-13; doi: 10.3390/app13179549.
14. Kelly A.L., Till K., Jackson D., Barrell D., Burke K., Turnidge J. (2021), *Talent identification and relative age effects in English male rugby union pathways: From entry to expertise*, "Frontiers in Sports and Active Living", vol. 3, pp. 640607; doi: 10.3389/fspor.2021.640607.
15. Kezic A., Babic M., Cular D. (2024), *Maturity Status and Relative Age of Elite Taekwondo Youth Competitors-Case Study on Croatian National Team*, "Sports", vol. 12, no. 2, pp. 62; doi: 10.3390/sports12020062.
16. Latyshev M., Tropin Y., Podrigalo L., Boychenko N. (2022), *Analysis of the Relative Age Effect in Elite Wrestlers*, "Ido Movement for Culture Journal of Martial Arts Anthropology", vol. 22, no. 3, pp. 28-32; doi: 10.14589/ido.22.3.5.
17. Lorenzo-Calvo J., de la Rubia A., Mon-Lopez D., Hontoria-Galan M., Marquina M., Veiga S. (2021), *Prevalence and impact of the relative age effect on competition performance in swimming: a systematic review*, "International Journal of Environmental Research and Public Health", vol. 18, no. 20, pp. 10561; doi: 10.3390/ijerph182010561.
18. Lorenzo-Couso R., de Quel O.M. (2016), *Relative age effect in Spanish Karate Championships*, "Revista de Artes Marciales Asiáticas", vol. 11, no. 2s, pp. 44-45; doi: 10.18002/rama.v11i2s.4164.
19. Minsoo J., Jiun Y., Hyo-Jun Y. (2022), *The Relative Age Effect of Elite Taekwondo Athletes*, "Annals of Applied Sport Science", vol. 10, no. 2, pp. 01-10; doi: 10.52547/aassjournal.998.
20. Muller L., Hildebrandt C., Schnitzer M., Raschner C. (2016), *The role of a relative age effect in the 12th Winter European Youth Olympic Festival in 2015*, "Perceptual and Motor Skills", vol. 122, no. 2, pp. 701-718; doi: 10.1177/0031512516640390.
21. O'Neill K.S., Cotton W.G., Cuadros J.P., O'Connor D. (2016), *An investigation of the relative age effect amongst Olympic athletes*, "Talent Development & Excellence", vol. 8, no. 1, pp. 27-39.
22. Ouergui I., Benyoussef A., Houcine N., Abedelmalek S., Franchini E., Gmada N., Ezdine B., Bouassida A. (2021), *Physiological responses and time-motion analysis of kickboxing: differences between full contact, light contact, and point fighting contests*, "The Journal of Strength & Conditioning Research", vol. 35, no. 9, pp. 2558-2563; doi: 10.1519/JSC.0000000000003190.
23. Rodrigues M.A.A., de Oliveira V., de Castro Ribeiro L., William Bortolan K., Clemente F.M., Franco Lima R., Figueiredo L.S., de Oliveira Castro H. (2023), *No relative age effect among Brazilian elite female futsal athletes: An analysis based on tactical individual performance and team's final position in the National championship*, "Kinesiology", vol. 55, no. 1, pp. 138-145; doi: 10.26582/k.55.1.14.
24. From WAKO official website, www.wako.sport/official-results/ (access Sep. 2023).
25. Yague J.M., de la Rubia A., Sanchez-Molina J., Maroto-Izquierdo S., Molinero O. (2018), *The relative age effect in the 10 best leagues of male professional football of the Union of European Football Associations (UEFA)*, "Journal of Sports Science & Medicine", vol. 17, no. 1, pp. 409-416.
26. Sasaki T. (2009), *Budo (the Martial Arts) as Japanese Culture: The outlook on the techniques and the outlook on the human being* [in:] W.J. Cynarski [ed.], *Martial Arts and Combat Sports: Humanistic Outlook*, Rzeszow University Press, Rzeszow, pp. 12-19.
27. Warchol K., Korobeynikov G., Osiel C., Cynarski W.J. (2021), *Martial arts as a form of physical activity for children and young people in the opinion of adult inhabitants of Podkarpackie Voivodeship*, "Ido Movement for Culture Journal of Martial Arts Anthropology", vol. 21, no. 1, pp. 28-37; doi: 10.14589/ido.21.1.5.

Częstotliwość występowania efektu względnego wieku w chorwackiej młodzieżowej drużynie kickboxingu

Słowa kluczowe: RAE, rywalizacja, sportowcy, sporty walki, WAKO

Streszczenie.

Tło. Procesy selekcji w sporcie młodzieżowym często wydają się być stresujące i niesprawiedliwe dla wielu sportowców. Jednym z powodów jest również efekt wieku względnego (RAE). W niniejszym badaniu zglębiono zjawisko RAE w sporcie, ze szczególnym uwzględnieniem jego potencjalnych implikacji w kontekście kickboxingu, poprzez zbadanie możliwości występowania tego zjawiska w młodzieżowej reprezentacji Chorwacji w kickboxingu.

Problem i cel. Badanie ma na celu rzucenie światła na wszelkie uprzedzenia związane z wiekiem, które mogą istnieć i ich wpływ na sukces i wyniki reprezentacji Chorwacji na ostatnich Mistrzostwach Świata WAKO 2022.

Materiał i metody. W badaniu wzięło udział 72 młodych członków chorwackiej kadry narodowej w kickboxingu, którzy zostali podzieleni na kategorie według wieku i sukcesów w zawodach, z danymi zebranymi z oficjalnych źródeł i przeanalizowanymi za pomocą testu Chi-kwadrat.

Wyniki. Na podstawie uzyskanych wyników, chorwacka młodzieżowa kadra narodowa w kickboxingu nie wykazuje efekt wieku względnego (RAE). Pomimo nierównomiernego rozkładu kwartylowego, różnica ta zmniejsza się, gdy weźmie się pod uwagę dyscypliny i poziomy sukcesów, a drużyna osiągnęła znaczący sukces na Mistrzostwach Świata bez „pomocy” RAE. Wnioski. Niniejszy artykuł jest pierwszym, w którym zbadano efekt wieku względnego (RAE) w kickboxingu. Badanie wykazało znaczącą obecność RAE w chorwackiej młodzieżowej

drużynie narodowej, szczególnie w pierwszych dwóch kwartylach, ale dalsza analiza nie wykazała znaczenia w dywizji semestralnej. Chorwacki kickboxing zdaje się być świadomy istnienia RAE i stosuje uczciwe procesy selekcji, co przyczynia się do sukcesu drużyny. Stąd potrzeba przeprowadzenia w przyszłości badań w sprawie RAE na szczeblu krajowym i międzynarodowym.