African Educational Research Journal
Vol. 8(2), pp. 392-397, June 2020
DOI: 10.30918/AERJ.82.20.074
ISSN: 2354-2160
Full Length Research Paper

The effects of relative age on selected biomotoric skills in puberty period

Atar Özdemir

Department of Coaching Education, Faculty of Sport Sciences, Çanakkale Onsekiz Mart University, Çanakkale, Turkey.

Accepted 28 May, 2020

ABSTRACT

The purpose of this study was to investigate the effect of relative age on selected biomotoric skills of children in puberty period. The sample of this research consisted of 30 male and 30 female students who have been studying at primary schools and on 9 age period. Identity info was grounded on determining chronologic ages of participants. In this research, different test protocols had been applied to determine performances related to biomotoric skills of students. Sit and reach test to determine flexibility performance, proagility for agility test, standing long jump and vertical jump tests for measuring leg strength were applied. 10 meters speed test was applied to determine running speeds. SPSS 20.0 package programme was used for data analysis. Mann-Whitney U test was used for the comparison of two groups. Results were given as arithmetic mean and standart deviation. $p < 0.05$ was accepted as significant. It was determined that flexibility, agility, and standing long jump variables were significant ($p < 0.05$), but the difference between vertical jump and speed variables were not statistically significant ($p > 0.05$) in the between male and female students participated in research. It was thought that having differences in biomotoric skills of children in different birth quarters arised from children born at first quarters were able to reach earlier to biological maturation level than children born at last quarters. In order to establish a norm, it was recommended to make more similar researches with more participants and repetitions.

Keywords: Puberty, relative age, biomotoric skills.

E-mail: ozdemir@comu.edu.tr.

INTRODUCTION

In recent years, the term of relateve age effect became a popular subject in sports sciences (Musch and Grondin, 2001). Relative Age Effect (RAE) is described as a result of developmental difference between ones who were born in first months and last months of the year (Wattie et al., 2008). Even though relative age was seen as a case creating a prejudice in participation to sportive activities and talent selection (Romann et al., 2018). It was stated to be a subject affecting performance in many sports branches (Hirose, 2009). It is difficult to organize classifications grounding on biological age systems in several sports branches. The chronological systems subjecting birth date can be used a criterion in classification of children for many competitions. Chronological age means duration passed from birth date to today and duration remained (Wattie et al., 2008). Biological age is shown as a unit of time of current biological growth and reflects informations related to birth months of an individual (Duarte et al., 2019). In adolescence period, there are physical, cognitive, and biomotoric differences in children to be seen even for those who are at the same age. As a result of classification made according to this circumstance, physical, affective, and motoric developmental levels of children who were not able to complete development period exactly and born in first months of a certain year comparing to children who were born in last last months of a year (Ibanez et al., 2018). Positive effects of physical strength and maturation which this development brought is called as RAE (Aune et al., 2017). For example: There are running race of children with 8 age. One of two children born in the same year was born on January and

the other one was born on December. The child who was born on January is 20% more developed than child who was born on December. As physical and motoric propesties of child born on January is more developed than child born on December, January born child is able to run faster than the other. In order to increase the performances of athletes it is a must to classify their ages chronologically (Delorme et al., 2009). Thus far, there have been several researches carried out related to RAE. Obtained results depending on the quality and number of studies, have supported the existence of RAE. As parallel with to this change, the differences occured in basic motoric properties, show changes in parallel with development. Strength, one of the basic motoric skills is described as a strength of muscle nerve system's skill produced against external resistances (Stone et al., 2007). Speed can be described as a skill to move from a place to another place in a maximum speed or performing movements at highest speed as possible (Merriaux et al., 2017). Mobility is a skill of range of motion in a muscle joint (Haff and Triplett, 2013). Endurance is a skill of resistance against fatigue after high loads of exercise and skill of fast recovery (Muratlı, 2005). Coordination with its sportive meaning; is to apply voluntary and involuntary movements as purposive, in a harmony, regularly in a sequence and it is the neural strength of organism (Mendez et al., 2008).

In order to increase the body capacity with relative age, developing well-planned training methods of basic motoric skills like strength, endurance, mobility; is one of the most important factors in success and in children in development age. This study was carried ou t with the purpose of investigating the effects of relative age on selected basic motoric skills of children in puberty period.

MATERIALS AND METHODS

The study sample was consisted 60 students (30 males and 30 females) who have been studying at primary schools and on 9 age period have participated in our study. As a condition of participation; being born on 2010, having no history of broken body part, trauma or operation were determined. Research group were divided into four groups as first quarter (n = 15) and last quarter (n = 15) males, first quarter (n = 15) and last quarter (n = 15) females.

Tests were conducted in gym of school. Before tests, children were informed about study, and by this way they were provided to fulfil the test in a more productive way. In order to make tests more productive and prevent injuries; ten minutes of jogging, and stretching exercises were performed. In determining the ages of children their identity info were taken as a basis, and their info were recorded according to their chronological ages in two quarters when they were born.

Data collection tools

Anthropometric measurement

Height and weight of participants were measured by SECA, convenient to test protocols (Tamer, 1995). BMI of participants were calculated with: Body weight (kg) / (Height (m))^2 formula (Zorba and Saygin, 2009).

Flexibility measurement

Flexibility measurement of participants were made with sit and reach test. Participants put their naked soles on a scaffold, try to reach frontward without bending knees and try to push the gauge fronward and try to stay 3 seconds where they reached, and their stretching distance were recorded. This test was performed two times and best score was recorded (Mookerjee and McMahon, 2014).

Standing long jump test

Participant stands on a non-slippery ground putting toes in front of the line. Feet are curled up by reaching out the hand frontward. Measurement was taken between tiptoe at the starting line and heel on the ground where participant jumped and fell. Best score was recorded after two trials (Sevim, 2006).

Vertical jump test

Vertical Jump tests of group participated in study were determined by marking the toppest point where they can reach by jumping and by standing. Afterward the difference between both was determined as "cm" and recorded. After 5 times jump test conducted to participants the best and the worst values were removed and the average of remaining three values were taken and recorded as "cm" (Mackenzie, 2005).

Agility test

Pro-agility test which is one of the most easy to apply test was used in study (3 cones are placed with 5 m distance, participants stands across the second cone, firstly jumps towards 1. Cone then 3. and lastly turns back on 2nd cone and duration is recorded as score) (Faigenbaum et al., 2006).

Speed test

In study, 10 m speed test was conducted. Participant

stands 50 cm back of the start line, knees curled up, and body is slightly bent frontward. When participant is ready, starts running at highest speed and tries to pass finish line as shortest duration as possible. Test result is recorded as “second”. This test was conducted twice and best score was recorded (Mackenzie, 2005).

Statistical analysis

SPSS 20. Package programme was used in this research. Normality analysis of data obtained made by Shapira Wilk test. As data did not show normal distribution, Mann Whitney U test was used for the comparison of data. Categorical variables were shown as frequency (n), per–cent (%), and continous variables as were shown as arithmetic mean (x) and standard deviation (SD).

RESULTS

As shown in Table 1, when statistical distributons of participant students were examined, it was determined that average heights were 135.07 ± 5.54, average weights were 32.69 ± 12.90, average mody mass index were 17.63 ± 5.92, average lean body mass were 25.85 ± 5.24, average body fat were 16.81 ± 11.33, average body fat mass were 6.83 ± 7.89, and average body fluid were 18.93 ± 3.83.

As shown in Table 2, when motoric properties of participant students were examined, while significant difference were determined between flexibility, agility, standing long jump, parameters ($p < 0.05$), there were no statistically significant differences were determined between vertical jump and speed parameters ($p < 0.05$).

When Table 3 was examined, average heights of students were 135.20 ± 7.25, average weights were 37.01 ± 11.89 and aerage body mass index were 19.89 ± 5.36.

As shown in Table 4, when motoric properties of participant students were examined, while significant difference were determined between flexibility, agility, standing long jump, parameters ($p < 0.05$), there were no statistically significant differences were determined between vertical jump and speed parameters ($p < 0.05$).

Table 1. Statistical distribution of physical measurements of male participants.

Variables	n	Min	Max	X ± Sd
Height (cm)	30	127.50	142.50	135.07 ± 5.54
Body weight (kg)	30	22.30	60.30	32.69 ± 12.90
Body mass ındex (kg/m^2)	30	11.70	30.10	17.63 ± 5.92

Table 2. Comparison related to motoric properties of male students.

Variables	Birth quarter	n	X ± Sd	z	p
Flexibility (cm)	First quarter	15	6.50 ± 1.38	.-2.385	**0.017***
	Last quarter	15	.285 ± 5.15		
Agility (sec)	First quarter	15	7.12 ± 0.232	.-2.492	**0.013****
	Last quarter	15	7.95 ± 0.74		
Standing Long Jump (cm)	First quarter	15	110.07 ± 11.68	.-2.108	**0.035***
	Last quarter	15	93.21 ± 9.66		
Vertical Jump (cm)	First quarter	15	18.02±3.76	-0.192	0.848
	Last quarter	15	17.85±3.88		
Speed (sec)	First quarter	15	2.60±0.27	-0.320	0.749
	Last quarter	15	2.69±0.14		

Note: First Quarter: January, February, March; Last Quarter:October, November, December, * $p < 0.05$, **$p < 0.01$.

DISCUSSION AND CONCLUSION

There are some similarity and differences in study we carried out in order to examine the comparisons of some selected physical and biomotor skills of selected relative age in children at primary school age. It was reported that

Table 3. Statistical distributions of physical measurements of female participants.

Variables	N	Min	Max	X ± Sd
Height (cm)	30	122.9	144	135.20 ± 7.25
Body weight (kg)	30	22.3	57	37.01 ± 11.89
Body mass ındex (kg/m^2)	30	13.8	30.2	19.89 ± 5.36

Table 4. Comparison related to motoric properties of female students.

Variables	Birth quarter	n	X± Sd	z	p
Flexibility	First quarter	15	8.14 ± 2.17	-3.009	**.003****
	Last quarter	15	-0.142 ± 4.33		
Agility	First quarter	15	7.56 ± 0.376	-2.619	**.009****
	Last quarter	15	8.55 ± .676		
Standing long jump	First quarter	15	108.84 ± 11.55	-2.104	**.034***
	Last quarter	15	87.90 ± 19.81		
Vertical jump	First quarter	15	17.38 ± 3.75	-1.221	0.222
	Last quarter	15	14.10 ± 4.79		
Speed	First quarter	15	2.75 ± 0.169	-0.447	0.655
	Last quarter	15	2.86 ± 0.330		

Note:*: $p < 0.05$, **: $p < 0.01$, 1. Quarter: January, February, March; 2. Quarter: October, November, December.

there were meaningful relationships in favours of children who were born in the first months of the year in the studies where chronological age was taken away from biological age (Roberts et al., 2012). When parameters related to physical properties of male and female students in first and second quarter; there were statistically significant differences determined.

Şahin (2017) reported that there were no statistically significant differences in physical properties of soccer players born in four different quarter distribution in a study of effects of relative age and physical performance of national team selections, he also determined that athletes in first quarter had more advantages comparing to athletes in other quarters. In the study of Matta et al. (2015), they examined the effect of relative age on anthropometric, biological maturation and performances and they concluded that there were no significant difference with regard to physical properties. In a study of Koç et al. (2012), they examined the effect of physical education lesson on selected motoric properties, they found significant differences in 1, 2 and 3rd grade primary school students' physical properties. As a result of our study, even though some properties of student in first quarter had numerically more physical properties than individuals in second quarter, there were no statistically significant differences were determined between two groups. Our findings support literature findings.

As a result of study, there were statistically significant differences in participants' flexibility parameters. When different studies were examined, Haslofça et al. (2016), examined the effect of relative age on anthropometric and motoric properties in children between 8-12 age they reported that relative age had an effect on flexibility parameter in children at 12 age and in our study relative age was not seen to have an effect on flexibility parameter in children at 9 age. Malija et al. (2004), explained that neuromuscular maturation had significant effects on performance in childhood period and the difference in flexibility parameter occurs as one grows older. In other studies, Ongül et al. (2017), examined the effects of games on selected motoric skills in children, and they determined significant differences in flexibility parameters. When literature is examined some it can be seen that most findings support our study besides in some studies it was seen that there was no relative age effect on 9 age or above. The difference in our study might be due to children who used to make gymnastics exercises.

As a result of study, there were statistically significant differences in agility parameters for both groups.

Şahin (2017) investigated the effect of relative age on physical performance in national soccer team selections and found significant differences in athletes who were born in first and fourth quarter according to months of

birth. Lovell et al. (2015), investigated the effects of relative age in England groundwork soccer team, they divided date of births of 8 to 17 aged soccer players as 1st quarter, 2nd quarter, 3rd quarter and 4th quarter. Accroding to agility values they obtained; agility performances were in favour of older players. These studies support our findings.

When our findings were examined, there statistically significant differences in standing long jump parameters in both groups.

When other studies were examined, Baikoğlu and Hocaoğlu (2017) made a research related to selecting Basketball players according to the effect of relative age on performance. In this research, there were statistically significant difference in standing long jump parameters of athletes in a chronological classification carried out according to months of birth. Torres et al. (2016) made their study related to relative age effect between adolescent and young adolescent basketball players. They reported that individuals whose chronological age were earlier were determined to be better than individuals who were born in latter periods. Also, it was thought that it was originated by an increase in age, due to a change in hormonal profile in metabolism depending on changes in endocrin system, and as a result of this, it orginates by anaerobic strength development. Our research is in parallel with other findings.

As a result of study, there were no statistically significant difference in vertical jump performances of individuals in first and second quarters in both groups. When different studies were examined in this field, Gil et al. (2007) studied anthropometric and physiological factors according to months of birth of 14 to 17 age soccer players and It was determined that 15-16-17 age soccer players were seen to have higher scores in vertical jump tests than 14 age soccer players. In a different study, Haslofça et al. (2016) studied the effects of relative age on anthropometric and motoric properties between 8 and 12 age children. They determined significant differences in performance of 11 age children. As a result of our study, in the parameters related to participants, thought be originated from developing of physical properties in the same age category and having closer anaerobic performance scores due to similar ages.

When findings were examined in our study, there were no statistically significant differences in speed properties of female and male participants according to chronologic age classification. In a study, Lovell et al. (2015) examined the relative age effect between anthropometric properties and physical performance and maturation of soccer players (n:1212) in England groundwork league. Date of births of 8 to 17 age athletes (U9 to U18) were divided as 1st quarter, 2nd quarter, 3rd quarter, and 4th quarter. In study anerobic performance; 10 to 20 meters sprint, agility, explosive force were examined. While it was reported that anaerobic performances were in favour of older ones, in a different study, Votteler and Höner (2014) made a research about the effects of relative age on motor performance and coordination and estimate performance properties of soccer players for future. They reported a significant relationship between speed and relative age, and this relationship was especially on soccer players who perform in U12 and U14 teams.

When we examine our findings, students in first quarter were determined to have better speed parameters than students in second quarter. This result supports that there are relationship between relative age and speed with literature. In our own findings, having no significant differences in speed parameters might be due to individuals were in adolescent age and they did not complete their anaerobic developments.

Children in different birth quarters were seen to have some different and similar physical and motoric properties. The cause of these differences were children born in first quarter have reached to their biological maturation faster than children born in second quarter and as a result of this; they had higher levels of physical performances. However, it is recommended to make researches with more participants and more repetitions. We also recommend that making more researches in the same field will be significant to determinate a norm.

REFERENCES

Aune, T. K., Pedersen, A. V., Ingvaldsen, R. P., and Dalen, T. (**2017**). Relative age effect and gender differences in physical education attainment in Norwegian schoolchildren. Scandinavian Journal of Educatıonal Research, 61(3): 369–375.

Baikoğlu, B.S., and **Hocaoğlu**, M. (**2017**). Bağıl Yaş Etkisinin Motorik Performansa Olan Etkisine Göre Genç Basketbolcuların Takıma Seçilme Durumları, Uluslararası Hakemli Ortopedi Travmatoloji ve Spor Hekimliği Dergisi, 11:31-40.

Delorme, N., Boiche, J., and Raspaud, M. (**2009**). The relative age effect in elite sport: The French case. Research Quarterly for Exercise and Sport, 80(2): 336-344.

Duarte, J. P., Silva, M. J., Costa, D., Martinho, D., Luz, L. G., Rebelo, G.R., and Malina, R. M. (**2019**). Repeated sprint ability in youth soccer players: Independent and combined effects of relative age and biological maturity. Journal of Human Kinetics, 67(1): 209-221.

Faigenbaum, A. D., Kang, J., McFarland, J., Bloom, J. M., Magnatta, J., Ratamess, N. A., and Hoffman, J. R. (**2006**). Acute effects of different warm-up protocols on anaerobic performance in teenage athletes. Pediatric Exercise Science, 18(1): 64-75.

Gil, S., Ruiz, F., Irazusta, A., Gil, J., and Irazusta, J. (**2007**). Selection of young soccer players in terms of anthropometric and physiological factors. Journal of Sports Medicine and Physical Fitness, 47(1): 25-32.

Haff, G. G., and **Triplett,** N. T. (**2013**). National Strength and Conditioning Association, NSCA's Tactical Strength and Conditioning Facilitator's Reference Guide. Human Kinetics.

Haslofça, E., Haslofça, F., and Kutlay, E. (**2016**). The Relative Age Effect on Anthropometric Characteristics and Motor Performances in Turkish Children Aged between 8 and 12 Years. SHS Web of Conferences, 26, 01105

Hirose, N. (**2009**). Relationships among birth-month distribution, skeletal age and anthropometric characteristics in adolescent elite soccer players. J Sports Science, 27(11): 1159-1166.

Ibanez, S. J., Mazo, A., Nascimento, J., and Garcia-Rubio, J. (**2018**). The relative age effect in under-18 basketball: Effects on performance according to playing position. Plos One, 13(7):1-11.

Koç, H., Tekin, A., Öztürk, A., Saraymen, R., Gökdemir, K., and Eliöz, M. (**2012**). The effect of acute exercises on blood hematological parameters in handball players. African Journal of Microbiology

Research, 6(9): 2027-2032.
Lovell, R., Towlson, C., Parkin, G., Portas, M., Vaeyens, R., and Cobley, S. (**2015**). Soccer player characteristics in English lower-league development programmes: The relationships between relative age, maturation, anthropometry and physical fitness. PLoS One, 10(9):1-14
Mackenzie, B. (**2005**). 101 Performance evaluation tests. London: Electric World Publication, 111- 168.
Malija, R. M., Bouchard, C., and Bar-Or, O. (**2004**). Growth, maturation and physical activity Champaign, Human Kinetics.
Matta, M. D. O., Figueiredo, A. J., Garcia, E. S., Wernek, F. Z., and Seabra, A. (**2015**). Relative age effect on anthropometry, biological maturation and performance of young soccer players. Revista Brasileira de Cineantropometria e Desempenho Humano, 17(3): 257-268.
Mendez, A., Hamer, P., and Bishop, D. (**2008**) Fatigue in repeated sprint exercise is related to muscle power factors and reduced neuromuscular activity. European Journal of Applied Physiology, 103(4): 411-419.
Merriaux, P., Dupuis, Y., Boutteau, R., Vasseur, P., and Savatier, X. (**2017**). A study of Vicon system positioning performance. Sensors, 17(7): 2-18
Mookerjee, S., and **McMahon**, M. J. (**2014**). Electromyographic analysis of muscle activation during sit-and-reach flexibility tests. Journal of Strength and Conditioning Research, 28(12): 3496-3501.
Muratlı S. (**2005**). Şahin G, Kalyoncu O. Antrenman ve Müsabaka. İstanbul: Yaylım Yayıncılık, 123:219, 341.
Musch, J., and **Grondin,** S. (**2001**). Unequal competition as an ımpediment to personal development: A review of the relative age effect in sport. Developmental Review, 21(2): 147-167.
Ongül, E., Bayazıt, B., Yılmaz, O., and Güler, M. (**2017**). Oyun ve Fiziki Etkinlikler Dersinin Çocuklarda Seçilmiş Motorik Özellikler Üzerine Etkisi. Spor Bilimleri Araştırmaları Dergisi, 2(1):45-52.
Roberts, S. J., Boddy, L. M., Fairclough, S. J., and Stratton, G. (**2012**). The influence of relative age effects on the cardiorespiratory fitness levels of children aged 9-10 and 11-12 years of age. Pediatric Exercise Science, 24(1): 72-83.
Romann, M., Rösseler, R., and Javet, M. (**2018**). Relative age effects in Swiss talent development a nationwide analysis of all sports. Journal Journal of Sports Sciences, 36: 17.
Sevim, Y. (2006). Antrenman Bilgisi Ankara: Nobel Yayınları.
Stone, M. H., Stone, M., and Sands, W. A. (**2007**). Principles and Practice of Resistance Training. Champaign, IL: Human Kinetics, 112-117.
Şahin, L. (**2017**). Futbol Milli Takım Seçmelerinde Bağıl Yaş Etkisi Ve Fiziksel Performans, Beden Eğitimi ve Spor Anabilim Dalı Doktora Tezi , Gazi Üniversitesi, Ankara.
Torres, J.J., Zarrazquin, I., Gravina, L., Zubero, J., Seco, J., Gil, S. M., and Irazusta, J. (**2016**) Basketball performance is related to maturıty and relative age in elite adolescent players. The Journal of Strength and Conditioning Research, 30(5):1325–1332.
Votteler, A., and **Höner,** O. (**2014**). The relative age effect in the German football TID programme: Biases in motor performance diagnostics and effects on single motor abilities and skills in groups of selected players. European Journal of Sport Science, 14(5): 433-442.
Wattie, N., Cobley, S., and Baker, J. (**2008**). Towards a unified understanding of relative age effects. Journal of Sports Sciences, 26(13): 1403-1409.
Zorba, E., and **Saygın,** Ö. (**2009**). Fiziksel aktivite ve uygunluk. Ankara: İnceler Ofset Matbaası.

Citation: Özdemir, A. (2020). The effects of relative age on selected biomotoric skills in puberty period. African Educational Research Journal, 8(2): 392-397.