

Building knowledge of healthy eating in hospitalized youth: a self-regulated campaign

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Abstract

Background: Data from the World Health Organization shows obesity has more than doubled worldwide since 1980. Childhood obesity is mainly associated with external and modifiable factors, as eating habits, existing room for promoting healthy lifestyles. Additionally, learning can take place in contexts other than schools, as the hospital, potentiating the time of hospitalization. Self-regulated learning framework is suited to train the skills necessary for self-management processes and behavioral changes. The aim was to describe and evaluate a campaign designed to increase knowledge about healthy eating by hospitalized school-aged youth. **Method:** A quasi-experimental design was used. Participants were randomly distributed between the experimental and control groups, each one with 15 participants aged between six and 16 years-old. Information about healthy eating was not provided directly; participants had to reflect and work to build knowledge through activities inspired in the self-regulated learning framework. **Results:** Results showed that the experimental group when compared with their counterparts significantly improved their knowledge on healthy eating after taking part in the campaign. **Conclusions:** Campaigns that increase knowledge on healthy eating based on the promotion of self-regulated learning strategies could be incorporated in health promotion programs not only in pediatric units but also in other educational contexts.

Keywords: healthy eating, campaign, hospital, school-age, self-regulated learning.

Resumen

Desarrollando conocimientos sobre alimentación saludable en jóvenes hospitalizados: una campaña de autorregulación. Antecedentes: el informe de la Organización Mundial de Salud indicó que la obesidad más que duplicó desde 1980. La obesidad infantil es mayoritariamente asociada a causas externas y modificables, como hábitos de alimentación, y puede ser combatida a través de estilos de vida saludables. Las intervenciones educativas pueden ocurrir en el hospital, potenciando el tiempo de hospitalización. El entrenamiento puede ser realizado en el marco de la autorregulación del aprendizaje. Nuestro objetivo es evaluar una campaña de promoción del conocimiento sobre alimentación saludable entre jóvenes hospitalizados en edad escolar. **Método:** se usó un diseño cuasi-experimental. Los participantes fueron distribuidos al azar entre los grupos experimental y control, cada uno con 15 participantes de entre 6 y 16 años. La información sobre alimentación saludable no fue ofrecida directamente, los participantes tuvieron que reflexionar y trabajar para construir conocimiento, a través de actividades inspiradas en el aprendizaje autorregulado. **Resultados:** los resultados muestran que después de la campaña, el grupo experimental, comparando con el grupo de control, mejoró significativamente su conocimiento sobre alimentación saludable. **Conclusiones:** campañas para incrementar el conocimiento sobre alimentación saludable basadas en el marco de la autorregulación del aprendizaje podrían ser incorporadas en programas de promoción de la salud.

Palabras clave: alimentación saludable, campaña, hospital, edad escolar, autorregulación del aprendizaje.

According to the World Health Organization (2016), obesity has more than doubled worldwide since 1980. In recent years, an increasing level of obesity has also been observed in the Portuguese population. For example, a recent study by APCOI (2013-2014) showed that 33.3% of Portuguese children aged between two and 12 were overweight, and 16.8% were obese. Although there are many factors that contribute to childhood obesity, most cases are associated with external factors which can be changed, such as

eating habits and physical inactivity (Faulkner, Kwan, MacNeill, & Brownrigg, 2011; Medina, Monteiro, Alves, & Souto, 2012).

Hospitalized children face numerous challenges that extend beyond their medical condition (Harris & Farrel, 2004), including difficulties with maintaining school contact and their education. For children, long periods of hospitalization or repeated admissions can span across multiple stages of learning and development, resulting in fragmented learning (Nisselle, Green, & Scrimshaw, 2011). Therefore, it seems important to not only continue children's learning curriculum, but to also offer activities with relevant psychosocial content (e.g., healthy eating) adjusted to their stage of development (Magalhães et al., 2018). The average hospital stay is short (about five days), but some children finish their recovery at home. This highlights the need to transform non-educational contexts into learning places to increase learning

opportunities (Magalhães et al., 2018; Nisselle et al., 2011; Rosário et al., 2016). We believe that pediatric wards should be considered learning environments so that hospitalized children may benefit from this informal learning opportunity; for example, they can learn about healthy eating.

The self-regulated learning (SRL) model provided the theoretical framework for the present study. As Bandura (2005) stressed, there is a need to put the theoretical knowledge in service of the practice and offer guidance on how to change and maintain health related behaviors. Literature shows that health programs (e.g., self-management in the context of chronic diseases) using the self-regulation framework are efficacious in improving health, decreasing hospital stays, and increasing adherence to treatment (e.g., Clark et al., 2005; West et al., 1997).

SRL is an active process in which subjects set goals to guide their learning by practicing self-control over their own cognition, motivation, and behavior (Zimmerman, 2002). The concept of SRL emerged from the work of Zimmerman (1998; 2000), and its cyclical model serves as the basis to the PLEE model used in the current study (Rosário et al., 2010). The recursive PLEE model consists of three cyclic phases (PLanning, Execution, and Evaluation) (Rosário et al., 2017). The planning phase begins prior to the performance of the task when students are expected to self-set their goals and select learning strategies to help them reach these goals (i.e. what they want to do, when, and how). The execution phase refers to the implementation of the pre-established plan and its monitoring. Finally, the evaluation phase consists of the analysis of the final product against the established goals. The results gathered at this phase feed the planning phase of the following tasks (Valle et al., 2009). Training on SRL strategies contributes to increasing and maintaining students' efforts towards meeting their self-set goals, level of interest in the task, understanding of learning objectives, and perceptions of self-efficacy when challenges arise (Bandura, 1986; Rosário et al., 2012; Rosário et al., 2016). SRL builds metacognitive competence since it involves mastering three types of knowledge regarding learning strategies: declarative, procedural, and conditional (Núñez, Rosário, Vallejo, & González-Pienda, 2013). Declarative knowledge (DK) refers to factual knowledge (e.g., knowing what is a healthy meal). Procedural knowledge (PK) refers to how the learning strategies are used (e.g., knowing how to make a healthy meal). Lastly, conditional knowledge (CK) refers to the ability to know when to use a particular learning strategy according to the context in question (e.g., knowing when to eat certain foods) (Rosário et al., 2017). Addressing declarative, procedural, and conditional components of the contents contributes to an integrated learning experience (Hailikari, Katajavuori, & Lindblom-Ylanne, 2008).

The main purpose of the present study is to describe and evaluate an SRL-inspired campaign designed to increase knowledge building about healthy eating by hospitalized school aged youth. Thus, aiming to achieve this goal, the current research followed a quasi-experimental design.

Method

Participants

The campaign took place in the pediatric ward of a regional hospital in northern Portugal. The ward is composed of 30 beds, in

which 15 are allocated to school-age children (six to 17 years old), the target population of this campaign. This pediatric ward is not suited to accommodate children with extreme health conditions. Still, reasons for internment are diverse (e.g., appendectomy, vesicular stomatitis, pyomyositis, peritonsillar abscess) with a highly unpredictable turnover rate. However, the average length of the stays for school-age children is five days.

The campaign lasted for one month, during which 60 school aged children were recruited at the time of their admission to the hospital. These children were randomly distributed between the two groups: Experimental (EG) and Control (CG). Of the 30 patients invited to participate in the campaign (EG), 15 (50%) did not complete all the activities of the protocol either due to the duration of their hospitalization (e.g., only spent one night at the unit) [$n = 7$ (23.33%)] or a lack of fit of the activities to their personal characteristics (e.g., children with cognitive deficits) [$n = 8$ (26.67%)]. Only participants completing all the activities of the campaign were included in the final sample of the EG. Regarding the CG, 15 of the 30 (50%) participants completed the posttest questionnaire. Reasons for not completing the study included the duration of the hospitalization and health indisposition due to clinical intervention.

Finally, the EG was composed of 15 children, nine girls (60%), aged between six and 14, with 8.8 years mean age ($SD = 2.51$), and the CG was composed of 15 children, six girls (40%) aged between six and 16, with 11.47 years mean age ($SD = 3.6$). Significant differences between group \times gender ($\chi^2 = 1.2, p = .273$) and between group \times age ($\chi^2 = 10.33, p = .324$) were not found.

Instruments

Knowledge of Healthy Eating Questionnaire. Participants' DK about healthy eating was assessed before and after the campaign with a purposely built questionnaire. The questionnaire was built by a team comprised by several specialists (psychologists, teachers, medical doctors, and nurses). The items were based on the directives by the Portuguese General Directorate for Health

Table 1
Knowledge of healthy eating questionnaire

Statement	
1	Food provides our body with what we need to grow up
2	Food contains nutrients that protect our body from diseases
3	Water does not belong on the food wheel
4	Vegetables, fruits, meat and fish are the only groups on the food wheel
5	According to the food wheel, there are forbidden foods
6	The size of the food wheel portions means nothing
7	Our meal should contain varied and colorful foods
8	Eating healthy is boring
9	Going to school without having breakfast does not interfere with my school performance
10	Healthier foods have more sugar, more fat, and more salt
11	Three meals a day are enough to have a balanced diet
12	The most important meal of the day is breakfast
13	Carbonated juices (e.g., sodas) should be our choice to accompany main meals
14	Yogurt is a good choice for a school snack
15	It is important to associate healthy eating with physical exercise

(DGS, 2017) and addressed healthy eating contents discussed in the activities of the campaign. The questionnaire consists of 15 statements and participants had to rate their agreement regarding each statement (e.g., “our meal should contain varied and colorful foods”; “going to school without having breakfast does not interfere with my school performance”) (see Table 1). Responses to individual items were scored from one (totally disagree) to five (totally agree) in a Likert-like format. The alpha of Cronbach was .73. Responses of each participant were summed to create a composite score ranging from 15 to 75, with higher scores implying more knowledge of healthy eating.

Procedure

The campaign took place in the pediatric ward and was conducted by the researchers (i.e. educational psychologists). After providing their informed consent, participants completed the questionnaire and the campaign was explained (see Figure 1). All activities were planned acknowledging that some patients could not get out of bed due to their clinical condition. Moreover, participants could decide whether or not to participate in the activities accordingly considering their vitality and state of mind, being reassured by the researchers that they could complete the activities whenever they felt capable. Participants' parents were not present during the activities; children completed the campaign by themselves under the supervision of the researchers.

The campaign consisted of eight activity stations, each taking about 30 minutes to complete (see Table 2). Thus, each participant needed two afternoons to complete the entire campaign. When one activity was completed, participants received one “Did you know...?” card with information that helped consolidate what was learned in that particular station. Once the eight cards were collected, participants received a reward: a special visit pass. This reward is valuable and highly appealing because, when hospitalized, patients can only receive visits from parents, siblings or grandparents.

Organizing the campaign into stations, each contributing to the final goal (i.e. special visit pass), is expected to promote the use of self-regulation strategies in the different phases of the SRL process (i.e. planning, execution, and evaluation). Particularly, while patients execute a particular activity, they monitor their progress and learn what is still missing to reach their goal (special visit pass). Moreover, information about healthy eating was not provided directly. Rather, participants had to reflect and display efforts to build knowledge, thus becoming agents of their own learning process (Cerezo, 2010).

Children in the CG did not participate in the campaign; they responded to the same measures as the EG, and were provided with information about healthy eating after responding to the posttest questionnaire.

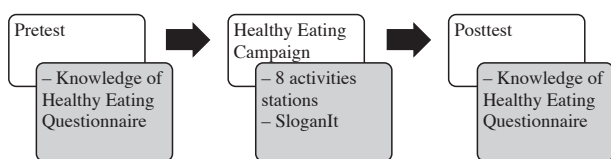


Figure 1. Flow of the study's procedure

Data analysis

Data from the dependent variable (i.e. knowledge of healthy eating) were gathered on two occasions: before the campaign (pretest) and at the end of the campaign (posttest).

Despite children were randomly assigned to the conditions (EG or CG), during the investigation, as aforementioned, 50% of participants in both conditions did not complete the study. For this reason, randomization did not help to strengthen the control of the research as expected.

First, an ANOVA test was conducted to examine if there were differences in the pretest between the groups regarding the dependent variable (declarative knowledge). No differences were found between the groups, so an ANCOVA test was run to analyze posttest measures of both groups (the pretest measures were included as covariates in the model).

The effect sizes were estimated with the *d* of Cohen (1988): $d < .20$ indicates a very small effect size; $d > .20 < .50$ indicates a small effect size; $d > .50 < .80$ a medium size effect size; and $d > .80$ a large effect size.

Results

Table 1 summarizes the means, standard deviations, skewness and kurtosis for the pretest and posttest measurements for both groups (experimental and control). Descriptive data suggests that children from the EG had increased levels of the dependent variable after the campaign in T2, whereas in the CG, the means for the variable remained similar. Taking the criterion of Finney and DiStefano (2006), all of the measures used two and seven for the maximum allowable values for skewness and kurtosis respectively.

Regarding the *pretest* measures, the Levene test showed that the error variance of the dependent variable was similar in both groups ($F(1,28) = .541; p > .05$). Moreover, data from the ANOVA test showed statistically significant differences between the groups ($F(1,28) = 7.292; p > .05; d = 1.02$) with a large effect size.

Data from the pretest was used as the covariate in ANCOVA to control the differences found in the pretest. Findings show that, after controlling for the effects of the differences in the pretest ($F(1,27) = 30.472; p < .001; d = 2.12$), the effect of the intervention was statistically significant ($F(1,27) = 27.073; p < .001; d = 2.01$) with a very large effect size. Results were presented graphically in Figure 2.

Discussion

The purpose of the present study was to describe and evaluate a campaign designed to promote school-age hospitalized patients' building of healthy eating. The core of the campaign was the theoretical framework of SRL, which grounded all the activities performed. The campaign significantly increased the participants' knowledge of healthy eating, when compared to children in the CG. Globally, the present findings are consistent with those of other educational experiences (Faulkner et al., 2011; Keihner et al., 2011), which show that appropriate methodologies and strategies (e.g., activities based on the SRL) may enhance children's knowledge of healthy eating habits.

A study that attempted to explore the perceived barriers of healthy eating showed that the lack of knowledge of which foods

Table 2
Activity stations

Activity Name	Brief description	Goal	References
Activity 1 “Why do we eat?”	Participants described the importance of eating and their reasons. Then, a slide displayed images allusive to these reasons (e.g., to have energy); participants completed their answers based on the images	The period of reflection and intentional promotion of the children’s thinking fostered their capacity for self-regulation	(Rosário et al., 2017)
Activity 2 The food wheel	Participants were asked about their knowledge on the food wheel; the meaning of the slices and their sizes was explained. Afterwards, participants received three food packages and were asked to put each in the right place of the wheel while explaining their choice	This station relies on DK and builds upon prior knowledge	(Hailikari et al., 2008)
Activity 3 Plasticine meal	Participants were asked to make a colorful and varied meal with plasticine, which implied using the PLEE logic (i.e., planned what foods they wanted to include and after finishing the dish, evaluate the task, analyzing whether the final product was consistent with the goals set and why)	Based on DK about food, but also on CK as they had to make the components appropriate for the required meal (e.g., rice, fish, and vegetables are appropriate for lunch); Use of PLEE logic	
Activity 4 Crossword puzzle	Participants completed a crossword with 10 keywords corresponding to tips about healthy eating	Based on DK about food; Exercising PLEE logic	(Rosário et al., 2013)
Activity 5 Fruit kebab	Participants chose different fruits to make their kebabs with	Practice choice and control skills: two pillars of self-regulation that are fundamental to the personal development of the children, as children exercise agency instead of following a predefined script; Apprehend that healthy eating can be fun	(Cerezo et al., 2010)
Activity 6 The traffic light	Researchers explained the meaning of the colors of the traffic light. This knowledge was applied to food consumption (e.g., green, consume daily). Participants were asked to put three images of foods in the correct place in the traffic light while explaining their reasoning	Focuses on CK; To promote integrated learning and subsequent behavior changes (e.g., candy consumption reduction), it is important that DK and PK are coupled with CK	(Hailikari et al., 2008; Rosário et al., 2010; Rosário et al., 2017)
Activity 7 Healthy lunch box	Various foods, both healthy and unhealthy, were presented to participants. They chose the foods most appropriate for being school snacks while justifying their choices. Healthier alternatives were discussed when the unhealthy options were selected	Demanding the use of the DK, PK, and CK; Reinforces the sense of agency and reflection about their choices	(Cerezo et al., 2010)
Activity 8 Food and sport	Participants play bowling. This sport was chosen because the hospital context does not allow children to do vigorous activities, such as jumping and racing. Also, it allows children to feel that, despite some physical and health limitations, they can still do sports	Introduce the benefits of allying a healthy diet with exercise; Contribute to increasing children’s self-efficacy, their own organizational skills, and the implementation of the actions needed to achieve a specific goal	(Bandura, 1986)
“Slogan It”	Participants were challenged daily to produce a slogan that promoted the consumption of a specific food (e.g., Help Mr. Smith create a slogan to promote the purchase of his apples.). Slogans were written on posters that were displayed on the pediatric aisles so that all of the children could see the work of their peers	Promote participants’ involvement in the campaign; exercising PLEE logic: planning, children have to think about the benefits of the selected food and how they can convince people to consume it; execution, children built an appellative slogan (e.g., Apples are yummy and good for your tummy!); evaluation, children assess whether the challenge was met	(Rosário et al., 2017)

Note: DK (declarative knowledge); CK (conditional knowledge); PK (procedural knowledge)

Table 3
Means and standard deviations for the two treatment groups regarding the dependent variable (Declarative Knowledge)

	M	SD	Skewness	Kurtosis
<i>Control Group</i>				
Pretest Declarative knowledge	68.600	4.579	-.804	-.626
Posttest Declarative knowledge	68.467	5.501	-.359	-1.306
<i>Experimental Group</i>				
Pretest Declarative knowledge	63.533	5.643	.311	-.178
Posttest Declarative knowledge	72.067	3.654	-1.278	-1.171

Note: Declarative knowledge (minimum 15, maximum 75)

are considered healthy is a major challenge in nutrition education (Goh et al., 2009; Kearney & McElhone, 1999). In fact, 70% of EU individuals believe their diets are already healthy and do not know how to evaluate their own diet appropriately in terms of fat, fibers, fruits, and vegetables (Kearney & McElhone, 1999). Hence, it is imperative to equip children with actual knowledge likely to engage them in health eating habits. However, it is possible and sometimes desirable the PK precedes the DK (Núñez et al., 2013; Ryle, 1949). In this campaign, participants learned the DK (“what”) of healthy eating through the PK (“how”) by performing activities related to key points of the theme. For example, in Activity 3, children learned the components of a healthy plate (e.g., protein, vegetables) by doing their own plasticine meal. Instead of

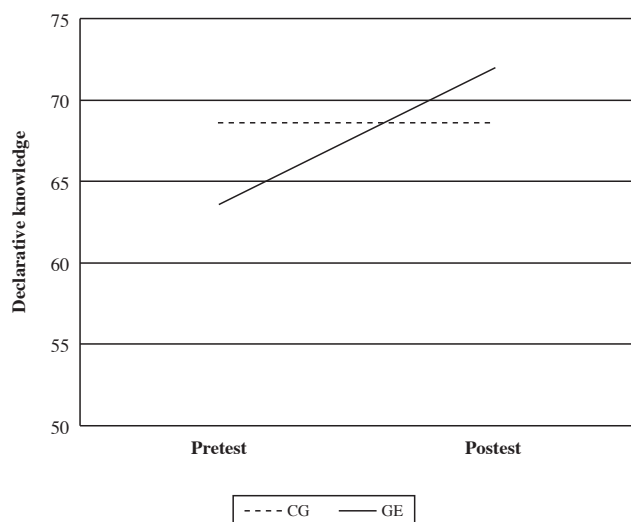


Figure 2. Graphical representation of intervention outcomes
Note: CG (control group); EG (experimental group)

passively listening what they should include in their meal, they actively created the meal and learned the quality of it.

Although this study only evaluates the knowledge acquired by the participants, their utterances suggest that incorporating self-regulation in the activities designed to promote healthy eating could have the potential to promote skills associated with a healthier lifestyle.

“I chose to put the soda in the school lunch bag because I thought this was good. But after all, it is not enough to be good just in terms of flavor; I learned that it has to be good for my body to grow well. The yogurt is good in flavor and good for me.” (14 years-old girl).

“In the plasticine activity I knew I had to make a varied and colorful meal. I made rice and fish and then I realized that something was missing. So I added lettuce and carrots, and it became more colorful.” (8 years-old girl).

My favorite activity was the Traffic Light because I learned that there are no forbidden foods. If we plan our meals, we can eat everything with moderation.” (Boy, 8 years-old).

The above utterances suggest how SRL may have been assimilated by the participants despite the briefness of the campaign. The participants planned (e.g., which foods they will choose to put in the lunch box), executed, and evaluated the outcomes of the tasks (e.g., my *plasticine* meal is not healthy), and then reflected on what to do next to make better choices.

The architecture of this thinking process triggers individuals' agent role in their learning process (i.e. children do not receive information about healthy eating passively; they perform the activities and reflect about the process); and allows individuals to build and consolidate knowledge (Rosário et al., 2017). Globally, our findings are consistent with recent literature stressing the importance of improving domain knowledge focused on health; for example, the study by Park and colleagues (2017) showed that education on osteoporosis knowledge could improve osteoporosis self-efficacy, and increase dietary calcium and vitamin D intake. Moreover, Chan and Prendergast (2016) reported that self-efficacy and perceived behavioral control are important variables in predicting healthy eating habits. However, when examining the impact of this campaign, it is important to acknowledge the context where it occurred and the lack of control of this study. A key characteristic of the hospital context is uncertainty from the unpredictability of each patient's hospital stay duration and disposition of inpatients to perform an activity (Magalhães et al., 2018). This helps explain why some children who started the campaign could not finish it. In addition, the instrument designed ad hoc for this research, the small sample size, and the absence of follow-up measures suggest that the results should be interpreted with caution and taken as preliminary. It is also important to acknowledge that some children, due to cognitive deficits, did not participate in the activities of the campaign. These children and their families are likely to also benefit from campaigns focused on healthy eating (Keihner et al., 2011), so future research may wish to adapt the contents of the activities of the campaign to children with cognitive deficits.

Future research could use a larger sample, consider other contexts, and evaluate whether the increase in knowledge remains over time. Future studies could also evaluate the impact of the campaigns based on SRL strategies and its relation to engagement in healthy behavior. Furthermore, to maximize the positive effects of this campaign, it is important to intervene as early as possible (e.g., beginning of elementary school), as suggested by the literature (Núñez et al., 2013; Rosário et al., 2017; Whitebread, Mercer, Howe, & Tolmie, 2013).

Consistent with Bandura (2005), the preliminary findings of the present study suggest the need to incorporate SRL in activities purposely designed to promote healthy eating. The use of SRL strategies to increase knowledge of healthy eating and encourage individuals' agent role seems to be promising to increase engagement in healthy habits. Therefore, the results suggest that similar campaigns could be incorporated in health promotion programs in additional contexts, such as primary healthcare centers and schools. Schools are key settings for health promotion as long as school-based interventions are theory-driven and focused on encouraging students' agency (Magalhães et al., 2018)

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