EFFECT ON REGULAR PRACTICE FOR PHYSICAL EXERCISES REGARDING LIFESTYLE AND MOTOR PERFORMANCE OF ASTHMATIC CHILDREN AND ADOLESCENTS

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Abstract
In this study, we aimed at verifying the effects of a 10–week respiratory exercise programme and swimming regarding lifestyle, motor performance and behaviour of expiratory flow in asthmatic children and adolescents. Thirteen subjects have participated in this study, and their mean age was 11.09 ± 2.24 years, including both genders—male and female. In order to assess the lifestyle, we used a questionnaire on how to use medication and conditions to do physical activities, improve sleep and suchlike. To verify the behaviour of expiratory flow, we used expirometer, and to assess the motor performance we used the Bruininks–Oseretsky Test of Motor Proficiency (BOTMP). The results showed improvements for the elements of lifestyle, as this study authors observed, and a slightly improvement for the expiratory flow after the programme. Regarding the motor performance, there was not statistically significant difference after the programme.
Keywords: Asthma - Children - Physical activity - Lifestyle - Motor Performance

Introduction

In recent years, there was a significant rise of diseases due to respiratory problems affecting airways, including asthma with higher in-

cidence. According to the Sociedade Brasileira de Pneumologia e Tisiologia—2002 (Brazilian Thoracic Association), the mean prevalence of asthma in Brazil is 20 %, which is the fourth leading cause of hospitalisation in the Country.

Asthma is a chronic, recurrent respiratory disease, which makes airways hyperirritable and hypersensitive. It affects persons of all ages and both genders, requiring some life changes – eg sleep, food habits, emotional aspect and in particular health problems (CABRAL; TEIXEIRA, 1994; GUALDI; TUMELERO, 2004; PITANGA, 2004; TAKETOMI; MARRA; SILVA, 2005; REZENDE et al., 2006; BROCKMANN et al., 2007).

In some studies (GUALDI; TUMELERO, 2004; SILVA et al., 2005; MOISÉS, 2006; REZENDE et al., 2006; MORAES et al., 2007; BROCKMANN et al., 2007), one stated that patients with respiratory disease also tend to reveal minus tolerance of physical exercise due to difficulty to breathe, restriction on an activity practice or even on lack of physical–motor activities. Such privation is due to present myths concerning asthma based on physical activity, consisting of a certain lack of motor experiences to avoid occurring asthma attacks. Some everyday activities—eg running, cycling, or school physical (PE) education attendance—are practically excluded from asthmatic children' motor repertoire. Such lack of practice opportunity tend to affect when acquiring a deep ability stage, impairing the motor development process, which is fundamental to ameliorate motor capacity and obtaining healthy habits that can be included for the whole life (MOISÉS, 1993; CABRAL; TEIXEIRA, 1994; GALLAHUE; OZMUN, 2005; BROCKMANN et al., 2007).

According to Betio, Krebs & Keulen (2007), is essential make children and parents aware of the importance on physical activity to develop physical, cognitive, emotional, social and motor aspects, which aid to treating asthma. PE professionals, thus, should be aware of symptoms presented by the students during lessons. They also should assess such children to create motor programme for improvement.

Research showed that programmes for physical activity regarding such pathology can potentially reduce asthma attacks occurrence and create good pulmonary ventilation. In addition, such programmes can be indicated since they were linked to the use of medicaments (SILVA; SANTOS; MIRANDA, 1994; CASSOL et al., 2004; SILVA et al., 2005; MOISÉS, 2006; REZENDE et al., 2006; MORAES et al., 2007;

BETIO; KREBS; KEULEN, 2007; ANTES et al., 2008). The physical activities, additionally, provide some gains in respiratory mechanics when preventing and correcting postures. Therefore, it enhances general physical condition of asthmatic subjects and develops physical and motor aptitudes (CABRAL; TEIXEIRA, 1994).

We must say exercises can be classified as 'more asthmogenic' (causing asthmatic attacks) – eg running, walking fast and cycling; and 'less asthmogenic' – eg swimming. Such activity is, therefore, the most recommended to asthmatics since it provides with a humid environment and appropriate to operate well for respiratory function and pulmonary ventilation, diaphragmatic re-education, strengthening the respiratory and body muscles in general, and preventing from changes in the spine (MOISÉS, 1993; WEISGERBER et al., 2003). Practising swimming in its several events, thus, is indicated to asthmatic children since it requires adaptations for how to breathe, encouraging correcting deformations which reach the chest.

Based on such information and lack of study considering also assessing motor variable and lifestyle, we aim at verifying the effects of a programme of respiratory exercise and swimming regarding lifestyle and motor performance for asthmatic children and adolescents.

Methods

This study was performed based on resolution No 196/96 of National Health Council (NHC) and approved considering its ethical aspects and methodologies for the Comitê de Ética e Pesquisa da Universidade Federal de Santa Maria—CEP/UFSM (Committee on Ethics and Research for the Federal University of Santa Maria) under protocol No 0193.0.243.000-07. Before performing the tests, the in-charge persons by the children and adolescents read and signed the Free and Clarified Consent Term concerning the study procedure.

Subjects

The study group was composed of 13 subjects (children and adolescents) of both genders (8 girls; 5 boys) and including asthma diagnosis. They initially take part in the extension project 'swimming and respiratory exercise for children and adolescents with respiratory problems', linked to the Centro de Educação Física e Desportos da Uni-

versidade Federal de Santa Maria—CEFD/UFSM (Physical Education Centre and Sports of Federal University of Santa Maria). The age bracket adopted was from 7 to 14 y.o. (mean 11.09 ± 2.24), due to protocol of motor tests (4–14 y.o.). We excluded from our study the children and adolescents with frequence below 75% lessons and with age bracket out of what is required in this study. Seventeen children composed the initial study group; however, due to lesson fault 13 participants composed the final group. The type of asthma present in the group was slight asthma described by rare attacks, and it gets better by using bronchodilators. During the attacks, the person is asymptomatic, strongly resisting physical exercise and normal life (MOISÉS, 1993). We verified the type of asthma by using a pulmonologist's sick note at the moment of the referred project registration.

Materials

To assess the components of lifestyle, we applied a questionnaire created especially for this study regarding the parents' sense to change participants' lifestyle after 10–wk treatment. We handed such questionnaire to in-charge persons for assistance in the changes during the interventions. The components assessed were: improving respiratory problem, sleep, breathing, how to use medicaments, food, disposition for other activity or physical activity practice (incl. school PE lesson participation).

For expiratory flow verification, we used expirometer model Mini-Wright-Peak Flow Meter 3103, make Clement Clarke. The expiratory flow measures, contrarily to the other assessments, were performed once a week within seven weeks. To perform the measure, the student should keep rested and stood up holding an apparatus in a way not to hampering the air outlet and inspire as much as possible, and then put the mouth on mouthpiece and expire as strong as possible. We tried three times and was considered the best (the one presenting more expiratory flow), as assessing protocol shows.

We used the BOTMP (1978 apud GALLAHUE, 1994) as tool to assess the participants' motor performance. Such tool informs on children' and youths' motor acquisition assessing both functions and dysfunctions and delays regarding motor development. The way we used in this study consists of 14 sub-tests which assess: agility and speed; balance (static and dynamic); bilateral coordination; strength; superior

member coordination; reaction speed; visualmotor control; and instruction. The values for general motor proficiency is from the pointing sum of all items, according to age bracket and months of each participant, as Battery Test manual showed before.

The training programme proposed was developed within 10 wk of two lessons a week for 50 min to evolve respiratory exercise, and time left to enhance swimming. The programme first moment (respiratory exercise) consisted of exercises focusing on muscle relaxation, respiratory exercises, muscle strengthening, and stretching, based on activity routine of the extension project. By contrast, swimming included the task to get adapted (familiarised) to liquid environment, starting the four strokes (crawl, back, breast, dolphin), and ludic activities. The lessons were developed in thermal pools of the Centro de Educação Física e Desportos—CEFD/UFSM (Centre of PE and Sports).

At the Laboratório de Aprendizagem Motora—CEFD/UFSM (a lab for motor learning), we collected the data for motor assessment. Regarding spirometry and applying the questionnaires, we performed them before lessons in the environment of thermal pools. After 10 weeks of swimming lessons, we accomplished the post-tests for motor assessment and questionnaires, while the data on the behaviour of expiratory flow were performed within seven weeks of intervention.

To assess the results obtained from pre-test and post-test we used descriptive statistics (mean and standard deviation) and percentiles. The t-test was used to investigate differences between pre-test and post-test by Statistical Package SPSS, version 11.0 with $p<0.05$ significance level.

Results and discussions

Table 1 refers to the variables from the questionnaire regarding lifestyle components, which shows improvement or not for such variables. The responses were linked to in-charge persons' perceptions on participants' lifestyle component changes after participation in the programme.

VARIABLE	IMPROVED	DID NOT IMPROVED
respiratory problem	**100%**	-
sleep	**81.8%**	18.2%
breathing	**72.7%**	27.3%
medicament	**54.5%**	45.5%
food	36.3%	63.7%
disposition	**72.7%**	27.3%

Table 1: Questionnaire variables regarding lifestyle components after 10 weeks of intervention

Obs.: In bolt, the above 50% improvement results in the sample assessed according to in-charge persons' sense.

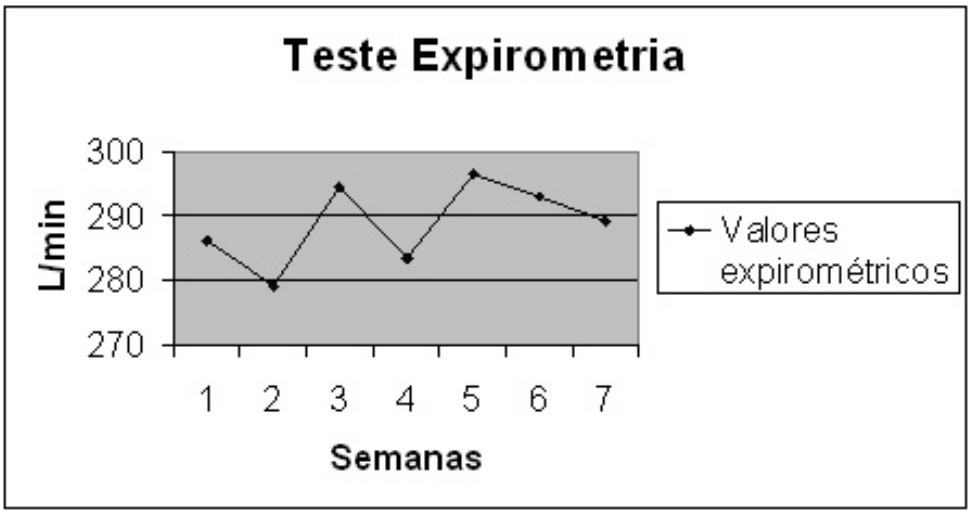
Based on table 1, we can see that the variables respiratory problem, sleep, breathing, how to use medicaments (interpreted as lessening how to use medicaments), and disposition to do physical activities got better after the programme; and it was in accordance with realising the in-charge persons for children and adolescents. 'Respiratory problem' changes, in particular, as questionnaire presents, are for the symptoms exhibited by the children during the intervention. The findings in this study are verified by the study of Antes et al. (2008), in which they clarified the betterment of the general aspects regarding asthmatic children's health after intervention in the similar activities (swimming and respiratory exercise). Realising the betterment, according to Gualdi & Tumelero (2004), can be referred to the betterment of physical condition due to practising physical activities aid some aspects – eg increased appetite, bettering sleep, lessening the quantity of drugs and furthering sense of well-being.

A study that also investigated the effects on interventions (eg kinesiotherapy and hydrotherapy, also utilising questionnaires to assess sundry aspects concerning asthmatic children's life quality) was accomplished by Surovenko et al. (2003 apud TAKETOMI; MARRA; SILVA, 2005). In the study, the authors obtained as result an improvement in the children's life quality, particularly reduction in attacks and hospitalisation, and it states the findings of this study.

Rezende et al. (2006), in their study, assessed the asthmatic children's life quality by using the sense of children's parents, before and after of a rehabilitation pulmonary programme including activity for stretching, strengthening superior members, sit-ups and aerobic exercises in a period of 24 sessions. The questionnaire included the physical activity domains, symptoms and emotions; the authors did not find statistically significant difference for pre-test and post-test. The varia-

tions on the items involving the questionnaires, however, showed inclination to improvement in life quality from parents' viewpoint regarding children' asthma linked to rehabilitation programme. The authors also stress that the data which relates to children's asthma, physical exercises and life quality demonstrated that cardio-respiratory conditioning is fundamental for clinical treatment of such pathology, creating a wide disease control. In this wise, Pituch & Bruggeman (1982 apud MOISÉS, 2006) assert that physical activity practice for asthmatic persons both reduce attacks and is positive to lessening school absences, improving disposition and influence on betterment of personal and social attitudes.

Regarding the behaviour of expiratory flow, you can see at the graph 1 the values for spirometry test relevant to seven weeks of lessons. We emphasise that the higher the values presented by participants, the better the capacity to expiry. The period to assess such variable was shorter due to the tests had been performed at the beginning of lessons and depended on time to carry it out since it was made individually, resulting in delay at the beginning of interventions. Observing the graph, you can see that after the first week there was an expiratory volume drop with values below 280 L/min. Between the week two and week four, occurred peaks in the expiratory volumes and, from week five, there was a drop in such volume (below 290 L/min), as the values for cut-offs (minimum and maximum). Despite such drop and visible oscillation in the graph, at the end of training you can realise results slightly superior to the ones found at the programme beginning, indicating an inclination to better the children's and adolescents' pulmonary ventilation after the programme.



Graph 1: Values regarding spirometry tests within seven weeks
Legend of graph: Spirometry Test| (Teste Espirométrico)L/min (L/min)|Spirometric Values (Valores Espirométricos)|Weeks (Semanas)

The results of his study were similar to the ones obtained from the study of Moisés (2006), performed by using 6–14 year-old age bracket children and adolescents. They were boys and girls submitted to an activity programme developed twice a week for 45 min each, within five months. It consisted of respiratory activities (posture, respiratory, muscle relaxation) and swimming. According to the author, the assessments showed positive results for all age brackets with reduction in the quantity of asthmatic attacks during the programme.

Other study holding also positive results regarding association between swimming and respiratory exercise was performed by Silva, Santos, and Miranda (1994). By using a programme with similar methodology (swimming; physiotherapeutic activity; exercise: respiratory, posture, relaxing), the authors assessed the effects on physical activity for asthmatic children (8–12 year old). After assessing the aerobic capacity and expiratory flow, the authors had concluded that the children (besides had improved aerobic capacity) exhibited a qualitative and quantitative reduction in asthmatic attacks. They also started to live better along with the attacks as controlling the breathing technique and positive body postures soften the sore caused by attacks.

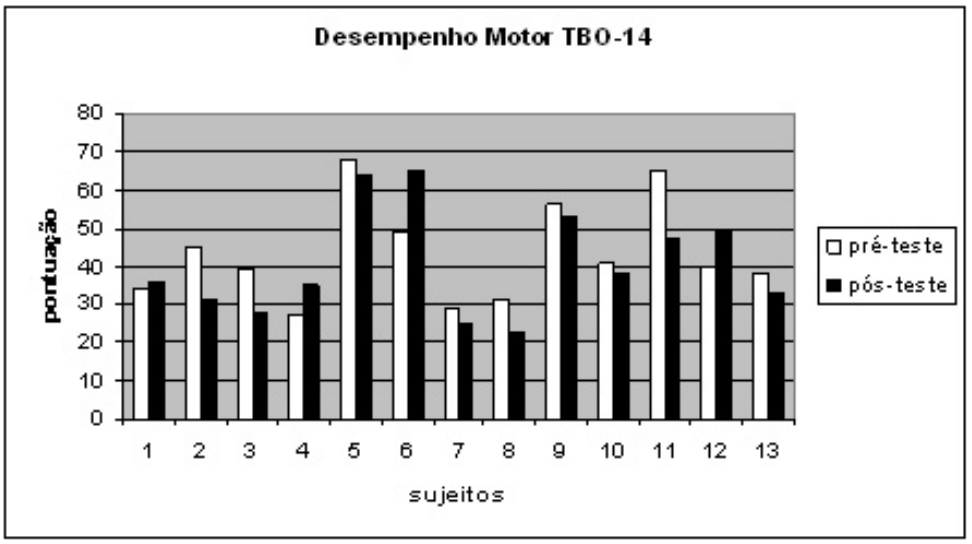
In the same way, Moraes et al. (2007) assessed 93 children and adolescents (boys and girls) divided into AG (n=69) and CG (n=24) – asthmatic group and control group (without asthma). The experimen-

tal group (EG) took part in a 7–month swimming programme (twice a week) and the PEF in both groups was assessed. The authors found that the AG children showed the PEF value before the programme lower than CG. After swimming programme, however, the range regarding the percentage of AG–PEF values was higher than in CG.

Macedo Júnior et al. (2007) performed other study that also assessed the expiratory flow in asthmatic children. In it, was assessed if only one swimming session furthers big changes after the PEF exercise in asthmatics. Eight boys (5–14 y.o.) took part in the study. They were involved in a 45–min swimming session, especially in activities to clear the thoracic, postural muscle and breathing exercise for swimming. Such activities are similar to the ones we developed here. The expiratory flow was assessed in three moments (10 min before exercise and 20 min after exercise). The authors concluded that the acute effect regarding swimming exercise results in positive changes for PEF. When we compared the results of this study, we verified how important a longer period of activities is to keep a better respiratory capacity.

Gualdi & Tumelero (2004) performed a study by using water exercise for asthmatic subjects, focusing on softening the complications. In the study, 5–9 y.o. children took part in a 3–month programme once a week for 45 min each lesson. The authors observed a betterment of 100 % for the asthma symptoms, according to the perceptions of children responsible persons. The intensity of attacks, in addition, was lower than when children did not do exercises. Such findings confirmed that the exercises specific for such pathology, linked to the use of medicaments, are efficient to both control the disease and better the general physical condition.

Graph 2 analysis shows the individual results regarding the motor performance for pre-test and post-test.



Graph 2: Motor performance TBO-14 (individual score)
Legend of graph: Motor Performance TBO-14 (Desempenho motor TBO-14)|Score (Pontuação)|pre-tes (pré-teste)|post-test (pós-teste)|subjects (sujeitos)

O Quadro 2 revela as médias do grupo para o desempenho motor em pré e pós-teste, apontando que os resultados em pós-testes foram inferiores aos obtidos em pré-teste.

motor performance	mean	DP
pre-test	43.23	13.06
post-test	40.62	13.98

Table 2: Mean and standard deviation for pre-test and post-test

Based on the results of t-test we have presented, considering $p \leq 0.05$ significance level, we concluded that there was not statistically significant difference ($p=0.978$) regarding the motor performance variables before and after the programme. Such findings were contrary to hypothesis of the study, in which one believed that a swimming programme and respiratory exercise could better the motor performance of the population in question. A factor that potentially influenced the low performance for the post-test was the low temperatures concerning the months for the study development. What states it is that the pre-test was performed at the beginning of May, in which the temperature was milder.

Silva et al., (2005) assessed variables different from the variables we studied here (physical conditioning and muscle strength) regarding

8–11 year–old asthmatic children. The physical exercise programme, with activities similar to the activities performed in this study, took the duration of four months with 90–min lessons. Contrarily to the findings in this study, the authors found statistically significant difference when they compared the initial assessments with final assessments. It confirmed that a physical training programme, with twice sessions weekly and duration of 90 minutes, can better physical conditioning and rise muscle strength. Despite focusing on different variables, the study programme previously cited obtained effective results. Such information can be attributed to the activity prolongation, which kept children in movement for a longer time, revealing betterment of the physical conditions.

The results of this study, despite being a different type, can be compared to what Sá & Pereira (2003) had ascertained. They assessed the balance and motor coordination based on the protocol of Bruininks & Oseretsky. One assessed 8–12 year–old male children who were starting to do judo. The authors also did not find great difference for the EG group and CG group at the capacity of balance after 36 weeks of physical straining, specific for balance. By contrast, regarding the capacity of motor coordination, the results were contrary to this study. The authors found great difference for CG and EG, showing that the physical training programme specific and simultaneous to judo lessons influence positively to rise the performance of bilabial motor coordination, making the movements more harmonious.

Benites & Corazza (2003), by using the same protocol of this study, also assessed other study regarding ability and motor standards in asthmatics. The group was composed of adolescents carrying bronchial asthma (n=31), from 11 to 14 y.o. divided into five groups: Adolescents carrying slight asthma, participants in the project Natação e ginástica respiratória para crianças e adolescentes asmáticos (Swimming and Respiratory Exercise for Asthmatic Children and Adolescents); (2) adolescents carrying moderate asthma, participants in the project Swimming and Respiratory Exercise for Asthmatic Children and Adolescents; (3) adolescents carrying slight asthma, participants in physical activities at school; (4) adolescents carrying moderate asthma, participants in physical activities at school; (5) adolescents carrying slight asthma, non-participants in programmes for physical activities. After assessing all children, the results revealed that—regardless of medical condition (slight or moderate) and participation in

physical activity concerning special programmes or at school—most subjects presented a low level for motor ability and a basic motor standard. Considering such study, the authors consider how important is professionals knowing restrictions and possibilities to develop children dealing with the population. Thus, they can create encouraging motor activities, which provide a better development for abilities and motor standards.

Barros et al., (2006) assessed the neuromotor variables (inferior member strength and agility) in (boys and girls) 33 HIV-positive children between 7 and 12 y.o. The group assessed consisted of 11 children from outskirts of Sao Paulo (not institutionalised) and 22 children living at institutions specific for HIV-positive patients, all participants in school PE lessens, 2–3 times a week. The results found in such study revealed that children had impairment in neuromotor variables assessed when compared to seronegative children to a State School at São Caetano. One found statistically significant differences for institutionalised schools and non-institutionalised schools; however for gender there was no difference. According to the authors, the risks for those variables assessed in this study may have resulted from children's physical impairment caused by the HIV and drug treatment, as well as a physical education with insufficient motor stimulation for a necessarily physical betterment.

When the authors assessed the literature consulted to discuss the study, we agree with when they say that a better preparation for PE professionals (to create activities for children presenting specific fragility in their motor development) is essential. Therefore, such children can also be encouraged during the lessons, creating opportunities to improve their ability and potentiality. This is also important for such children's parents to provide, also within domestic context, investigating environments by using activities and games.

Conclusion

The results of this study reveal how efficient is the programme for respiratory exercise and swimming regarding lifestyle components. Such fact is from positive results described by parents' or in-charge persons' perceptions. Hence, it asserts how essential was having developed physical activities specific for such group concerning the betterment of general health aspects.

Regarding behaviour of expiratory flow, the participants presented a slightly betterment of results after the programme, and such results are based on what we found in other studies that also affirm that benefits from doing physical activities improve the ventilation function for asthmatic subjects.

For the results of motor performance analysis, in particular, we could observe that they were not agreeing with our expectations regarding the study. Such fact also is the contrary of what we found in other studies with asthmatic children holding interferences concerning respiratory, postural, and swimming exercises, which showed better effective results.

The restrictions found in this study concerns to the developing period (10 weeks), which may be insufficient to improve the motor requirements. There was not performed, thus for, motor exercises specific for each variable assessed (coordination, agility, balance, etc) by using the protocol.

We can observe, thus, how important is to elaborate motor programmes with longer periods (over 10 weeks) and specific to develop certain basic abilities, which benefit several health aspects in general for asthmatic subjects.

Bibliographic references

ANTES, D. L. et al. Aspectos gerais da saúde em portadores de enfermidades respiratórias praticantes de um programa de atividades físicas regulares. **Lecturas Educación Física y Deportes**, Buenos Aires, v. 13, p. 1/123-2, 2008. Disponível em: <http://www.efdeportes.com> Acesso em: 20 dez. 2008.

BARROS, C. et al. Avaliação das variáveis de força muscular, agilidade e composição corporal em crianças vivendo com HIV/AIDS. **Revista Brasileira Ciência e Movimento**, Brasília, v. 14 n. 4, p. 47-54, 2006.

BENITES, A. C. F.; CORAZZA, S.T. Habilidades e padrões motores em adolescentes portadores de asma brônquica. **Kinesis**, n. 29, ago/dez, 2003.

BETIO, J.; KREBS, R. J; KEULEN, G. V. Atividade física para portadores de asma. **Cinergis**, Santa Cruz do Sul, v. 8, n. 2., p. 7-12,

jul/dez, 2007.

BROCKMANN, P. V. et al. Actividad física y obesidad en ninõs con asma. **Revista Chilena de Pediatria**, Santiago v. 78, n. 5, p. 482-488, 2007.

CABRAL, A. L.; TEIXEIRA, L. R. (coord). **Vencendo a asma:** uma abordagem multidisciplinar. São Paulo: Ed. Bevilacqua, 1994.

CASSOL, V. E. et al. Broncoespasmo induzido pelo exercício em crianças e adolescentes com diagnóstico de asma. **Revista Brasileira de Pneumologia**, Rio de Janeiro, v. 30, n. 2, p. 102-108, 2004.

GALLAHUE, D. L. **Cross-cultural considerations in the motor performance of young children.** Indianápolis, 1994.

GALLAHUE, D. L.; OZMUN, J. C. **Compreendendo o desenvolvimento motor:** bebês, crianças, adolescentes e adultos. São Paulo: Phorte, 2005.

GUALDI, F. R.; TUMELERO, S. Asma e os benefícios da atividade física. **Lecturas Educación Física y Deportes**, Buenos Aires, año 10, n. 72 – mayo, 2004. Disponível em: <http://www.efdeportes.com> Acesso em: 23 ago. 2007.

MOISÉS, M. P. (coord). **Atividades físicas e a criança asmática.** Brasília: Ministério da Educação e do Desporto, Secretaria dos Desportos, 1993.

_____. Ginástica respiratória para asmáticos: efeito de redução do número e intensidade de crises asmáticas. **Revista Mackenzie de Educação Física e Esporte**, São Paulo, v. 5, n. esp., p. 76-81, 2006.

MACEDO JÚNIOR, A. T et al. Resposta aguda do pico de fluxo expiratório após uma sessão de exercícios de natação em crianças asmáticas. In: SIMPÓSIO NORDESTINO DE ATIVIDADE FÍSICA E SAÚDE, 6. Lauro de Freitas - BA. **Anais do VII Simpósio Nordestino de Atividade Física e Saúde**, 2007.

MORAES, G. M. L. et al. Comportamento do fluxo expiratório antes e após aula de natação em crianças portadoras de asma. **Revista Sociedade Brasileira Clínica de Medicina**, São Paulo, v. 5, n. 1, p. 7-13,

jan-fev. 2007.

PITANGA, F. J. G. **Epidemiologia da atividade física, exercício físico e saúde.** 2. ed. São Paulo: Phorte, 2004.

REZENDE, I. M. O. et al. Efeitos da reabilitação pulmonar sobre a qualidade de vida: uma visão das crianças asmáticas e de seus pais. **Acta Fisiatr**ica, São Paulo, v. 15, n. 3, p. 165-169, 2006.

SÁ, V. W.; PEREIRA, J. S. Influência de um programa de treinamento físico específico no equilíbrio e coordenação motora em crianças iniciantes no judô. **Revista Brasileira Ciência e Movimento**, Brasília, v. 11, n. 1, p. 45-52, 2003.

SILVA, C. S. et al. Avaliação de um programa de treinamento físico por quatro meses para crianças asmáticas. **Revista Brasileira de Pneumologia**, Rio de Janeiro, v. 31, n. 4, p. 270-285, 2005.

SILVA, F. M.; SANTOS, A. C.; MIRANDA, J. As atividades físicas na recuperação das crianças portadoras de deficiência respiratória. **Revista do Centro de Ciências da Saúde**, Santa Maria, v. 13, n. 4, p. 16-21, out-dez 1994.

SOCIEDADE BRASILEIRA DE PNEUMOLOGIA E TISIOLOGIA. **Manual de pneumologia.** Porto Alegre, 2002.

TAKETOMI, E. A.; MARRA, S. M. G.; SILVA, G.R. Fisioterapia em asma: efeito da função pulmonar e em parâmetros imunológicos. **Fitness & Performance Journal**, Rio de Janeiro, v. 4, n. 2, p. 97-100, mar/abr. 2005.

WEISGERBER, M. C. et al. Benefits of swimming in asthma: effect of a session of swimming lessons on symptoms and PFTs with review of the literature. **Journal of Asthma**, v. 40, n. 5, p. 453-54, 2003.

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