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Original Article

Educational technology for promoting parental self-efficacy in controlling childhood asthma

Tecnologia educacional para promoção da autoeficácia dos pais no controle da asma infantil

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ABSTRACT

Objective: to verify the self-efficacy of parents and caregivers in controlling childhood asthma before and after an educational intervention and to associate the scores with sociodemographic factors. **Methods:** quasi-experimental study, with 65 parents and caregivers of children with asthma. The Self-Efficacy and Their Child's Level of Asthma Control scale – Brazilian version – was used before and 30 days after the intervention with the reading of the booklet "Are you able to control your child's asthma – let's learn together?" For the analysis, McNemar's Chi-square and Wilcoxon statistical tests were used. **Results:** after 30 days, the effect of the intervention demonstrated statistical significance between high self-efficacy scores and the following variables: marital status (Odds Ratio:2.6; p≤0.001), family income (Odds Ratio:3.4; p≤0.001) and *Bolsa Família* Program benefit (Odds Ratio:2.9; p≤0.001). **Conclusion:** the educational booklet was shown to be effective in increasing the self-efficacy of parents and caregivers in the control and management of childhood asthma.

Descriptors: Self Efficacy; Asthma; Educational Technology; Health Education; Nursing.

RESUMO

Objetivo: verificar a autoeficácia de pais e cuidadores no controle da asma infantil, antes e depois de intervenção educativa e associar os escores com os fatores sociodemográficos. **Métodos:** estudo quase-experimental, com 65 pais e cuidadores de crianças com asma. Utilizou-se a escala *Self-Efficacy and Their Child's Level of Asthma Control* - versão brasileira antes e 30 dias depois da intervenção com a leitura da cartilha "Você é capaz de controlar a asma da sua criança – vamos aprender juntos?". Para análise, realizaram-se os testes estatísticos Qui-quadrado de McNemar e Wilcoxon. **Resultados:** após 30 dias, o efeito da intervenção demonstrou significância estatística entre os escores de autoeficácia elevada e as variáveis: estado civil (*Odds Ratio*: 2,6;p≤0,001), renda familiar (*Odds Ratio*: 3,4; p≤0,001) e benefício do Programa Bolsa Família (*Odds Ratio*: 2,9;p≤0,001). **Conclusão:** a cartilha educativa mostrou-se eficaz no aumento da autoeficácia de pais e cuidadores no controle e manejo da asma infantil.

Descritores: Autoeficácia; Asma; Tecnologia Educacional; Educação em Saúde; Enfermagem.

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Introduction

Asthma is the most common chronic respiratory disease among children worldwide. More than 262 million people live with asthma, and 80% of deaths from the disease occur in developing countries[1].

In Brazil, the International Study of Asthma and Allergies in Childhood (ISAAC) demonstrated that asthma is the respiratory disease with the highest prevalence and impact in children and adolescents[2]. In the period between 1998 and 2019, the total number of hospital admissions for asthma was 3,138,064. It was observed that children aged 1 to 4 years old had the highest number of hospital admissions for asthma (1,531,463; 48.8%), followed by children aged 5 to 9 years old (671,495; 21.4%). The Northeast region presented the highest incidence of hospitalizations throughout the period analyzed[3].

Asthma is a disease of multifactorial cause that is generally diagnosed in early childhood and can be influenced by genetic, environmental, economic, cultural, and social factors. The successful management and control of asthma is due to factors such as continuous outpatient follow-up, uninterrupted use of prophylactic drugs, home care consistent with the social, economic, and cultural reality of the families, family support, and health education[4].

Among the main causes of non-control of asthma is the lack of adherence to treatment, due to difficulties with disease management[4]. Self-efficacy can be the key to improving the confidence and motivation of parents and caregivers and[5] therefore, the engagement in health behaviors capable of sustaining the interventions initiated[6] regardless of social, demographic, health, and environmental differences[7]. Self-efficacy refers to people's belief in their own abilities to perform the behaviors necessary to produce specific performance achievements, influencing dedication to achieve desired goals and perseverance in the face of obstacles, as well as the ability to persist in the face of failures[6]. Self-efficacy is suggested as a health education tool for making people more resilient in the face of difficulties, encouraging healthy lifestyle choices[7].

Thus, proposing interventions focused on improving self-efficacy and shared decision making are important tools for achieving effective asthma management and control[8]. The development of educational technologies based on Self-Efficacy Theory has been a strategy used by researchers in health education actions with caregivers in the prevention of childhood diseases[7]. Among these technologies, the printed version stands out for being a material that can be used to mediate the interaction between the health professional and the individual, enabling the change of daily habits, if it contains clear information and shows the benefits of following the approached care[9].

To contribute to the use of tools that promote self-efficacy in asthma management and control and facilitate the understanding of parents and caregivers about the disease and the care necessary to prevent asthma attacks, a booklet was developed and validated in printed format as a support for families. This technology is the only one available in Portuguese to promote self-efficacy and health education for parents and caregivers of children with asthma and has undergone a rigorous process of creation and validation of content and appearance by expert judges[10], being chosen for the development of the present research. Based on these considerations, the objective was to verify the self-efficacy of parents and caregivers in controlling childhood asthma before and after an educational intervention and to associate the scores with sociodemographic factors.

Methods

This was a quasi-experimental, before-and-after study, with a single group, carried out in a Primary Health Care Unit (PHCU), which provides regular care to children registered in the Program for Comprehensive Care of Children and Adults with Asthma (PROAICA), in the city of Fortaleza, Ceará, Brazil.

A total of 65 parents and caregivers of children

with asthma who were waiting for their PROAICA appointment from March 2019 to January 2020 and who met the inclusion criteria participated in the study: being the parents and/or caregivers of at least one child between 2 and 12 years of age, with a pre-established medical diagnosis of asthma, who should be followed in the Primary Care Unit and be registered in the asthma program. The exclusion criteria adopted were parents and caregivers with cognitive limitations, proven by medical diagnosis, which would prevent them from participating in the educational intervention or from answering the Self-Efficacy and Their Child's Level of Asthma Control Scale - Brazilian version (STCLA-VB) and the other instruments. The discontinuity criteria adopted were withdrawal of parents and caregivers from participating in the study after data collection had started; change in telephone number that prevented the assessment of self-efficacy based on the STCLA-VB scale; and death of parents and caregivers or of the child during the study. It is noteworthy that all 85 parents and caregivers who attended the PROAICA appointment during the study period were invited. The invitation was accepted by 78, and only 65 of them remained until the end of the study.

For the sample calculation, the formula $n=(\sigma12+ \sigma22).(Z\alpha/2+ Z1-\beta)2/(\mu2- \mu1)2$ was used, where: "n" is the calculated sample; "σ1" is the standard deviation obtained in a previous study (SD = 5.7)[11]; "σ2" is the expected standard deviation in the present study, for which it was estimated that there was no variability with respect to the previous study; "Zα/2" is the standardized normal variance associated with the confidence level for a two-tailed hypothesis at a value of 1.96; "Z1-β" is the power of the sample, the value of 0.84 being considered; "μ1" is the mean self-efficacy scores obtained in a previous study (M = 68.13)[11]; "μ2" is the expected mean total scale scores after the intervention with the primer reading, so that it is estimated to obtain a difference of at least 3 points of increase in high self-efficacy scores after the intervention. In this way, a sample size equal to 57 parents and caregivers of children with asthma was obtained. However, the authors preferred to exceed the minimum sample size, considering that, after 30 days, there could be sample loss.

Data collection was carried out by a previously trained team in three stages: Stage I - first assessment using the STCLA-VB scale and application of the sociodemographic form (in the PHCU); Stage II - educational intervention (in the PHCU); and Stage III - telephone contact for assessment of self-efficacy based on the STCLA-VB scale, after 30 days of Stages I and II.

The first stage occurred in the Primary Health Care Unit, where the parents and caregivers of children with asthma who were waiting for the PROAICA consultation were invited individually. In a reserved room, they were informed about the objective of the study; and those who agreed to participate were asked to sign the Informed Consent Form. Then, the STCLA-VB scale and the sociodemographic form were applied.

The STCLA-VB scale measures the self-efficacy scores of parents and caregivers in the control and management of asthma in children. It was translated, adapted, and validated for use in Brazil with a Content Validity Coefficient (CVC) of 0.88 and Cronbach's alpha of 0.92. It is a Likert-type scale, composed of 16 items, distributed in the Expectations of efficacy (items 1-6) and Expectations of results (items 7-16) domains, and can range from 16 to 80 points, so that, the higher the score, the higher the self-efficacy of parents and caregivers in the management and control of their children's asthma. It is noteworthy that the sum of 16 to 57 points is considered low self-efficacy; 58 to 67 points, moderate self-efficacy; and 68 to 80 points, high self-efficacy[11].

As for the sociodemographic form, the following

variables were investigated: age of the parents and caregivers of children with asthma, education, marital status, occupation, income, and receipt of the *Bolsa Família* benefit.

In the second stage, which occurred on the same day as the first, the intervention was carried out through the delivery of the booklet "You can control your child's asthma - let's learn together". Each participant was instructed to read the educational booklet completely and silently. The average time spent reading the material was 15 minutes. If the participants had any questions during and/or after the reading, the necessary explanations were given based on the information described in the booklet itself. If parents and caregivers did not report any doubts, no additional guidance was given.

It is noteworthy that the booklet used in the intervention was built and validated aiming to promote self-efficacy of parents and caregivers in the management and control of asthma in children[10]. The self-efficacy theory[6] was used as a theoretical framework for its development, and the items of the scale (STCLA-VB) were used, resulting in a material that addresses nine topics: 1) What is asthma? 2) Let's learn what can cause asthma symptoms; 3) Let's learn how to reduce asthma triggers; 4) Learn the importance of the health care service; 5) Know when the child needs to use medication; 6) Know when the asthma attack needs to be treated in the emergency room; 7) Let's learn how to use the pump; 8) Let's learn how to keep the child's mouth healthy; 9) Controlled asthma improves health and well-being[10].

The third stage occurred after 30 days of the intervention and consisted of phone calls with the purpose of applying the STCLA-VB scale to assess the self-efficacy scores of parents and caregivers in asthma management and control.

The data collected were compiled and stored in a Microsoft Excel structured spreadsheet. Descriptive analysis was performed using the statistical program R, version 4.1.1. For the sociodemographic data, absolute frequencies and percentages of the variables were used. We also analyzed the association of self-efficacy scores based on the STCLA-VB scale, before and 30 days after the primer application, using McNemar's chi-square with their respective measures of effect magnitude (Odds Ratio (OR) with 95% confidence interval (CI)). In the bivariate analysis, the Shapiro Wilk test was used to assess adherence to normal distribution of the data. For comparison of means, due to data asymmetry, the Wilcoxon signed ranks test was used. It was adopted as statistically significant $p<0.05$. The data were grouped and organized in tables.

Regarding ethical procedures, the research was approved by the Research Ethics Committee of the Federal University of Ceará under opinion no. 1,846,995/2016, following Resolution 466/2012, from the National Health Council.

Results

The main sociodemographic characteristics of the sample analyzed were most parents and caregivers of children with asthma were 36 years old or older (33; 50.8%), had 10 or more years of schooling (33; 50.8%), lived with a partner (47; 72.3%), worked exclusively in the home (35; 53.8%), had a family income of one to three minimum wages (49; 75.4%), and received *Bolsa Família* Program benefits (47; 72.3%).

When analyzing the effect of the intervention on the sociodemographic variables and self-efficacy of parents and caregivers of children with asthma, it was shown that, in those who were married or living in a stable union, the intervention was able to increase by 2.6 times the chance of raising the self-efficacy scores ($p<0.001$). Regarding having an income of one to three minimum wages, this chance was 3.4 times ($p<0.001$). In addition, the intervention was able to increase self-efficacy scores in the group of people who received the *Bolsa Família* Program benefit by 2.9 times more ($p<0.001$), as shown in Table 1.

Table 1 – Association between high self-efficacy before and after the intervention, according to the categories of sociodemographic variables (n=65). Fortaleza, CE, Brazil, 2020

Variables	Before	After	OR*	CI (95%)†	p-value‡
	n (%)	n (%)			
Age group (years)			1.1	0.61-1.92	0.893
21-35	23 (71.9)	29 (90.6)			
36-65	27 (81.8)	32 (97.0)			
Education (years)			1.2	0.68-2.19	0.589
Up to 9	25 (78.1)	30 (93.8)			
>10	25 (75.8)	31 (93.9)			
Marital status			2.6	1.54-5.66	< 0.001
Married/stable union	34 (72.3)	43 (91.5)			
Single/divorced/widowed	16 (88.9)	18(100.0)			
Occupation			1.5	0.85-2.74	0.185
Works in the home	27 (77.1)	34 (97.1)			
Works outside the home	23 (76.7)	27 (90.0)			
Family income (minimum wage)§			3.4	1.94-8.24	< 0.001
1 a 3	37 (75.5)	45 (91.8)			
< 1	13 (81.3)	16(100.0)			
Bolsa Família Benefit			2.9	1.67-6.42	< 0.001
Yes	35 (74.5)	44 (93.6)			
No	15 (83.3)	17 (94.4)			

*OR: Odds Ratio; †IC: confidence interval; ‡McNemar's X2 test; §Minimum wage in the study period: R$ 1,045.00

When comparing the mean ranks of the scores of the STCLA-VB scale before and after the educational intervention, it can be seen that there was an increase in self-efficacy of parents and caregivers in asthma control and management, with statistical significance between the mean ranks of the total scores of the scale (p<0.001) and the mean ranks of the scores of the Expectations of efficacy (p<0.001) and Expectations of results (p<0.001) domains. According to the results presented, it can be seen (Table 2) that the educational intervention proposed in the study favored the promotion of self-efficacy of parents and caregivers in the control and management of asthma in their children.

Table 2 – Comparison of the mean scores of the total scores and domains of the Self-Efficacy and Their Child's Level of Asthma Control scale - Brazilian version, before and after the educational intervention with parents and caregivers of children with asthma (n=65). Fortaleza, CE, Brazil, 2020

Variables	Middle ranks		p-value*
	Before	After	
Full scale	70.7	77.2	< 0.001
Expectation of effectiveness	25.3	28.5	< 0.001
Expectation of results	45.4	48.7	< 0.001

*Wilcoxon's test

Discussion

The limitations of this study include the difficulty in contacting the participants by telephone to continue the study and the discontinuation of 13 participants, which reduced the sample size. Another limitation to be considered was the short-term follow-up (four weeks). It is important to carry out other studies to verify the impact of medium- and long-term educational interventions on the levels of self-efficacy, as well as the effect of reading the booklet "Can you control your child's asthma - let's learn together?" on the parameters of asthma control.

The study brings contributions to the practice, to the extent that it was perceived that the reading of the booklet by parents and caregivers contributed to the improvement of self-efficacy. The intervention highlights the applicability of the booklet as a technology that can be used in health education strategies carried out by health professionals, especially nurses. This can develop actions that can contribute to the promotion of parental and caregiver confidence in the management and control of asthma in children, leading to better adherence to treatment, reduction of asthma attacks, reduction of direct and indirect costs due to visits to emergency or urgent care services, use of medications, and school absenteeism, with consequent improvement in the quality of life of children and their family members.

Regarding the education of parents and caregivers, the literature shows that it is associated with higher scores of their self-efficacy in the management and control of childhood asthma[11], which is in opposition to the findings of the present study. In the present study, it was observed that parents and caregivers with higher education levels were able to increase their self-efficacy in the control and management of childhood asthma after the educational intervention with the educational booklet, but there was no significant association

The educational level of parents is important when it comes to children with asthma, that is, the fewer years of study and knowledge about the disease, the higher the occurrence of asthma attacks due to difficulties in recognizing the symptoms presented by the children, which can lead parents to ignore a mild asthma episode that can worsen over time[12]. This situation can possibly result from the difficulty in understanding the disease, the lack of knowledge about the possibility of using free preventive medications, the lack of adherence to the action plan stipulated for the control of the disease, and the lack of bonding with a health care institution that supports and welcomes their children in case of acute exacerbation of asthma[4,12].

The presence of a partner increased the scores of the STCLA-VB scale in the control and management of childhood asthma, corroborating a study that found that the empowerment of the family significantly improves asthma control in pediatric patients, since the responsibility for the child's asthma treatment falls predominantly on the parents and caregivers[13]. Furthermore, it has been shown that, in those families with a traditional structure, the presence of the father figure is a factor that can influence the maternal well-being, since he can be part of a support network, thus contributing to the family's coping[14].

Regarding income, it was noticed that the low socioeconomic level can affect high self-efficacy in asthma management and control. However, parents and caregivers who worked exclusively in the home showed an increase in self-efficacy, confirming the study that demonstrates that the daily contact with the patient with asthma naturally enables greater learning and confidence on the part of parents[15].

In view of the constant demands for care of children with asthma, both at home and in the monitoring of health care services, the importance of the financial benefits provided by the government through the *Bolsa Família* Program and the access to free medication through the *Farmácia Popular* (Popular Pharmacy) Program should be emphasized. A study found that the level of asthma control was directly proportional to family income, that is, families whose children had uncontrolled asthma were more likely to have their productivity and income impaired[16].

In verifying the association between the risk of hospitalization of children with asthma and unfavorable socioeconomic conditions in municipalities of an underdeveloped country, it is evident that, the lower the level of development, employment, and income in each municipality, the greater the risk of hospitalization for asthma in children. In view of these data, the researchers suggested increasing investment in the generation of jobs in less developed municipalities to increase family income and reduce the rate of pediatric hospitalizations[17].

Family income has an influence on the occurrence of asthma, as well as on the access to and use of health services and goods that can contribute to the control of the disease[2]. A study conducted with parents of children with asthma that evaluated risk factors and benefits for pulmonary function identified that children of parents with no fixed income were associated with lower forced vital capacity and forced expiratory volume in one second, indicating impaired pulmonary function[18].

Caregivers who manage a child with high-risk asthma in the context of poverty indicate the need for continuous education about the disease, greater sensitivity to the complexity of the domestic management of asthma and family-centered interventions[19]. Concerning asthma control, it is a consensus that health

education interventions are important tools for raising the awareness of the child and the family, regarding improving knowledge, adherence to treatment, and achieving and maintaining asthma control[4].

The intervention carried out with the reading of the educational booklet was evidenced, based on the STCLA-VB scale, as effective in promoting the self-efficacy of parents and caregivers, making them more confident and able to provide adequate care in the control and management of asthma in their children, with better expectations of efficacy and results. In line with the results of the present study, research carried out with the use of educational materials, also based on the Self-Efficacy Theory, have found increased self-efficacy with the participating public[7].

The concept of self-efficacy is related to cognitive behavior modification, considering that a strong sense of personal efficacy is related to engagement in health-promoting behaviors, sense of personal accomplishment and good social integration. Self-efficacy beliefs determine how people feel, think, motivate and behave[6].

Therefore, a study carried out with parents of children and adolescents aged 4 to 17 years old with persistent asthma evaluated how their levels of personal self-efficacy can contribute to an improvement in asthma control and in the quality of life of the patients. The results revealed that parents with better levels of self-efficacy about the indication and how to use their children's asthma control and crisis rescue medications were less likely to report the use of medications, contributing to an improvement in their quality of life[20].

A study developed with parents and caregivers of children with asthma compared the effect of two educational technologies, a computer program, and a printed educational technology, to promote self-efficacy in controlling childhood asthma. It was verified that, in both groups, over time, there was an improvement in asthma management and knowledge, due to persistence in the face of the difficulties encountered, resulting in an improvement in the quality of life of the child and of the family[5]. It is highlighted that the use of educational interventions with parents and caregivers of children, based on the self-efficacy theory, contributes to the adherence to treatment of diseases in childhood[7].

In view of the results, it can be emphasized that the booklet "You can control your child's asthma - let's learn together" was considered an effective intervention to promote the self-efficacy of parents and caregivers regarding the care of their children with asthma. In addition, it allowed to rescue with the participants the sources of elaboration and/or consolidation of the parents and caregivers' confidence regarding success experiences, vicarious experiences, verbal persuasion, and physical and emotional reactions[6].

In this sense, it is recommended that nurses and other health professionals apply the booklet with the families of children with asthma in order to help them during the educational interventions, aiming to increase the confidence of parents and caregivers in skills related to the care of their children in the control and proper management of asthma.

Conclusion

The use of an educational technology, designed based on the concept of self-efficacy to improve the control and management of childhood asthma, is able to raise the self-efficacy scores of parents and caregivers of children with asthma.

The use of the booklet as an educational strategy made it possible to correct or minimize negative beliefs and to consolidate positive beliefs in the self-efficacy of parents and caregivers in promoting the control and proper management of asthma in their children.

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Authors' contribution

Conception and design, data analysis and interpretation, article writing, relevant critical review of the intellectual content, and final approval of the version to be published: Lima KF, Dias AJL, Alves AKS, Furtuoso FMR, Serra TQ, Abreu VSM, Barbosa LP.

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