PESO MÁXIMO DA MOCHILA RECOMENDADO PARA CRIANÇAS EM CONTEXTO ESCOLAR: UMA *SCOPING REVIEW*

PESO MÁXIMO RECOMENDADO DE LA MOCHILA PARA NIÑOS EN EL CONTEXTO ESCOLAR: UNA REVISIÓN DEL ALCANCE

MAXIMUM BACKPACK WEIGHT RECOMMENDED FOR CHILDREN IN SCHOOL CONTEXT: A SCOPING REVIEW

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RESUMO

Objetivos: mapear a evidência em relação ao peso máximo da mochila recomendado para crianças em contexto escolar.

Metodologia: sugerida pelo Joanna Briggs Institute. A análise de relevância dos artigos, a extração e síntese dos dados desenvolveu-se por dois revisores independentes. Questão de partida: qual o peso máximo da mochila recomendado para crianças, dos 6 aos 12 anos, em contexto escolar? Fontes de dados: estudos primários publicados em bases de dados científicas, diretrizes internacionais e literatura cinzenta.

Síntese dos dados: identificaram-se 353 publicações, onde foram incluídas 28. A percentagem de peso recomendada subdivide-se em duas categorias: com recomendação (que oscila entre 5%-20%) e sem recomendação.

Conclusões: Esta *scoping review* permitiu mapear a evidência em relação ao peso máximo da mochila recomendado para crianças em contexto escolar, onde o valor de 10% foi o que obteve maior consenso.

Descritores: Criança, Suporte de carga, Escolas, Serviços de saúde escolar, Enfermagem em Reabilitação

RESUMEN

Objetivos: mapear la evidencia en relación con el peso máximo de mochila recomendado para niños en el contexto escolar.

Metodología: sugerida por el Instituto Joanna Briggs. El análisis de relevancia de los artículos, la extracción y síntesis de los datos fue realizado por dos revisores independientes. Pregunta inicial: ¿cuál es el peso máximo de la mochila recomendado para niños de 6 a 12 años en un contexto escolar? Fuentes de datos: estudios primarios publicados en bases de datos científicas, directrices internacionales y literatura gris.

Resumen de los datos: se identificaron 353 publicaciones, de las cuales se incluyeron 28. El porcentaje en peso recomendado se divide en dos categorías: con recomendación (que va del 5% al 20%) y sin recomendación.

Conclusiones: Esta revisión de alcance permitió mapear la evidencia en relación con el peso máximo de la mochila recomendado para niños en la escuela, donde el valor del 10% fue el que obtuvo el mayor consenso.

Palavras clave: Niño, Carga de peso, Escuelas, Servicios de salud escolar, Enfermería en Rehabilitación

ABSTRACT

Objectives: to map the evidence in relation to the maximum backpack weight recommended for children in school context.

Methodology: it was suggested by the Joanna Briggs Institute. The relevance analysis of the articles, the extraction and synthesis of the data was carried out by two independent reviewers. Starting question: what is the maximum backpack weight recommended for children, from 6 to 12 years old, in school context. Data sources: primary studies published in scientific databases, international guidelines and gray literature.

Summary of the data: 353 publications were identified, out of which 28 were included. The recommended weight percentage is divided into two categories: with recommendation (ranging from 5% -20%) and without recommendation.

Conclusions: This scoping review allowed mapping the evidence in relation to the maximum weight of the backpack recommended for children in school, where the value of 10% was the one that obtained the greatest consensus.

Keywords: Child, Weight-Bearing, Schools, School Health Services, Rehabilitation Nursing.

INTRODUCTION

The regular use of school backpacks, often heavy and/or innappropriate, which hold manuals and materials for the entire school day, presents a multiplicity of risks, especially during the period of a child's growth [1 - 3].

In fact, children and young people, still in the process of growth, have greater vulnerability and immaturity of the musculoskeletal system, as ossification is incomplete and there is a large amount of cartilaginous tissue, which contributes to an increased incidence of musculoskeletal injuries (MSI) due to overload[4], namely scoliosis, hyperkyphosis and hyperlordosis in various stages of growth [5-6].

According to the National School Health Program (2015-2020), MSIs in students often result from the physical overload associated with excess weight of backpacks, the adoption of incorrect postures, due to the inadequacy of school furniture to its anthropometric and to inappropriate sporting activity, either due to the type of practice or excessive exercise[7].

Since 1977, there has been scientific reference regarding the percentage of weight that a child must carry in the school bag, which should not exceed 10% of their body weight, ie, the maximum acceptable limit will be 1/8 of their body weight [8].

Since then, this value has been accepted by the scientific community [3, 9], although there are studies that oppose this percentage, suggesting other values [10-11], or even stating that it is not appropriate to suggest the same for all children's backpack weight limit, that is, a single weight limit may not be suitable for all students[12].

Thus, it is clear that the recommended weight percentage of the school backpack it still not unanimous, and this issue involves a multifactorial complexity that should deserve the full attention of the school community (SC), which includes students, teachers, parents and other professionals[7], from the school health and scientific community, through a more in-depth literature review, through the scoping review methodology, since after conducting a preliminary survey at the Joanna Briggs Institute (JBI) Database of Systematic Reviews and Implementation Reports, the Cochrane Database of Systematic Reviews, the Cumulative Index to Nursing and Allied Health Literature (CINAHL) (via EBSCO) and the Medical Literature Analysis and Retrieval System Online (MEDLINE), via PubMed, did not find any literature reviews published in this thematic scope[13].

This scoping review intends to contribute to the standardization of actions in the field of School Health, based on the reference to a maximum backpack weight recommended in scientific studies, "where the discipline of Nursing, namely the Rehabilitation specialist nurse, can develop actions for diseases prevention and strengthening of protective factors" [13; 50], through concerted action in the implementation of Postural Education Programs (PEP), duly supported.

This literature review aims to: (a) map the evidence regarding the maximum recommended backpack weight for children aged 6 to 12 years-old in a school context; (b) identify recommendations related to the topic; (c) identify areas of research and future investigations.

METHODS

In order to deepen the knowledge on this subject, a scoping review protocol was elaborated[13], with the starting question: what is the maximum recommended backpack weight for children, aged 6 to 12 years-old, in a school context ?

This scoping review adopted the methodology suggested by the JBI, described by The JBI Reviewers' Manual[14]. With this method, it was intended to provide a map of the reach of available evidence, when a specific issue is not yet clear, as is the case[14].

The selection criteria were defined and applied according to the PCC methodology (P- Population, C - Concept, C - Context):

• Population (P): children aged from 6 to 12 years-old, regardless of gender;

• Concept (C): maximum recommended backpack weight for children;

• Context (C): Basic education schools (BE) (1st and 2nd cycles of studies), regardless of geographic location and educational system.

Between February and July 2018, the articles presented in full text and that the language included Portuguese, English and Spanish were analyzed. All references cited by the articles included were taken into account.

Primary studies covering the subject studied, in databases, published international guidelines and gray literature were included. In studies with children who had a different age range, the inclusion criteria were studies in which the mean age of participants was less than 13 years-old. As exclusion criteria, opinion articles and news were not included.

The search strategy was divided into three stages: first, an initial search was carried out in the CINAHL, Medical Literature Analysis and Retrieval System Online (MEDLINE), Mediclatina, Sportdiscus, databases. Academic Searchcomplete, via EBSCO Host Online Research Databases, where the words contained in the title, abstract and keywords were analyzed.

In a second research, the keywords and/or descriptors duly selected were used: schoolbag; backpack*; load*; safe weight; load carriage; child*; school*, which gave rise to the Boolean phrase schoolbag OR backpack* AND load* AND safe weight OR load carriage AND child* AND school* NOT adult* NOT adolescen*. This phase included a search of the Institute for Scientific Information (ISI) Web of Science databases; CINAHL, MEDLINE, Mediclatina, Sportdiscus, Academic Searchcomplete; National Center for Biotechnology Information (NCBI)/PUBMED. Research was also carried

out in the Portugal Scientific Repository of Open Access (RCAAP).

Finally, a list of all publications found was created.

Data were extracted from the included articles, by two independent reviewers, using a table-type instrument (Table 1), developed specifically for this review, taking into account specific details about the relevant population, concept, context and research methods for the question and for the stated objectives of this scoping review, as indicated by the methodology developed by JBI.

ANALIZED SCIENTIFIC PAPER	
Reviewer:	Date of extraction: __/__/__
Database	
Article Códe	Title
Authors	
Year	
Country	
Expertise	
Population/Sample	
Methodology	
Results/Details **Recommended backpack weight**	
Suggestions/Recommendations/Reviewer Comments	
Bibliography cited	

***Table 1** – Instrument for extracting data from the analyzed studies.Porto, Portugal, 2018*

The reviewers compared the findings of the surveys carried out in the different databases, verified the differences and resolved the disagreements in the findings, culminating in the results of this scoping review.

RESULTS

353 publications were identified in different databases. It should be noted that no gray bibliography inherent to the theme was found in the RCAAP.

The process of extracting the articles is outlined, in the form of a Prisma diagram, in Figure 1.

At the end of the last stage, 28 studies were included to integrate the sample, of which six emerged from the cited references (Table 2).

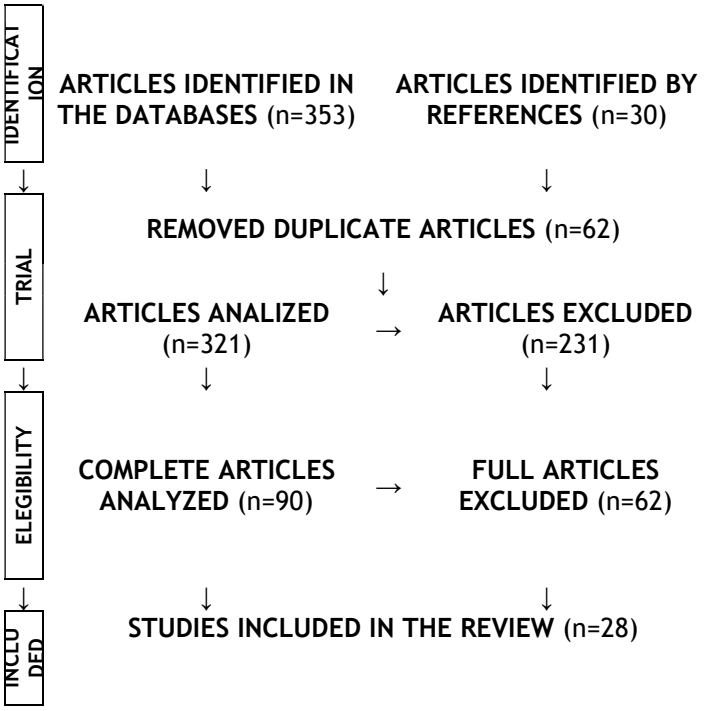
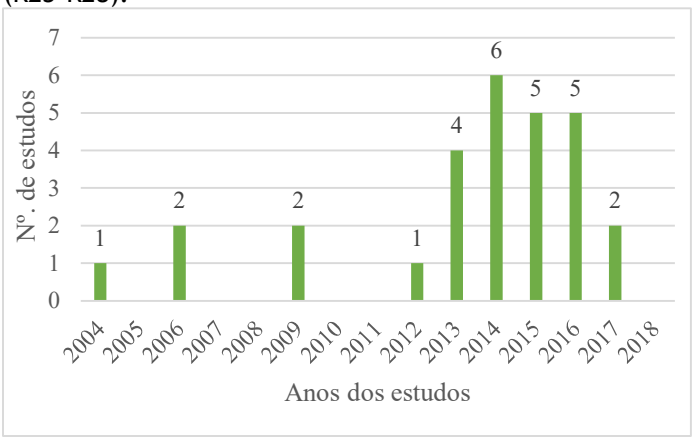


***Figure 1** – PRISMA diagram of the study selection processs. Porto, Portugal, 2018*

Table 3 presents the objectives of each of the 28 studies included.

Most studies address the relationship between school backpack weight and body posture and/or pain, the effect of the backpack on plantar pressure/reaction forces and gait parameters, and the impact of backpack weight on ventilatory function.

Regarding the years of publication of the studies included in this scoping review, as can be seen in Graphic 1, twenty-two of the studies were published from the year 2013 (R2-R22) and six before this year (R23-R28).



***Graphic 1** – Distribution of the year of publication of studies.Porto, Portugal, 2018*

R1	**Mosaad DM, Abdel-Aziem AA.** Backpack carriage effect on head posture and ground reaction forces in school children. Work. 2015; 52(1): 203-209. DOI: 10.3233/WOR-152043
R2	Khallaf ME, Fayed EE, Ashammary RA. The effect of schoolbag weight on cervical posture in schoolchildren. Turk J Phys Med Rehab. 2016; 1(62): 16-21. DOI: 10.5606/tftrd.2016.12754.
R3	Silva D, Soares H, Rodrigues MA. Schoolbag weight and the postural and psychophysical changes in young Students: a Pilot Study. Occupational Safety and Hygiene IV. 2016: 453-457 DOI: http://dx.doi.org/10.1016/j.ergon.2015.09.010
R4	Dockrell S, Blake C, Simm C. Guidelines for schoolbag carriage: an appraisal of safe load limits for schoolbag weight and duration of carriage. Work. 2016; 53: 679-688. DOI: 10.3233/WOR-162260.

R5	Drzał-Grabiec J, *et al*. Effect of asymmetrical backpack load on spinal curvature in school children. Work. 2014; 51(2): 1-6. DOI: 10.3233/WOR-141981
R6	Al-Katheri AE. Impact of backpack load on ventilatory function among 9-12 year old Saudi girls. Saudi Medical Journal. 2013; 34(12): 1255-1261. DOI: 10.1080/00140139.2014.997803
R7	Adeyemi AJ, Rohani JM, Rani MRA. Interaction of body mass índex and age in muscular activities among backpack carrying male schoolchildren. Journal of Prevention Assessment & Rehabilitation. 2014; 52(3): 677-686. DOI: 10.3233/WOR-152102
R8	Kabilmiharbi N, Santhirasegaram TA. Study on relationship between carrying schoolbags and the prevalence of neck and back pain among 7 – 9 year old students. MATEC Web of Conferences. 2017; 87. DOI: 10.1051/matecconf/20178702013
R9	Bahiraei S, Jafarian M, Mohammad E. The effects of backpack weight on the static and dynamic balances of female students. Annals of Applied Sport Science. 2015; 3(3): 57-66.
R10	Mo SW, *et al*. Effect of backpack load on the head, cervical spine and shoulder postures in children during gait termination. Ergonomics. 2013; 56(12): 1908–1916. DOI: 10.1080/00140139.2013.851281
R11	Dianat I, *et al*. The use of schoolbags and musculoskeletal symptoms among primary school children: are the recommended weight limits adequate? Ergonomics. 2014; 56(1): 79–89. DOI: 10.1080/00140139.2012.729612
R12	Malik M, Vinay D, Kumkum P. Assessment of change in cervical and shoulder posture due to carriage of different weight of backpack. 2017; 9(2): 1266-1275. DOI: 10.31018/jans.v9i2.1353
R13	Adeyemi AJ, Rohani JM, Rani MR. Backpack-back pain complexity and the need for multifactorial safe weight recommendation. Applied Ergonomics. 2016: 1-10. DOI: 10.1016/j.apergo.2016.04.009
R14	Song Q, *et al*. Effects of backpack weight on posture, gait patterns and ground reaction forces of male children with obesity during stair descent. Research in Sports Medicine: An International Journal. 2014; 22(2): 172-184. DOI: 10.1080/15438627.2014.881823
R15	Zhou N, *et al*. Effects of daily used bags on biomechanics characteristic of elementary. 2016; 16(4): 265-274. DOI: 10.24264/lfj.16.4.2
R16	Usman G, Agha S, Ameen F. Effects of heavy bags, plus desks and postural variations association with lower back pain in school going children. Gomal University Journal of Research. 2014; 30(1): 76-83.
R17	Dockrell S, Simms C, Blake C. Guidelines on schoolbag use: messaging to inform the stakeholders. Work. 2016; 54: 489–492. DOI: 10.3233/WOR-162260
R18	Vieira AC, Ribeiro F. Impact of backpack type on respiratory muscle strength and lung function in children. Ergonomics. 2015; 58(6): 1005-1011. DOI: 10.1080/00140139.2014.997803
R19	Walicka-Cuprys K, *et al*. Influence of the weight of a school backpack on spinal curvature in the sagittal plane of seven-year-old children. BioMed Research International. 2015; 1-6. DOI: 10.1155/2015/817913
R20	Zhou N, *et al*. Investigation of the effect of varied schoolbag weight on the health of primary. Pielarie Incaltaminte. 2015; 15(3): 159-168. DOI: 10.24264/lfj.15.3.3
R21	Terpstra R. September 17 is National School Backpack. Curriculum Review. 2014; 54(1)
R22	Kistner F, *et al*. Postural compensations and subjective complaints due to backpack loads and wear time in schoolchildren. Pediatric Physical Therapy. 2013; 25(1): 15-24. DOI: 10.1097/PEP.0b013e31827ab2f7
R23	Shasmin, H. N., *et al*. A Preliminary Study of Acceptable Load Carriage for Primary School Children. Biomed. 2006; 15: 171-174. DOI: 10.1007/978-3-540-68017-8_44
R24	Bauer, DH, Freivalds, A. Backpack load limit recommendation for middle school students based on physiological and psychophysical measurements. Work. 2008; 32: 339–350. DOI: 10.3233/WOR-2009-0832
R25	Dockrell S, Simms C, Blake C. Schoolbag weight limit: can it be defined? Journal of School Health. 2013; 83(5): 368-377. DOI: 10.1111/josh.12040.
R26	Brackley HM, Stevenson JM. Are children's backpack weight limits enough? A critical review of the relevant literature. Spine. 2004; 29(19): 2184–2190. DOI: 10.1097/01.brs.0000141183.20124.a9
R27	Lindstrom-Hazel D. The backpack problem is evident but the solution is less obvious. Work. 2009; 32: 329–338. DOI: 10.3233/WOR-2009-0831.
R28	Razali R, *et al*. Accetable load carriage for primary school girls. European Journal of Scientific Research. 2006; 15(3): 396-403.

Table 2 *– Bibliographic references of the articles included. Porto, Portugal, 2018*

AIMS

R1 - To evaluate the effect of backpack transport on neck angles and ground reaction forces in children.

R2 - To relate the effect of various loads from the school bag on the cervical posture during static posture and after walking.

R3 - To analyze the applicability of a new experimental procedure to determine biomechanical and psychophysical changes in young students, while carrying a school bag on one and two shoulders.

R4 - To analyze the existence of musculoskeletal discomfort based on the percentage of body weight, school backpack weight and duration of transport.
R5 - To evaluate the parameters of body posture in the sagittal plane for an asymmetric backpack load equal to 10% of a child's body mass.
R6 - To explore backpack load in the form of percentile of body weight and its impact on ventilatory function.
R7 - To analyze the interaction between body mass index and age in muscle activities, backpack height and perceived level of pain, resulting from the different weight of school backpacks.
R8 - To relate the way to carry the school bag and the prevalence of neck and back pain in students.
R9 - To analyze the effects of the school bag on the balance of female students.
R10 - To quantify the effects of carrying different backpack loads on posture while walking.
R11 - To analyze the relationship between the use of school bags and the prevalence of musculoskeletal symptoms
R12 - To measure the percent variation in the students' neck and shoulder posture angles due to carrying different backpack weights.
R13 - To analyze school backpack-related back pain and other related risk factors.
R14 - To analyze the effects of backpack weight on posture, gait pattern and ground reaction forces in obese children.
R15 - To evaluate the effects of daily used school bags on biomechanical characteristics.
R16 - To relate the use of heavy school bags and school desks in postural variations and low back pain in children.
R17 - To provide school backpack transport guidelines as a knowledge base for stakeholders including users (children), parents, backpack manufacturers and other stakeholders such as teacher organizations, health professionals and policy makers.
R18 - To analyze the influence of the backpack type on lung function and respiratory muscle strength in children.
R19 - To relate the weight of the school bag with the child's body weight and body posture
R20 - To explore the effects of different weights of school bags on the biomechanics of elementary school students.
R21 - To inform about national school backpack awareness day.
R22 - To analyze the effects of carrying heavy backpacks up to 20% of body weight on posture and pain complaints in elementary school children.
R23 - To analyze changes in ground reaction forces and trunk tilt among elementary school students when carrying heavy school bags.
R24 - To assess posture, heart rate, perceived exertion, and perceived pain to find an acceptable backpack load limit for high school students.
R25 - To review the literature on school backpacks with special emphasis on load limit and musculoskeletal pain guidelines.
R26 - To review the literature on epidemiology, physiology and biomechanics that contribute to establishing a weight limit for children's school bags.
R27 - To review the literature on the risk of back pain in school-age children associated with carrying school bags.
R28 - To analyze how increased backpack load affects gait and posture in elementary school children.

Table 3 *– Objectives of included articles. Porto, Portugal, 2018*

Fifteen studies were carried out in Asia [R2, R6-R16, R20, R23, R28], seven in Europe [R3-R5, R17-R19 R25], five in North America [R21-R22, R24, R26-R27] and a study comes from the African continent [R1].

Regarding the specialty/area of intervention of the authors of the studies, most articles were carried out in the scope of Engineering [R3, R7-R8, R13, R15, R20, R23-R24, R28], Physiotherapy [R1-R2 , R4, R6, R17, R19, R22, R25] and in the area of Sports Science [R5, R9-R10, R14, R26]. The remainders are distributed by specialties such as Occupational Therapy [R21, R27], Occupational Health [R11], Family Resource Management [R12], Community Health [R16] and Health Sciences [R18].

Regarding the samples used, in the different studies included, there is an oscillation between 5 and 500 participating children.

Three studies were carried out only with female children [R6, R9, R28] and four male children [R3, R7, R10, R23]. All the rest were carried out with children of both genders.

The ages included in the studies in this literature review range from 6 to 15 years-old, but the average age of participants was always less than 13 years-old, in order to meet the defined PCC criteria.

As for the research methodology, it was found that twelve studies are experimental [R3, R6-R7, R10, R12, R14-R15, R20, R22-R24, R28], seven descriptive-correlational [R2, R4-R5, R11, R16, R18-R19] and three are literature reviews [R25-R27]. The other studies used the descriptive research method [R8-R9], multicase [R1] and mixed [R13]. Two of the selected articles are guidelines/guidelines regarding the recommended weight of the school bag [R17, R21].

In a school context, with regard to recommendations about the maximum weight of the backpack, in relation to the body weight of children aged 6 to 12 years-old, ten studies recommend the value of 10% [R3-R5, R8, R10-R11, R19, R22, R24, R28], seven indicate that backpacks should only weigh up to 15% [R14-R16, R18, R20-R21, R23], two studies suggest values below 7.5% [R1, R6] and five recommend weight ranges between 5 and 20% [R2, R9, R12, R25-R26]. Four studies state that it is not prudent to recommend a percentage of backpack weight in relation to the child's body weight [R7, R13, R17, R27].

According to the investigations included in this literature review, the consequences of carrying heavy backpacks can lead to complications in children at various levels, such as: pain in the neck, shoulders and back [R11-R13, R16, R21-R22, R25-R26 , R28], postural changes (at the level of spinal curvatures) [R1-R3, R5, R10, R12, R14-R16, R19, R22-R24], change in balance and movement conditioning [R9], decreased ventilatory function [R6, R18] and changes in plantar pressure and gait [R20, R23].

Recommendations to address the consequences of excessive backpack weight can be identified in table 4.

As areas of future research, seven studies indicate that it will be essential to assess longitudinally and in the natural school environment the consequences of excessive backpack weight, in terms of changes in spinal curvatures [R1-R3, R10, R27] and in terms of back pain[R27] and the child's psychosomatic complaints [R27]. Five articles also suggest verifying the relationship between backpack transport and other risk factors for the development of MSI in children [R4, R8, R25-R26]. Other articles propose the study of the child's perception of the backpack's weight (perceived weight) [R27]; as well as the assessment of physical fitness in transporting it [R26]. An article also mentions the importance of studying the design of backpacks and the necessary adaptations for their transport [R26].

RECOMMENDATIONS	
R4, R8, R12, R26	Improved design of backpacks
R4, R5, R24, R25	Postural Education Programs, by teachers, physiotherapists or nurses, as part of the school curriculum, including students, parents and teachers, without neglecting the specifics of each context/individual
R2, R5	Regular tracking of body posture and backpack weight
R12, R19	Regular tracking of body posture and backpack weight school↔house
R4, R18	Use of a backpack with two straps
R21	Visual testing of pressure zones related to excessive backpack load
R25	Increased number of school lockers
R14	Decrease in backpack weight percentage recommended for obese children

Table 4 – *Recommendations to overcome the consequences of the excessive weight of the backpack of the items included. Porto, Portugal, 2018*

DISCUSSION

With this scoping review, we sought not only to understand what the articles included suggest in relation to the percentage of maximum recommended backpack weight, but also to highlight other aspects intrinsically related to this topic, such as the consequences of carrying heavy backpacks, and some recommendations to prevent/correct this situation. For this reason, understanding the aspects that interfere with children's health will be important for health professionals to implement an evidence-based practice.

In view of the analysis of the results, the findings were not uniform, subdividing into two categories: those that recommend the maximum weight percentage of the school bag (which ranges between 5% and 20%) and those that do not recommend any type of percentage, especially given the increase in the number of obese children, as a calculation based on the percentage of body weight may not be an appropriate approach. It should be noted that the value of 10% was the one with the greatest consensus.

Thus, in relation to the question raised initially, it is concluded that the literature defends that the content of the school bag should not exceed 10% of the child's body weight in a school context. However, it should not be overlooked that it may not be prudent to recommend a fixed weight percentage. On the one hand, the weight of the school bag, expressed as a percentage, may not be the only factor associated with musculoskeletal symptoms in BE children, given, for example, the current increase in obesity levels among students [R7]. On the other hand, in relation to the recommended maximum backpack weight limits, which are generally proposed for children, although scientifically not consensual, they are largely exceeded in daily life[15].

Thus, the most prevalent consequences of carrying heavy backpacks occur at the musculoskeletal level, but other anatomical and physiological systems of the child may also be compromised, due to the transport of overweight backpacks.

This review was comprehensive in terms of the location of the included studies. However, it is noteworthy that most studies are from Asia and only

two, from European studies, are Portuguese. No other study comes from a Portuguese/Spanish speaking country.

The variability of studies included confirms the complexity and scope of factors that characterize this issue and, as noted, this research encompassed studies from the last 14 years, which gives it a wide range.

The studies included in this scoping review are not uniform in terms of sample size, gender and age, and the methodology adopted. As such, some of these studies do not allow us to generalize the results, what constitutes a limitation of them.

It is important to mention that the interpretation of the results of this scoping review should be done prudently, given the limitations identified in the included studies. Also, the non-inclusion of international gray literature may have limited some of the scientific research carried out in this area.

It should be noted that, worldwide, no study on this topic, included in this review, was carried out by the area of Nursing. However, this discipline, by taking an interest in and intervening in the phenomena that affect School Health, is intrinsically involved with this issue. Also, the lack of studies, both in the form of scientific articles and gray bibliography, in Portugal, on this topic, reinforces the importance of Rehabilitation Nursing investing in this area at the research level.

Thus, knowledge, with multidisciplinary contributions, of the factors that affect the child's health, allows nurses to provide their intervention with greater rigor, in order to minimize the effects of the overload inherent in carrying the school bag, namely, in the adoption of safe practices[15].

As suggested by the World Health Organization, much of the morbidity in children and young people is preventable, and low-cost measures are shown to be effective in preventing substance abuse, injuries and mental disorders, among others[16]. In this specific case, there is a wide range of measures to overcome the consequences of excessive backpack weight, which are considered to be measures of low economic value and, as such, likely to be easily implemented.

At the labor level, there is legislation that limits the maximum weight, in tasks that involve manual handling of loads, for adults. However, it appears that limits and guidelines for application in school-age children have not yet been developed with regard to this issue.

Although the economic importance of this problem may be small in the short term, the rates of low back pain in children are close to those observed in adults, which may have consequences in the medium and long term[10].

Until a consensus on a universal load limit is agreed and the publication of guidelines and/or legislation that everyone can understand is disseminated, students, parents, teachers, health professionals and all others involved should be made aware of the problem inherent in the carrying heavy backpacks, promoting the necessary measures to help prevent injuries to children.

CONCLUSION

With the synthesis of research results with worldwide relevance, through the scoping review methodology, it was possible to see the percentage of maximum backpack weight recommended for children (6-12 years-old) in the school context, in order to contribute to the incorporation of knowledge scientific knowledge in professional nursing practice.

This literature review allowed for the future transfer of evidence by highlighting aspects inherent to the maximum recommended backpack weight for children aged 6 to 12 years-old in a school context, according to the literature. The value of 10% was the one with the greatest consensus. Thus, to make a difference in promoting school health, it is essential to link knowledge from research into clinical practice.

That said, deficiencies in current literature must be addressed so that evidence-based guidance can be provided to students, parents, teachers and other interested parties. It is therefore suggested that a general guideline might be more appropriate than a single load limit guideline, that is, instead of trying to establish a single load limit for all children, the research focus should be on factors that affect the transport of the school bag.

These suggestions leave open a wide range of future research areas, which may contribute to greater knowledge and support of the consequences of transporting a school bag in children aged 6 to 12 years-old.

For what was mentioned above, and due to some aspects that still lack consensus, it is suggested to carry out a literature review, for the joint identification of risk factors (e.g. backpack design; individual characteristics; perceived weight; psychosomatic factors ; among others) that contribute to MSIs and back pain in school-age children.

Due to the seriousness of this problem, the entire SC should be educated in the area of Ergonomics. Also, regular tracking of the child's posture and backpack weight, adjusted to different contexts and the implementation of Postural Education Programs, as part of the academic curriculum, by rehabilitation nurses, emerge as key recommendations in reducing the content of the backpack, and in managing the transport of books from school to home.

Many of the solutions to the problem implicit in the weight of school bags are found locally in each SC. Projects carried out by students and/or teachers in collaboration with parents and health professionals that focus on each individual/class/school/school grouping should be valued. Also, for example, providing school lockers or improving accessibility to them could be a solution.

Ongoing strategies based on each SC should also aim to disseminate information about what is known, including awareness of the ideal weight and typology

of backpacks and specific school resources, through various media, such as campaigns advertising, lectures/participation in parents' meetings, among others, using existing or new forms of communication.

To this end, the need to increase the number of nurses in schools is a priority, so that there is a sustained intervention in line with the needs of each SC, in logic of action centered on the empowerment of those involved.

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