ORIGINAL ARTICLE

Analysis of motor capacities in the maturational stages of female adolescents

Open acess

Jaqueline dos Santos Valente Barros[1], Marcos Venicius Malveira de Lima[2] , Aristéia Nunes Sampaio[3], Suellem M. B. de Moura Rocha[4], Paulo Moreira Silva Dantas[5], Shirley Regina de Almeida Batista[6], Romeu Paulo Martins Silva[7]

[1]Mestranda em Ciências da Saúde na Amazônia Ocidental (UFAC/AC). Docente do curso de Educação Física (Licenciatura e Bacharelado) da Universidade Federal do Acre. Laboratório de Aprendizagem, Desenvolvimento e Controle Motor – UFAC (LADECOM)

[2]Doutorando em Ciências da Saúde da Faculdade de Medicina do ABC (FMABC)-Santo André (SP). Enfermeiro da Secretaria de Estado de Saúde do Acre (SESACRE). Laboratório de Delineamentos de Estudos e Escrita Científica da União Educacional do Norte (UNINORTE/AC)

[3]Mestranda em Ciências da Saúde na Amazônia Ocidental (UFAC/AC). Docente do curso de Educação Física (Licenciatura e Bacharelado) da Universidade Federal do Acre.

[4]Mestranda em Ciências da Saúde da Saúde na Amazônia Ocidental (UFAC/AC). Docente do curso de Nutrição da Universidade Federal do Acre.

[5]Doutor em Ciências da Saúde (UFRN/RN). Docente do Departamento de Educação Física-DEF/UFRN, Programa de Pós-graduação em da Saúde – PPGCSA/UFRN, Programa de Pós-graduação em Educação Física – PPGEF/UFRN.

[6]Doutora em Ciência do Desporto na Universidade do Porto, Portugal (FADEUP). Área de conhecimento: Especialidade de Desporto, Educação e Cultura. Docente do curso de Educação Física (Licenciatura e Bacharelado) da Universidade Federal do Acre (UFAC). Laboratório de Aprendizagem, Desenvolvimento e Controle Motor– UFAC (LADECOM).

[7]Doutor em Genética e Bioquímica. Docente do Departamento de Educação Física da Universidade Federal do Acre– UFAC. Coordenador do programa de Pós- graduação em Ciências da Saúde na Amazônia Ocidental/UFAC.

Corresponding author
jaqueline.ufac@hotmail.com

Manuscript received: 25 January 2017
Manuscript accepted: 12 May 2017
Version of record online: 06 September 2017

Abstract

Introduction: Maturation is a biological phenomenon inherent to the human being that acts alongside environmental factors in its relationship with the development of children and adolescents.

Objective: To analyse the motor skills during maturational stages of female adolescents.

Methods: This study included 133 female adolescents aged between 10 and 17 years from federal schools in the city of Rio Branco, State of Acre, Brazil. Sexual maturation was evaluated using Tanner's self-assessment. Motor skills were assessed using the following tests: strength (Jump Test); coordination (Burpee Test); balance (Flamingo Test); flexibility (Sit and Reach Test); agility (Shuttle Run Test). The data were analyzed using SPSS 20.0 software through analysis of variance. The significance level was fixed at 5%.

Results: No significant statistical results were found for strength, agility, balance and flexibility, evidencing that maturational advances did not influence these skills. In the coordination variable, significant results were obtained.

Conclusion: The results of this study suggest that maturational advancement in adolescents does not influence strength, agility, balance or flexibility. However, it does influence coordination, presenting better performance at stage P2.

Keywords: maturation, motor skills, puberty

Suggested citation: Barros JSV, Lima MVM, Sampaio NA, Rocha SMBM, Dantas PMS, Batista SRA, et al. Analysis of Motor Capacities in the Maturational Stages of Female Adolescents. *J Hum Growth Dev. 2017; 27(2): 206-212.* DOI: http://dx.doi.org/10.7322/jhgd.125018

INTRODUCTION

Growth, maturation and development are processes that occur us uninterrupted throughout our lives. They communicate with each other, resulting in qualitative changes in children and adolescents, due to the interaction between environmental and genetic factors. Growth and maturation are functional processes, while development is mostly a behavioural process. It is noteworthy that these three processes can both interfere with and be influenced by physical activity, performance and aptitude[1-3].

Biological maturation is a process in which changes linked to genetically inherited intrinsic factors occur, which are related to changes in the behavioural domains that present specific variations between individuals, that is, several people with the same chronological age can be at different maturational stages, suggesting that each individual has a biological clock that regulates its own progress[1,2].

In both genders, sexual maturation is based on the development of secondary sexual characteristics: both present pubic hair growth, simultaneously with the growth of breasts in females and the growth of testicles in males. Such maturation can mostly be observed through medical examinations, except in cases of population studies, which use self-assessment based on Tanner's illustrations[4-6].

It is in the age group between 10 and 20 years that the human being experiences a moment of great transformation, called adolescence, where individuals are moving out of childhood towards the adulthood. It is also during this period that the effects of maturation on the growth and development of adolescents in the same chronological age are verified. However, in addition to influences from the environment, there are also influences from social and cultural contexts[1,4,5]. Sexual maturation and growth spurts are quite evident in the biological field. These changes cause interference in sports practices and their performance[2,6]. In this perspective, adolescents are at the centre of much research.

This understanding of the maturational moment is an important tool to understand the peculiarities of the individual. In the motor field, such changes allow the accomplishment of new tasks related to motor skills with an increasing degree of complexity, which go beyond the functional and behavioral domains of childhood. The interaction between the environment and neuromuscular systems from birth to adolescence contributes to the development of motor competence[1,3,7].

The motor skills analysed in this study are part of the physical fitness components related to health, such as strength, muscular endurance, cardiovascular endurance, flexibility and body composition[7]. These capacities can be influenced by the maturational stages and the body changes resulting from their different phases. This research anticipates that maturation influences the performance of motor skills.

Thus, with an emphasis on describing the influence that sexual maturation exerts on motor abilities, the objective of this study is to analyse motor skills in the maturational stages of female adolescents.

METHODS

Characteristics of the Study

This is a cross-sectional and descriptive study. A total of 133 female adolescents aged between 10 and 17 years from the federal schools (FS) of Rio Branco, Acre State, participated in this study. The inclusion criteria included being enrolled in the institution and female, aged between 10 and 17 years. Those who were undergoing medical treatment that made it impossible to carry out the evaluations were excluded from the study.

Instruments and Procedures

Initially, contact was made with the board of directors of the schools, with the purpose of explaining to them the procedures for conducting the research. The 'Free and Informed Consent Term (FICT)' was passed on to the school to be read and signed by the parents or representatives of the adolescents. After receiving the FICT signed by those responsible, the evaluation of sexual maturation was performed according to the ethical aspects. Training was conducted for two specific evaluators, using the development protocol proposed by Tanner, covering five stages. After a previous explanation of the evaluation, the adolescents were invited to perform the self-evaluation of pubic hair. For each participant, the Tanner plank was individually presented with photographs of the distinct stages of female sexual maturation regarding pubic hair (PP1, PP2, PP3, PP4, PP5). In addition to the figures presented in the maps, there was a table with the respective taxonomic classifications for each stage of sexual maturation (Stage I (PP1) – pre-puberty; Stages II (PP2), III (PP3) and IV (PP4) – puberty; Stage V (PP5) – post-puberty). The self-evaluation of pubic hair is highly correlated with medical evaluations and corresponding confidence[3,4,8,9]. At a later stage, participants were assessed for motor skills, such as static balance, strength, flexibility, agility and coordination.

Force was evaluated with the Sargent Jump Test, to measure the power of the lower limbs through vertical impulsion. To determinate thrust, the initial value of the highest rate reached during the attempts was subtracted. The result of the jump value was recorded in centimetres[10].

Balance was evaluated through the Flamingo Static Balance Test, to evaluate overall balance. The test consists of balancing on one foot on a bar for one minute. To obtain the result, one must count the number of tests that were necessary (not the falls), the lower scores indicate better performance[11].

Flexibility was assessed through the Sit and Reach Test to determine the flexibility of the posterior thigh and lumbar muscles. The results were measured in centimetres, using the best of three attempts performed by the evaluated[10].

To evaluate agility, the Go-and-Go Racing Agility Test – Shuttle Run – was used. This capacity was measured through an alternating run of 9.14 metres. The materials used were two blocks of wood (5 cm x 5 cm x 10 cm) and a stopwatch. Two trials were allowed for each subject[10].

Coordination was assessed through the Burpee Test, with the purpose of measuring the coordination between trunk movements and lower and upper limbs. The result was given in terms of numbers of cycles performed in 10 seconds, the evaluated one performed the largest number of times in a single attempt[10].

All data were collected at the school and at the

participants' physical activity location. On the first day, two tests were performed: the Flamingo Static Balance Test and Sargent Jump Test. On the second day, three tests were performed: the Sit and Go Flexibility Test, Go-and-Go Racing Agility Test – Shuttle Run and the Burpee Test (coordination). The sequences of the tests were observed, they occurred in predicted places. All the necessary procedures for the validation of the data collection occurred according to the protocols established in the experimental procedure of the study. The study procedures were approved by the research ethics committee of Fundação Hospitalar CEP-FUNDHACRE, Rio Branco, Acre State, Brazil, under protocol no. 378/2009.

Statistical Analysis

The adolescents were grouped by stage of maturation. Descriptive analyses of the variables were carried out through statistical indicators of central tendency (mean), variability (standard deviation) and percentage frequencies. The Kolmogorov-Smirnov normality test was performed to examine the distribution of the data. Normal variables were height, flexibility and weight. The mean differences among the maturation stage groups for motor capacities were tested by performing ANOVA, using the alpha level of 0.05 for the analysis. SPSS version 20.0 was used.

RESULTS

Table 1 shows the results of the relationship among motor skills (agility, coordination, balance, flexibility, strength) and maturational stages, based motor tests and measures to evaluate the sexual maturation of female adolescents (Table 1).

Regarding agility, the results did not reveal statistically significant differences between the maturational stages, showing that the agility of the investigated adolescents does not differ at each stage. It may be noted that the highest level of agility occurred exclusively at stage P3. The motor coordination factor revealed statistically significant effects between the maturational stages ($p < 0.05$), showing a better performance at stage P2. Regarding balance, no statistically significant differences were found between stages, in this case, the mean values indicate higher performance at stage P5. Regarding flexibility, no statistically significant differences were found between the maturational stages, showing a higher performance only at stage P5. Regarding strength, there were no statistically significant differences, the best force average occurred of stage P2. It was observed that as the stages advance the force increases, oscillating at stage P2, which had the greater level of force.

Table 1: Descriptive values of mean, standard deviation (SD), F and p of the skills analysed, relative to the maturational stages of female adolescents.

Fatores	Estágios	Média ± DP	F	p
Agilidade	PH1	13,60 ± 0,17	0,672	0,756
	PH2	12,67 ± 1,33		
	PH3	12,40 ± 1,21		
	PH4	12,88 ± 1,46		
	PH5	12,60 ± 1,72		
Coordenação	PH1	9,00 ± 6,24	2,92	0,024
	PH2	15,86 ± 3,19		
	PH3	13,89 ± 4,43		
	PH4	13,55 ± 3,89		
	PH5	14,29 ± 3,38		
Equilíbrio	PH1	9,33 ± 3,05	0,33	0,893
	PH2	10,34 ± 5,54		
	PH3	9,36 ± 4,54		
	PH4	9,75 ± 4,23		
	PH5	9,02 ± 3,37		
Flexibilidade	PH1	22,66 ± 9,50	1,05	0,389
	PH2	29,56 ± 7,90		
	PH3	27,63 ± 8,13		
	PH4	29,22 ± 9,12		
	PH5	29,61 ± 8,41		
Força	PH1	26,00 ± 3,46	0,49	0,781
	PH2	31,52 ± 21,27		
	PH3	27,31 ± 5,80		
	PH4	29,24 ± 5,97		
	PH5	30,35 ± 5,94		

DISCUSSION

Maturation did not influence the performance of flexibility, strength, agility and balance, having significance only in coordination. These results may be related to growth spurts, a period in which females present a fat gain (7.1 kg) at puberty with increases in adolescence, limiting performance in certain practices where they must sustain weight[1,12,13].

According to Malina[1], there are sensitive periods of higher levels in certain motor capacities. These marked moments in fitness occur during or shortly after maturation, close to 13 years of age. Although not reported, the mean age of the adolescents studied was 13.0 ± 1.9 years. In this sense, studies seek a better understanding of the influence of maturation on the motor performance of children, adolescents and athletes[6,13-15].

It was observed in agility, that as maturation progresses, it does not influence the adolescents investigated. However, a progressive increase of P1 to P3 was observed, with a small decrease at P4 and a slight increase at P5.

Thus, a decrease in the values found according to the higher level of sexual maturation of the adolescents studied, showing better performances, was observed. So far, the best result was found in the pubertal group 3. These results corroborate with those reported in Ozmen's study[16] which was conducted with teenage badminton players who underwent six weeks of core strength training twice a week. Their results showed that strength training did not influence the performance of agility. The muscle nucleus may have provided support to the lower limbs during the test, evidencing that explosive exercises for the lower limbs may be more effective in increasing agility.

Pion *et al.*[17] when evaluating the agility of young female volleyball athletes through the EUROFIT and Shuttle Run (same instrument used in this research), concluded that there was no significant effect on the agility variable. These results are comparable to those observed in this study. This effect may be justified by the increase in the muscular mass of females, growing up to 7 kg between the ages of 6 and 23 years, occurring during adolescence, as well as the growth of the leg leading to decreased walking intensity[18].

However, Paul *et al.*[19] and Young *et al.*[20] affirm that agility is considered a key aspect in the performance of sports teams and are also able to distinguish between more qualified and less qualified individuals. Cognitive and perceptual factors can influence the satisfactory performance of this ability, as well as weight, height and body fat, even though physical actions compose the largest total time dimension to complete an agility test.

Capistrano *et al.*[21] when evaluating 98 children of both genders, aged 7 to 10 years in Florianópolis/SC, observed a significant difference in some skills, among them being female agility, which contributed significantly to explaining the variability of motor performance between school age males and females. In this study, females outperformed males in motor skills.

In relation to motor coordination evaluated through the Burpee Test, shown in Table 1, there were significant differences, highlighting a progressive variation among the maturational stages. A sudden increase between the P1 and P2 stages was observed, a period in which the best performance was identified, having a reduction in P3 and evidencing a slight decrease in P4 and remaining at a constant level in P5. A trend of progression as the stages advance was observed. In this same context, Montezuna *et al.*[22] analysed the occurrence of motor coordination modification after an intervention of dance classes among deaf females aged 13 to 18 years, reporting an increase in the performance of this variable.

Similarly, Pion *et al.*[17] when comparing the motor coordination of Belgian adolescents aged 15–16 years old, elite and sub-elite volleyball players, observed that high-level female players had better results only in coordination when compared to others. It was also pointed out that motor coordination is an indicator of talents for the modality studied in females.

Studies by Antunes *et al.*[23] with Portuguese children of both genders aged from 6 to 14 years reported that coordination improved with increasing age and the increase of fat mass negatively influenced motor performance. A similar analysis of gross motor coordination and weight status in children aged 7 to 10 years old corroborated the above research in that weight status had a negative influence on motor competence, with the opposite also being true[24].

However, we cannot fail to mention that the males did better than the females in several tasks.

The values found for strength and flexibility in our study did not interfere with the positive motor coordination results found in the maturational stages. These data were comparable with those obtained by Chaves *et al.*[3] with Peruvian male and female adolescents aged 6 to 14 years, who identified that performance in motor tests improved with age. In addition, children with greater flexibility and explosive strength were less likely to have problems with gross motor coordination.

Pereira[25] states that adolescents who present with difficulties in the evolution of motor coordination will have implications over the years, which may last for a lifetime. In this area, it is reported that, during childhood, the improvement of motor coordination is indispensable, considering that this benefit will be reflected throughout life.

In the analysis of motor capacity balance, shown in Table 1, it was observed that the adolescents had little progression from P1 to P5, with a slight increase in P3, P4 and P5. Through these results, we observed that this variable is proportionally less developed as the adolescents reach a more advanced maturational level. According to Malina and Bouchard[15] the performance should improve with a higher maturational stage, being usually better in females during childhood, something that did not occur in our study, in which both genders seem to reach a plateau. The same literature suggests a 'clumsy' period during the adolescence spurt, which is usually attributed to the contrasting times in which the growth spurts of the lower extremities occur and in the muscle mass.

All movement involves an element of balance that is the basic aspect of this. Motor capacity is a complicated part of motor fitness, influenced by sense organs, the cerebellum and proprioceptors[7]. In contrast to our results, Etayo *et al.*[26] by using the Flamingo Test (the same instrument used in this research), discovered in their analyses an increase in balance of older European children, which surpassed the males' capacity. For these authors, this study may be recommended in children most likely to develop health problems with low levels of fitness. Earlier, Ozmen16 also achieved the same result with an evolution in balance in teenage badminton players.

Zaqout *et al.*[11] when analysing the determinants of physical fitness in children between 6 and 11 years of age, found a correlation between increased frequency of fruit and vegetable intake (as a marker of healthy eating habits), which

was associated with better physical fitness and with increased balance, especially in females.

Observing the behaviour of the variable flexibility, from the values found for all stages of maturation, although not significant, they fit the results of the classification stipulated by Fitnessgram[26] which indicates the ideal values for children and adolescents from 7 to 17 years between 23 to 28 centimetres for females. Similar values were found in our study, where we detected a progressive increase from P1 (22.66 ± 9.50) to P5 (29.61 ± 8.41).

Our findings are similar to those reported by Ulbrich6 who followed eutrophic individuals between 6 and 16 years old at different maturational stages, concluding that there was no improvement in the level of flexibility, most probably because of the growth spurt and that hormonal changes can promote bone growth faster than muscles and tendons. Godoi Filho and Farias[6,14] also measuring the physical fitness of children and adolescents of both genders in the pubertal period, affirm that 60% showed low rates of flexibility, failing to meet the minimum requirements for health-related aptitude. It can be observed that the results in females presented a better performance at stage P3 and in general, females were more flexible than males in all ages.

Catuzzo *et al.*[13] when examining the association between motor competence and the components of physical fitness in children, revealed that maturation and an increase in body weight is detrimental to satisfactory performance. In that matter, good aptitude results are related to competence during childhood and adolescence.

Additionally, the research conducted by Luciano *et al*[27] evaluating the level of physical activity performed by adolescents and their correlations with pubertal stages and Body Mass Index (BMI), showed that the post-pubertal present significantly greater times than the pre and pubertal ones, considering that the total amount of time spent sitting during a weekend may favour a sedentary lifestyle and a possible increase body fat in adolescents, only reinforcing a negative association between body weight gain and motor competence in teenagers. It was also found that the association between flexibility and motor competence is uncertain.

The study Chaves *et al.*[3] performed with adolescents aged 6 to 14 years, using the same Sit and Reach Test, found an improvement in flexibility performance with increasing age. Similarly, Schwanke[12] in his work with children and adolescents from 7 to 17 years, who participated in a four-month stretching and muscle strengthening programme, observed gains in flexibility as a final result.

This characteristic was also observed by Etayo[26] who aimed to report physical fitness standards for European children. The female individuals obtained an improvement of flexibility when compared to the males.

Although there is a divergence in the literature about the gains in flexibility and its association with maturational stage, Malina and Bouchard[15] point out that flexibility at puberty is preceded between 5 to 8 years of a peak performance constancy, having a decrease and showing the worst effects at ages 12 and 13 years, with an improvement at 18 years. It also claims a reduction for males with the progress of puberty.

In the strength test, no significant differences were found in adolescents in the maturation stages, although a trend towards progression was observed. According to the findings of Godoi Filho and Farias[14] when they analyzed the physical fitness of 436 adolescents of both genders between 11 and 14 years of age they concluded that males progressed in strength and in speed, indicating the influence of increased age and the hormone testosterone. However, females demonstrated a decrease in mean strength performance in maturational stages, suggesting that such conditions may be related to pubertal development and growth spurts, corroborating the findings of the present study.

Anderson *et al.*[6] observed in adolescents between 6 and 17 years of age, participants in regular sports activities, that physical fitness variables indicate an improvement of isometric and explosive strength as the biological maturation progresses and physical fitness improvement in children and adolescents presented a distinction between maturation stages. Additionally, the study by Schwanke *et al.*[12] when assessing abdominal strength in a sample of schoolchildren in Brazil, found results that point to strength gain. In this line of research, similar findings were found in studies by Chaves *et al.*[3] Paul *et al.*[19] Pereira *et al.*[28] and Linhares *et al.*[29]

Catuzzo[13] observed the association of physical fitness components related to health and motor competence, finding a positive relationship between strength and motor competence. Rowland[18] stated that because of hormonal factors, females do not show strength gains at puberty. This affirmation was found in our study, when the strength levels did not differ between the pre-pubertal, pubertal and post-pubertal stages in the adolescents investigated. Malina1 reported that maturity is positively linked to force measurements and resistance studies do not follow an order controlling individual differences in maturation.

Differently from that shown in the literature[1,2,6,7,15] on the corporal modifications and progressions in physical fitness which occur in adolescence, the present study did not identify any increases at any maturational stages of the teenagers investigated regarding the motor capacities agility, strength, balance and flexibility. This may have occurred because in this period there are several morphological and functional changes that cause direct interference in performance and motor capacity[2]. It is important to highlight that motor coordination revealed a significant performance in relation to the other capacities, showing a correlation with maturation.

Thus, it was concluded that maturation influenced motor coordination ability revealing a significant increase in the pre-pubertal phase for the pubertal phase. There was no influence of motor abilities on agility, balance, strength and flexibility in the stages of maturation of female adolescents.

Conflict of Interest

All authors declare no conflicts of interest involved.

REFERENCES

1. Malina RM. Top 10 research questions related to growth and aturation of elevance to physical activity , performance , and fitness. Res Q Exerc Sport. 2014;85(2):157-73. DOI: http://dx.doi.org/10.1080/02701367.2014.897592
2. Ré AHN. Crescimento, maturação e desenvolvimento na infância e adolescência : Implicações para o esporte. Motricidade. 2011;7(3):55-67.

3. Chaves RN, Valdívia AB, Nevill A, Freitas D, Tani G, Katzmarzy PT, et al. Developmental and physical-fitness associations with gross motor coordination problems in Peruvian children. Res Dev Disabil. 2016;53-54:107-14. DOI: https://dx.doi.org/10.1016/j.ridd.2016.01.003
4. Faria ER, Franceschini SCC, Peluzio MCG, Sant'Ana LFR, Priore SE. Aspectos metodológicos e éticos da avaliação da maturação sexual de adolescentes. Rev Paul Pediatr. 2013;31(3):398-405. DOI: http://dx.doi.org/10.1590/S0103-05822013000300019
5. Tanner JM. Growth at Adolescence'Blackwell. 2nd ed. Oxford: Blackwell Scientific Publications; 1962.
6. Ulbrich AZ, Bozza R, Machado HS, Michelin A, Vasconcelos IQA, Stabelini Neto A, et al. Physical fitness in children and adolescents in diferents maturacion stages. Fit Perf J. 2007;6(5):277-82. DOI: http://dx.doi.org/10.3900/fpj.6.5.277.e
7. Gallahue D, Donnelly FC. Educação física desenvolvimentista para todas as idades. São Paulo: Phorte; 2008; p.80-91.
8. Rasmussen AR, Wohlfahrt-Veje C, Tefre de Renzy-Martin K, Hagen CP, Tinggaard J, Mouritsen A, et al. Validity of self-assessment of pubertal maturation. Pediatrics. 2015;135(1):86-93. DOI: https://dx.doi.org/10.1542/peds.2014-0793
9. Jaruratanasirikul S, Piyawut K, Tassanakijpanich N, Sriplung H. Reliability of pubertal maturation self-assessment in a school-based survey. J Pediatr Endocr Metab. 2015;28(3-4):367-74. DOI: https://dx.doi.org/10.1515/jpem-2014-0053
10. Johnson BL, Nelson JK. Pratical measurements for evolution in physical education. 4 ed. Minnesota:Burgess Publishing Company; 1979; p.475.
11. Zaqout M, Vyncke K, Moreno LA, de Miguel-Etayo P, Lauria F, Molnar D, et al. Determinant factors of physical fitness in European children. Int J Public Health. 2016;61(5):573-82. DOI: http://dx.doi.org/10.1007/s00038-016-0811-2
12. Schwanke NL, Pohl HH, Reuter CP, Borges TS, de Souza S, Burgos MS. Differences in body posture , strength and flexibility in schoolchildren with overweight and obesity : A quasi-experimental study. Man Ther. 2016;22:138-44. DOI: http://dx.doi.org/10.1016/j.math.2015.11.004
13. Cattuzzo MT, Henrique RS, Ré AH, Oliveira IS, Melo BM, Moura MS, et al. Motor competence and health related physical fitness in youth : A systematic review. J Sci Med Sport. 2016;19(2):123-9. DOI: http://dx.doi.org/ 10.1016/j.jsams.2014.12.004
14. 14. Godoi Filho JRM, Farias ES. Aptidão física de escolares do sudoeste da Amazônia Ocidental em diferentes estágios de maturação sexual. Rev Bras Educ Fís Esporte. 2015;29(4):631-9. DOI: http://dx.doi.org/10.1590/1807-55092015000400631
15. Malina RM, Bouchard C, Bar-Or O. Crescimento, maturação e atividade física. São Paulo: Phorte; 2009; p.229-566.
16. 16. Ozmen T, Aydogmus M. Effect of core strength training on dynamic balance and agility in adolescent badminton players. J Bodyw Mov Ther. 2016; 20(3):565-70. DOI: http://dx.doi.org/10.1016/j.jbmt.2015.12.006
17. Pion JA, Frasen J, Deprez DN, Segers VI, Vaeyens R, Philippaerts RM, et al. Stature and jumping height are required in female volleyball, but motor coordinations is a key factor for future elite success. J Strength Cond Res. 2015; 29(6):1480-5. DOI: http://dx.doi.org/10.1519/JSC.0000000000000778
18. Rowland TW. Fisiologia do exercício na criança. 2. ed. Barueri: Manole; 2008; p. 21-193.
19. Paul DJ, Gabbett TJ, Nassis GP. Agility in Team Sports : Testing , Training and Factors Affecting Performance. Sport Med. 2015;46(3):421-42. DOI: http://dx.doi.org/10.1007/s40279-015-0428-2
20. Young WB, Dawson B, Henry GJ. Agility and change-of-direction speed are independent skills: Implications for training for agility in invasion sports. Int J Sport Sci Coach. 2015;10(1):159-70.
21. Capistrano R, Ferrari EP, Alexandre JM, Silva RC, Cardoso FL, Beltrame TS. Relation between motor perfomance and physical fitness level of schoolchildren. J Hum Growth Dev. 2016;26(2):174-80. DOI: http://dx.doi.org/10.7322/jhgd.119261
22. Montezuma MAL, Rocha M V, Busto RM, Fujisawa DS. Adolescentes com deficiência auditiva: A aprendizagem da dança e a coordenação motora. Rev Bras Ed Espec. 2011;17(2):321-34. DOI: https://dx.doi.org/10.1590/S1413-65382011000200010
23. Antunes AM, Maia JA, Stasinopoulos MD, Gouveia ER, Thomis MA, Lefevre JA, et al. Gross motor coordination and weight status of portuguese children aged 6-14 years. Am J Hum Biol. 2015;27(5):681-9.DOI: https://dx.doi.org/10.1002/ajhb.22715
24. D'Hondt E, Deforche B, Gentier I, Verstuyf J, Vaeyens R, De Bourdeaudhuij I, et al. A longitudinal study of gross motor coordination and weight status in children. Obesity. 2014;22(6):1505-11. DOI: https://dx.doi.org/10.1002/oby.20723
25. Pereira ES, Moreira OC. Importância da aptidão física relacionada com à saúde e aptidão motora em crianças e adolescentes. Rev Bras Prescr Fisiol Exerc. 2013;7(39):309-16.
26. De Miguel-Etayo P, Gracia-Marco L, Ortega FB, Intemann T, Foraita R, Lissner L, et al. Physical fitness reference standards in European children : the IDEFICS study. Int J Obes. 2014;38(Suppl.2):557-66.

DOI: https://dx.doi.org/10.1038/ijo.2014.136
27. Luciano AP, Bertoli CJ, Adami F, Abreu LC. Nível de atividade física em adolescentes saudáveis. Rev Bras Med Esporte . 2016;22(3):191-4. DOI: http://dx.doi.org/10.1590/1517-869220162203139863
28. Pereira A, Costa AM, Santos P, Figueiredo T, João PV. Training strategy of explosive strength in young female volleyball players. Medicina (Kaunas). 2015;51(2):126-31. DOI: http://dx.doi.org/10.1016/j.medici.2015.03.004
29. Linhares RV, Matta MO, Lima JRP, Dantas PMS, Costa MB, Fernandes Filho J. Efeitos da maturação sexual na composição corporal, nos dermatóglifos, no somatótipo e nas qualidades físicas básicas de adolescentes. Arq Bras Endocrinol Metab. 2009;53(1):47-54. DOI: http://dx.doi.org/10.1590/S0004-27302009000100008

Resumo

Introdução: A maturação é um fenômeno biológico inerente ao ser humano que atua em conjunto com fatores ambientais devido a sua relação com desenvolvimento de crianças e adolescentes.

Objetivo: Analisar as capacidades motoras nos estágios maturacionais de adolescentes do sexo feminino.

Método: Participaram deste estudo 133 adolescentes do sexo feminino, entre os 10 e os 17 anos provenientes de uma escola Federal na cidade de Rio Branco, no Estado do Acre. A maturação sexual foi avaliada através do método da auto avaliação das pranchas de TANNER. As capacidades motoras foram analisadas através dos testes: Força, Jump Test; Coordenação, Teste de Burpee; Equilíbrio, Teste flamingo; Flexibilidade, Teste de Sentar e Alcançar; Agilidade, Teste de Shuttle Run. Os dados foram analisados no programa R através de Análise de Variância (ANOVA). O nível de significância fixou-se em 5%.

Resultado: Não foram encontrados resultados estatisticamente significativos nos fatores força, agilidade, equilíbrio e flexibilidade. No fator coordenação obtivemos resultados estatisticamente significativos.

Conclusão: O avanço maturacional de adolescentes não influenciou na força, agilidade, equilíbrio e flexibilidade. No entanto, influenciou na coordenação motora, apresentando um melhor desempenho no estágio P2.

Palavras-chave: maturação, habilidades motoras, puberdade