96 - EXERCISE PROGRAM FOR CHILDREN AND ADOLESCENTS WITH DOWN SYNDROME: LITERATURE REVIEW

JULIANA RIBEIRO GOUVEIA REIS;
LILIAN CRISTINA GOMES DO NASCIMENTO;
MARIA GEORGINA MARQUES TONELLO
Universidade de Franca. Franca, SP, Brasil.
julianargr@hotmail.com

doi: 10.16887/85.a2.96

I – INTRODUCTION

Down syndrome (DS) is a genetic condition that results in specific mental and physical characteristics that brings a delay in motor development in early childhood and cognitive impairment at school age (Ribeiro, 2009).

It is the most common genetic cause of mental disability. It is considered the most common chromosome aberrations in newborn infants, with an incidence of 1/660 births, with an average of 8.000 new cases per year in Brazil. (NISLI, 2009).

According to the Brazilian Geography and Statistics Institution(IBGE) In the 2.000th year Census, there were 300.000 Down syndrome people in Brazil, under a 50 years life expectancy.

According to Martins in 2013, the performance of people with SD is lower than people who do not have the syndrome, that fact could be explained by the way that SD people realize the adaptive reaction that involves how this individual sets up its world. In this case, the motor, verbal, and graphical responses of SD are slower due to their limitations by internal aspects (deficits in short-term memory, cerebellar hypoplasia, motivation, interactive processes) and external aspects (exciting environment, parental involvement), but they can all be minimized with appropriate support.

The literature has been established that physical activity interventions may help in the development of DS children and adolescents. Therefore the aim of this paper was to evaluate, by a systematic review, exercise protocols employed among DS children and adolescents.

II-METHODS

This study was under taken through a literature survey of papers published from January 2013 to August 2014, regarding the electronic databases PubMed, Scopus and Medicine®, using the following Keywords: "Down Syndrome", "children", "adolescent", "exercise therapy", "rehabilitation".

The inclusion criteria were randomized controlled trials with follow-up less than two months, in DS children and adolescents who had exercise therapy as an intervention. Some studies were excluded: the ones that presented unsuitable patients, inappropriate interventions or in which the control group performed exercise.

III- RESULTS

Thirty studies involving exercise and SD protocols were identified. However, after applying the inclusion criteria, only 9 were part of the scope of this review - 3 studies were related to aerobic exercise, 2 were about resistance exercise, 2 regarded mixed protocols and 1 vibratory exercise.

Study	Intervention and method	Outcomes
Wu et al 2014	36 DS children, randomized into 2 groups	High Intensity Training improved the development of pattern joint.
Apoloni et al 2013	12 DS children, randomized into 2 groups: IG-Trampoline+run+jump 10 minutes -3x/ week for 12 weeks CG- no intervention Strength and force plate	Reduction of the center of pressure area, anteroposterior average speed, average lateral and anteroposterior frequency that resulted in improved posture.
Aguero et al 2013	30 DS adolescents, randomized into2groups: IG- 20 weeks of whole body vibration(WBV) CG –without intervention body composition DXA	20 weeks of WVB trainings were not sufficient to increase the lean body mass in DS adolescents, but it could be useful to improve the body composition in this population.
Aguero et al 2012	28 children and adolescents were randomized into 2 groups: GI-Exercise conditioning and jumps 25 minutes, 2x/ week for 21 weeks CG: Did not exercise. DXA	Increased total lean body mass and bone mineral density.
Lin et al 2012	92 SD adolescents were randomized into 2 groups: IG: treadmill exercise for 5 minutes and 20minutes of activity based on virtual reality administered three times a week for 6 weeks. CG: no intervention Pre and post-test for muscle strength, performance and agility	A physical short-term training program used in this study was able to improve muscle strength, performance and agility in DS adolescents.
Grupta et al 2011	23 children and adolescents with Down syndrome were randomized into 2groups IG-Resistance exercises for upper body and balance training for 6 weeks CG-usual activities at school Handgrip strength(dynamometer) and Test of Motor Proficiency Bruininks Oseretsky	There was an increase in muscle strength and balance significant improvement
Shields et al 2010	70 teens randomized into 2 groups: IG-progressive resistance training 2x/ week for 10 weeks CG-recreational activities withoutphysical training. Muscle strength and performance tasks.	Improvement in the performance of work tasks with progressive resistance training
Khalili et al 2009	44 children with DS IG - Aerobic exercise for 30 minutes, 5 days a week for eight weeks(walking, running and cycling, moderate intensity). CG- without intervention Spirometry	An 8-week program of aerobic exercise improved lung function in infants with intellectual disabilities
Lotan et al 2007	68 DS adolescents (30 female, 38 male) were randomized into 2 groups IG-The participants were trained twice a week for 10 weeks (n= 34). CG-participated in a social group(n =34). Task performance, muscle strength and physical activity levels.	There was no difference between groups in task performance. The IG has increased its force of upper and lower limbs in 11th week compared to the CG, but only muscle strength of lower limbs in 24th week.

IV- DISCUSSION

Results confirmed that physical exercise is able to promote positive health effects in DS children and adolescents, which includes balance and posture improvement, body composition, muscular strength, agility, tasks performance and lung function increase.

DS Children presented a development of postural control similar to the children with typical development, however, the development is followed by motor difficulties and postural deficits until they reach adult age, so exercise is able to help in the development of DS children and adults (CARVALHO, 2008).

Apoloni(2013) took a different trial in which the children had to jump on a trampoline, run and jump again for 10 minutes. This model lasted 12 weeks and was performed three times a week. It was possible to record a reduction of pressure center, anteroposterior, mediolateral average speed and anteroposterior frequency, showing posture improvement.

The balance can also be damaged due to factors such as difficulties in motor coordination, cerebellar hypoplasia, co-contraction of agonist-antagonist muscles, difficulty in integrating, realizing and making slow movements to adapt to the changing tasks at the environment conditions (OLIVEIRA, 2013). Other authors demonstrated significant improvement in balance with the application of a protocol for 6 weeks with resistance training of the upper limbs associated with balance training protocol (Gupta, 2011).

Another condition in SD is the change in body composition, which progresses to low mineral levels bone, predisposing to osteoporosis and bone fragility risks. Aguero et al in 2011 proposed an exercise protocol that involved performing jumps and conditioning exercises and verified positive effects on bone mineral content with the increase in total slim mass in DS children and adolescents. The same author in 2013 applied a protocol full body vibration protocol during 20 weeks, but this mode was not effective in altering body composition.

The study by Lin and colleagues (2012) proposed a 20 minutes exercise protocol based on virtual reality and treadmill, three times a week during 6 weeks. This training was able to increase muscle strength in DS children. It is not possible to attribute task performance and agility to fragmented specific causes of motor difficulties presented by these individuals. Either way, there were also identified some difficulties in understanding and processing information, especially those related to feed back for the reorganization of motor actions (Barros, 2012).

Previous studies emphasize that there is the kind of exercise able to enhance task performance and agility in DS children and adolescents. Shields (2010) who applied a protocol of progressive resistance exercises twice a week for 10 weeks demonstrated this outcome. Moreover, Lotan et al (2007) applied a protocol of resistance training for a 68 DS adolescents group and this was not able to improve tasks performance.

Lin et al showed positive results in agility with DS who had been part of a group intervention based on virtual reality. The study by Wu e tal(2014) showed upon a year followed-up study the effectiveness of an high intensity workout in the development of joint pattern. However, a protocol based on recreational exercise, was unable to promote similar effects(Borsatti, 2013).

Many Down syndrome children have abnormalities affecting lung function, such as congenital heart disease, pulmonary hypertension, pulmonary hypoplasia, upperairway immunodeficiency and obstruction. Therefore relative changes lower airways, arehypotonia, obesity, immune dysfunction, cardiacdisease, largeairwaycompression, reduced volume of the lower respiratory tract, tracheobronchomalacia, pulmonary hypoplasia, subpleuralcysts, gastroesophageal reflux, nasal congestion, tonsil andadenoids. Such disorders predisposes this population to recurrent infections and it impacts their life quality (SOARES, 2004).

Kalli(2009) developed a program of aerobic exercise, consisting of moderate-intensity exercise, such as walking, running and cycling, with a duration of 30 minutes 5 times a week for 8 weeks and checked improvement in lung function in DS children with DS.

V-CONCLUSION

This study found that it was not possible to establish a consensus on the best activity to this particular population. However, most studies confirms the benefits of physical activity, in general to the health of DS children and adolescents. It is important to notice the limitations of studies that aimed to investigate the effect of exercise on various factors, including the quality of the methodology employed in clinical trials and inconsistent results, there is strongly scientific evidence published by different research groups that confirms the importance of exercise for DS individuals. Therefore physical exercise is the main focus in rehabilitation programs as well as potentially interactive facts of behavior, both of them determinants for health promotion.

REFERENCES

AGUERO, A.G.; RODRÍGUEZ, G.V.; CABELLO, A.G.; ARA, I.; MORENO, L.; CASAJÚS, J. A. A 21-week bonde deposition promoting exercise programme increases bone mass in young people with Down syndrome. Developmental medicine & child neurology. 54, p. 552-556, 2012.

APOLONI, B. F.; LIMA, F.E.B.; VIERIA, J.L.L. Efetividade de um programa de intervenção com exercícios físicos em cama elástica no controle postural de crianças com Síndrome de Down. Revista Brasileira Educação Física do Esporte. V. 27, n. 2, p. 217-223, 2013.

BARROS, F.C.; FREITAS, A.; GIMENEZ, R. Controle motor e sincronização temporal de indivíduos com Síndrome de Down diante de restrições na tarefa motora. Science in Health. V. 3, n.3, p. 125-130. Set-sez, 2012.

BORSATTI, F.; ANJOS, F.B.; RIBAS, D.I.R. Efeitos dos exercícios de força muscular na marcha de indivíduos portadores de Síndrome de Down. Fisioter. Mov, v.26, n.2, p 329-335, abril/junho, 2013.

CARVALHO, R.L.; ALMEIDA, G. L. Controle postural em indivíduos portadores da síndrome de Down: revisão da literatura.Fisioterapia e Pesquisa, v. 15, n.3, p 304-308, julho/set. 2008.

GRUPTA, S., RAO, B.K. Effect of strength and balance training in children with Down`s syndrome: a randomized controlled trail. ClinRehabil. V. 25, n. 25, p. 425-432, may., 2011.

HORAK FB, MACPHERSON JM. Postural orientation and equilibrium. In: Sehaprd J, Rohwell L (eds). Hand book of physiology. New York: University Press; 1995.

KHALILI, M.A. ELKINS, M.R. Aerobic exercise improves lung function in children with intelectual disability: a randomized trial. Aust J Physiother. V.55, n. 3, p. 171-175, 2009.

LIN, H.C.; WUANG, Y.P. Strengh and agility tranining in adolescents with Down syndrome: a randomized controlled trial. Rev. Dev. Disabil. V. 33, n.6, p. 2236- 2244, nov/ dez. 2012.

OTAN, M. Quality physical intervention actvity for persons with Down syndrome. Scientific World Journal. V. 7, p. 7-19, 2007.

MARTINS, M.R.I.; FECURI, M.A.B.; ARROYO, M.A.; PARISI, M.T. Avaliação das habilidades funcionais e de auto cuidado de indivíduos com Síndrome de Down pertencentes a uma oficina terapêutica. Rev. CEFAC. Mar-Abr; v. 15, n. 2:p.361-365, 2013.

NISLI, K.Prevalência de cardiopatias congênitas em portadores da síndrome de Down. Jornal de Pediatria, v. 85, n 5, p.. 377-378, 2009.

OLIVEIRA, T. F.; VIEIRA, J.L.L.; SANTOS, A.I.G.G.; OKAZAKI, V.H.A. Equilíbrio dinâmico em adolescentes com Síndrome de Down e adolescentes com desenvolvimento típico. Motriz, v. 19, 0.2, p 378-390, abril/ junho, 2013.

SHIELDS, N.; TAYLOR, N. F.; FERNAHALL. A Study protocol of a randomized controlled trail to investigate if a community based strengh training programme improves work task performance in Young adults with Down syndrome. BMC Pediatrics, 10:17, 2010.

SORES, J.A.; BARBOZA, M. A.I.; CROTI, U.A.; FOSS, M.H.D.A., MOSCARDINI, A.C. Distúrbios respiratórios em crianças com Síndrome de Down. ArqCienc Saúde, v.11, n. 4, p. 230-233, out-dez, 2004.

RIBEIRO, M.F.M.; BARBOSA, M. A.; PORTO, C.C. Paralisa cerebral e síndrome de Down: nível de conhecimento e informação dos pais. Ciência & Saúde Coletiva, 16 n.4, p. 2099-2106, 2011.

WU, J.; LOOPER, J. ULRICH, R.M.A.B. Effects of various treadmill interventions on the development of join kinematics in infants with Down Syndrome. Physical Therapy, V.90, n.9 p 1265-1277, 2014.

Rua Major Gote, 808, Bairro: Caiçaras, Patos de Minas- Minas Gerais

EXERCISE PROGRAM FOR CHILDREN AND ADOLESCENTS WITH DOWN SYNDROME: LITERATURE REVIEW

ABSTRACT

Down syndrome (DS) is a genetic condition that results in particular physical and intellectual characteristics, causing a delay in development. The aim of this study was to determine, by a systematic review of the literature, the exercise protocols employed in children and adolescents with DS. In the research, there were previously established criteria and it was possible to identify thirty studies, but only nine were part of the scope of this review. From this nine studies, three of them regarded aerobic exercise protocols, two were about resistance exercise, two experimented a protocol combination, and there was one vibratory exercise approach. We conclude that all studies showed benefits for this population, however, there is no consensus about the best activity to indicate. We suggest that future studies should propose different exercise protocols for analysis of each variable assessed to establish best parameters for practicing physical activity in this population.

KEYWORDS: Down syndrome, exercise, health promotion

PROGRAMME D'EXERCICE POUR LES ADOLESCENTS AVEC SYNDROME DE DOWN: UN EXAMEN SYSTÉMATIQUE

RÉSUMÉ

La trisomie 21 est une maladie génétique qui se traduit par des caractéristiques physiques et intellectuelles spécifiques, entraînant un retard de développement.Le but de cet article a été de déterminer, par un examen systématique de la littérature, les protocoles d'exercice utilisés chez les enfants et adolescents atteints de la trisomie 21.A la recherche, 30 études ont été identifiées à partir de l'application de critères préalablement définis, et seulement 9 ont fait partie de la portée de cet examen, et de ceux-ci, trois étaientsur l'exercice aérobie, deux sur des exercices de résistance, deux protocoles mixtes, un exercice de vibration. Il est conclu que toutes les études ont montré des bénéfices de cette population, mais il n'y a pas de consensus sur quelle activité doit être indiquée.Nous suggérons que les études futures devraient proposer des protocoles d'exercices différents pour l'analyse de chacune des variables évaluées pour déterminer les meilleurs paramètres pour la pratique de l'activité physique dans cette population.

PROGRAMA DE EJERCICIOS PARA ADOLESCENTES CON SÍNDROME DE DOWN: UNA REVISIÓN SISTEMÁTICA

RESUMEN

El síndrome de Down (SD) es un trastorno genético que da lugar a las características físicas e intelectuales específicas, lo que resulta en un retraso en el desarrollo. El objetivo de este trabajo fue determinar, a través de una revisión sistemática de la literatura, los protocolos de ejercicio usados en niños y adolescentes con síndrome de Down. En la búsqueda se identificaron 30 estudios de la aplicación de criterios previamente definidos, sólo 9 eran parte del alcance de esta revisión, y de éstas, tres tratados es el ejercicio aeróbico, el ejercicio de resistencia dos, dos, protocolos de ejercicios mixtos una vibración. Se llegó a la conclusión de que todos los estudios mostraron beneficios a esta población, sin embargo, no hay consenso acerca de la mejor actividad que debe indicarse. Sugerimos que los estudios futuros deben proponer diferentes protocolos de ejercicio para el análisis de cada variable evaluada para establecer los mejores parámetros para la práctica de la actividad física en esta población

PROGRAMA DE EXERCÍCIOS PARA CRIANÇAS E ADOLESCENTES COM SÍNDROME DE DOWN: UMA REVISÃO SISTEMÁTICA

RESUMO

A síndrome de Down (SD) é uma condição genética que resulta em características físicas e intelectuais específicas, ocasionando um atraso no desenvolvimento. O objetivo deste artigo foi determinar, por meio de uma revisão de literatura sistemática, protocolos de exercício utilizados em crianças e adolescentes com SD. Na busca foram identificados 30 estudos, a partir da aplicação dos critérios previamente definidos, apenas 9 fizeram parte do escopo desta revisão, sendo que desses, três tratavam-se de exercícios aeróbicos, dois de exercícios resistidos, dois protocolos misto, um exercício vibratório. Conclui-se que todos estudos apresentaram benefícios a essa população, entretanto não existe um consenso sobre qual a melhor atividade a ser indicada. Sugerimos que estudos futuros devem propor diferentes protocolos de exercícios para análise de cada variável avaliada a fim de estabelecer melhores parâmetros para a prática da atividade física dessa população.

PALAVRAS-CHAVE: Síndrome de Down, exercício físico, promoção de saúde.