"Ser Criança" – an oral health literacy program for vulnerable children and families

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Study protocol

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Abstract

Background: Over the years, there has been an increasing and effective integration and participation of oral health in the concept of general health. The absence of educational interventions, and behavioral strategies for children´s oral health are still considered gaps in today's society. The main objective of this work was to define strategies of educational interventions in children's oral health.

Methods: The intervention for the "*Ser Criança*" Program involved the development of a website - "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile) for three target groups: children, parents and educators / teachers. With this proposition, it is expected that children, families, and school communities improve behavioral habits related to oral health. Also, the "*Ser Criança*" Program involves a specific protocol defining oral health literacy strategies and dental appointments among the children and families.

Results: The "*Ser Criança*" Program involves a specific protocol defining oral health literacy strategies and dental appointments for children and families. It is crucial to emphasize that most recreational activities are beneficial in the transmission of motivational values. The use of educational games, exploration of macro dental models, theatre and music are valid examples of these activities. Interventions based on digital media (applications or *"apps"* and the Internet) also prove to be a constant demonstration of success for children's personal and cognitive growth. Aiming on a digital tool for pre-school and elementary school children, through a web-based platform allows, especially amongst the hard-to-reach communities, an immeasurable access to multiple possibilities.

Conclusions: Educating future generations using attractive educational, didactic and, above all pedagogical interventions can greatly improve health interventions, especially in the field of dental medicine.

Background

The integration and participation of oral health into the overall health concept is a process that has been refined over the years. In the 1940s, the World Health Organization (WHO) defined health as "(…) *a complete state of physical, mental and social well-being and not merely the absence of disease or infirmity*" (1).

The notion of quality of life has been developed in parallel with the undeniable value of the oral condition. Oral health diseases can negatively impact on the functional, psychological and social well-being of an individual (2).

As far as preschool children are concerned, the repercussions on quality of life and oral health are notorious when oral diseases are reported (3). The high prevalence of some pathologies at these early ages, such as dental caries (most common), trauma and malocclusion, is closely linked to poor quality of life, not only individually but also at the household level (3–5). Although the literature extensively addresses the topic of oral health promotion, the lack of children's educational interventions, as well as the application of behavioral strategies, are still considered gaps in today's society. An educational intervention will not be effective if it is only child-centred, thus devaluing the child's environment, personal and interpersonal relationships (6).

Understanding the best interventional strategy to apply can be somewhat challenging. In-depth knowledge of the effectiveness of various educational alternatives helps identifying the best option for each age group. Thus, the analysis of the effectiveness of educational interventions on children's oral health is considered a very interesting topic (7).

An effective intervention in the child's oral health must combine two concepts: education and fun. The ease of learning at preschool and school ages is closely linked to the act of playing. Learning with fun can bring many benefits to children such as: awakening visual alertness, consolidating memory and reasoning strategies, or increasing attention span (8). According to Milteer *et al.* (9), from an early age, playing is considered crucial in a child's cognitive, creative, emotional, and physical development (9). Also parents who spend more time with their children in building playful activities end up strengthening the primordial family connections. For children in unfavorable households, the "fun" factor often goes unexplored, considerably reducing the child's potential for learning and intellectual development. These circumstances can be overcome in a supportive society where teachers, early childhood educators, and educational assistants´ role is valued (9).

The choice of the best educational interventional method continues to be the subject of regular study and analysis. One of the most conventional processes advocated in the literature is a strictly theoretical oral education. This type of childhood instruction rarely generates a positive behavioral change (10). Currently, the variability of pedagogical alternatives is considered one of the main factors for improving children's oral health (6). The oral health promotion actions directed to children can be carried out through playful tools that make the learning process more appealing, dynamic, easy to understand, and consequently more effective. Some playful communication strategies adapted to this public are: educational games, short plays, songs, and exhibitions of dental macro-models. All of these will contribute to increase knowledge, as evidenced by some previously conducted studies (11, 12). The choice of the activity to be proposed must be made in a coherent and appropriate manner according to the child's degree of cognitive knowledge and maturity. Only in this way will the information to be transmitted be effectively grasped by the children (13).

In recent years, we have seen a revolution in the field of technology, which has changed the way we interact with other people and the way we search for and exchange information. Information and communication technologies have the potential to revolutionize the delivery and organization of health care in many different ways: improving outcomes, reducing costs, increasing access, especially in disadvantaged and rural areas and low-income countries (14). Teledentistry is a combination of telecommunications and dentistry that involves the exchange of clinical information and images remotely for dental consultation and treatment planning (15). According to the American Dental Association (ADA) policy with regards to teledentistry this is not a specific service, but a collection of means to improve care delivery, a wide variety of technologies and tactics to provide virtual educational and medical services. It includes, but is not limited, to the following modalities:

- Synchronized (live videos): live, two-way interactions between a person (patient, caregiver) and a healthcare professional using audio-visual telecommunications technology.
- Asynchronous (store and forward): transmission of recorded information (e.g.: x-rays, photographs, videos of patients) over a secure electronic communications system to a healthcare professional, who uses the information to assess the patient's condition or provide a service, and no real-time interaction takes place.
- Remote patient monitoring: collection of personal and medical data from an individual at one location via communication technologies, which is transmitted to a provider (sometimes via a data processing service) at a different location for use in follow-up care, or for patient supervision only.
- Mobile health (mHealth): healthcare and educational practices supported by mobile communication devices, such as cell phones, tablets, and personal digital assistants.

While direct in-person examination has historically been the most direct way to provide care, technological advances have expanded the options for dentists to communicate with patients. The ADA believes that the examinations performed with teledentistry can be an effective way to extend the reach of professionals, increasing access to treatment for a population within a reasonable geographical distance (16).

Educational interventions for oral health promotion

Activities that promote oral health and, consequently, provide a range of possibilities that support children's knowledge are increasingly excellent alternatives for children's cognitive evolution. Children's growth and resourcefulness will be extensively influenced by their learning years. In parallel, the presence and attitude, not only of the parents, but also of the educators will contribute positively or negatively to the child's development (17, 18).

Today's dentistry is constantly challenged to intervene in an educational manner in the daily lives of children and young people. As mentioned above, appealing and engaging strategies should be pursue for transmitting concepts of oral pedagogy, strengthening the triad - children, parents, and teachers/childcare workers (13).

Educational games are conventionally considered to be a stimulating and truly dynamic method or educational alternative that reinforces learning at a young age (8). They are considered attractive options for a generation that lives intensely connected to games.

Play has several benefits in the learning process of individuals in younger age groups. With a diverse range of educational games, those involving strategic planning are highly engaging for children (8, 14). In this type of game, the youngest are exposed from the start to several options, eventually deciding which is best or worst for the course of the game. Depending on the decision, the outcome may change. This teaching strategy has numerous advantages. Besides encouraging and reinforcing one's identity early on, it also increases knowledge retention through trial-and-error methods (8, 14).

The use of interactive and, at the same time, educational games has been favored in dental medicine (14). With daily use of many of these games, some children's behaviors will gradually change until a habit is created. Before the games are shown, it is mandatory that there is an evaluation of all their components so that the pedagogical objectives are met (19).

In the study by Aparecida *et al*. (19) a didactic game was developed for children between the ages of five and seven. The game is entitled "Doctor Treats Teeth*"* and is composed of three parameters related to oral health: the cause of oral pathologies; prevention methods; and hygienic procedures. All components were put to the test through association, memory, and drawing games. After a detailed analysis by three professionals from different fields (dental medicine, education, and psychology), some conclusions were drawn. First, the field of dental medicine was ensured by the correct and concise transmission of all the necessary concepts adapted to the age group. Second, the educational question demonstrated that the language used, although extensive, was simple and accessible. Finally, the psychologists revealed that the game consolidated many useful and positive themes for the children. Overall, it was considered an educational, dynamic, and interventional approach for the entire study group.

Theatre can also be considered a remarkable interpellation of educational actions in the field of oral health. The creation of stories and their personification are considered excellent alternatives for the transmission of the educational message. Playful teaching, more specifically, theatre can energize the way of learning by stimulating participation and interaction both individually and collectively. Overall, the inter- and intrapersonal development of each child is explored extensively. In addition to the primary goal of conveying knowledge about oral health, theatre also allows for the exploration of characteristics that enhance imagination and vocabulary development. All of this contributes favorably to the overall development of the younger learners (13, 20). Music is considered a universal language. The transmission of knowledge can be ensured through musical expression. In early childhood education, music provides the dissemination of the pedagogical message in a creative and playful way. Although the lyrics of the songs can be adapted to the various languages, the melody remains, and it is precisely this musical rhythm that makes content retention possible. Unconsciously, our mind memorizes and reproduces the melody very easily (13). The music or musical interpretation reflects some steps that are intertwined with the hygiene routine, such as brushing the teeth, but also emphasizes the importance of prevention, demystifies transient scenarios about going to the dentist, and consequently circumvents some psychological issues such as anxiety and fear of the dentist (13, 21).

Macro-modelling is a method recognized by multiple dental professionals that is commonly used in the office. Macro models are large-scale 3D representations of the oral cavity (like an enlargement) For children, these models are an extremely educational resource because it allows the dentist to explain various concepts inherent to oral health, such as the correct brushing technique. With this interaction, between patient and dentist, the interest in the area and the treatment itself becomes much more simplified. Contact with the macro models stimulates curiosity and communication among children. If the concepts are well grasped, the children's hygiene routine will improve, as will oral health indicators (20–22).

A New Digital Era For Oral Health Literacy

Anxiety, nervousness, and even fear are very recurrent feelings before and during the visit to the dentist (23). There are many techniques to circumvent these anxious behaviors. One of the most used methods is the *'tell-show-do'*. As the name implies, this technique aims to explain the procedure, demonstrate, and finally "apply" the treatment in an interactive and harmless way. It is very common to enlist the help of parents or siblings to comfort the child. It is also usual, depending on the outcome of the appointment, to give positive reinforcement (24).

Nowadays, we live in an increasingly technological and digital era. From young age, there is a natural and almost innate mastery to discover the computer world. Technology has been an excellent ally in the fulfilment of various daily tasks, and these are encompassed in a very diverse range. The importance of digital choices has been put to the test with the current pandemic situation imposed by COVID-19. For thousands of people worldwide, and because of imposed social distancing, the internet became, very often, the only solution to give continuity to work, but also to allow the communication between teachers and students (online teaching). The education of the youngsters was also ensured through the use of technology, and it is imperative to highlight the role of teachers and kindergarten educators who, in conjunction with parents and/or caregivers, managed to maintain the educational focus during the confinement phase. Thus, and with an entirely changed reality, tens of thousands of children have adapted their learning routines. Although distance learning is not a new concept, it is undeniable to underline its importance throughout this period (20). Dozens of digital platforms, computer applications, and educational resources, mostly free and available in several languages, have facilitated and revolutionized student learning on a large scale (23).

Parallel to the importance of the use of digital media, it is crucial to analyse the high discrepancy concerning the lack of access by many families. Witt *et al.* say that, if on the one hand, many have the opportunity to enjoy this electronic alternative, on the other, especially the weakest households, do not have access to this medium, and it is a constant challenge. Virtual connection and outreach to the most disadvantaged communities remains a constant topic that incites interest in vast studies (22).

Methods

" Ser Criança **" Program**

Despite the various alternatives that exist, it is indisputable that the technological world is gaining more and more visibility in areas such as dental medicine. The applications are playful, interactive, and dynamic tools that contribute to the development of education not only for the children, but also for the family and school environment where they are involved (24).

Still, in the context of digital interventions, also the *websites* can be considered relevant alternative methods in disseminating educational information regarding oral health (25, 26). Children, parents and early childhood educators form a triad that is the basis for a successful educational foundation and is used as a model in the "*Ser Criança*" Program.

A partnership was established between "*Reencontro - Associação Social, Educacional e Cultural de Vila Nova de Tazem*" (social, educational, and cultural association) and the Faculty of Dental Medicine of the *Universidade Católica Portuguesa* (FDM-UCP).

The program "*Ser Criança*" intends to evaluate the condition of a group of socioeconomically vulnerable children belonging to the municipality of Gouveia, Portugal, and to understand the cause and the type of disturbance combining health education in the family context. It is a pioneer program in charge of the "*Reencontro*" Association.

The social problem that "*Ser Criança*" intends to address is that of children's social exclusion, consequently poverty and other forms of extreme deprivation faced by children and their families. The presence of a child in a household whose vulnerabilities are very marked significantly hinders his or her integral development. It is extremely important to intervene in children's development from early childhood, in order to enhance equal opportunities in society and to stop the cycle of social exclusion (26). "*Ser Criança*" is a program that intends to include several areas that are interconnected and inherent to the child's overall quality of life. For this, and through the partnership between FDM-UCP and "*Reencontro*" Association, "*Ser Criança*" was extend to oral health, thus emerging the "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile). This population benefits from the acquisition of knowledge in oral health, enabling an improvement in health indicators.

The objective of this work is to establish methods to promote oral health literacy applicable to the participants of the "*Ser Criança*" Program, namely:

- The development of a *website* - "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile), through the platform *Wix* (https://projsc.wixsite.com/projetosercrianca), that connects the program's three target groups: children, parents/caregivers, and teachers.
- Creation of a protocol for remote dental appointment supported by information obtained by intraoral photos, using teledentistry.

Results

Development of the website for oral health literacy: " Ser Criança – Aprender a Sorrir **" (A Child - Learn to Smile)**

The theme of sustainability is closely linked to the overall vision of the "*Ser Criança*" Program. The development of a digital alternative that can be an alternative model for oral health education aimed at the three target groups (children, parents and educators), is an important contribution to a more sustainable society, and this fact allows us to meet the objectives set for the program. As such, and being an interventional method based on literature, the proposal for the program includes the creation of a *website*. In addition to the oral health education of these groups, the *website* will also function as a means

of publicizing the program. The logo (Fig. 1) created at the beginning of the program development was included in the *website* "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile).

The participants in this program were mostly from socioeconomically weak households. During the period of confinement, caused by the COVID-19 pandemic, the website was launched through the means used by the schools (involved in the "*Ser Criança*" Program) in distance learning, such as printing out the drawings for coloring and sending them by mail to the respective addresses of the parents or caregivers. Although the use of the digital world may be limited, it is a feasible alternative for accessing the content of the website. In a post-confinement and therefore more controlled phase, the exploitation of the website has been done with the guidance of teachers or kindergarten teachers. Recently, the Portuguese government established a set of guidelines to be applied to pre-school and school education in a post-confinement phase. Many of these guidelines involved encouraging the use of digital resources for stimulation in early childhood education.

The *website* of the Program "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile), has as *link* access https://projsc.wixsite.com/projetosercrianca. This *website* consists of six main pages: 1) Home; 2) Who we are; 3) Team; 4) Children; 5) Parents and 6) Educators (Fig. 2). All components present on the pages aimed at children, parents, and educators are reinforced by information regarding oral health described in the literature.

The "Home" page expresses an overview of the entire *website layout*, highlighting the "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile) logo, also created and developed for the promotion and dissemination of the entire program.

The "Children" tab is subdivided into three pages: 1) Learning Games; 2) Let's Paint!; 3) Challenge yourself. At this stage of construction of *website*, a very simple and interactive example is already available on the Learning Games page, created by a member of the "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile) team. This game is titled "The toothbrush superhero". The objective of the game is to collect all the brushes and, at the same time, to "escape" from candies (ice cream, candies, and donuts). The longer you stay in contact with the brushes, the more points you accumulate. With each new *record* achieved, the player has the possibility to register his name. This original game from the "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile) Program perfectly intertwines oral health literacy, daily challenges and fun. This section of the website is dynamic *and* will gradually grow with the addition of challenging games that can be adapted for various age groups. The second division "Let's paint!" presents some examples of coloring pages that can be printed by parents or teachers and given to children. The last subdivision of the "Kids" page is made up of some specimens with a higher level of difficulty, such as crossword puzzles, dot-matching, and alphabet soup.

The page dedicated to parents contains two sections: "Story Time" and "More Information". The first section "Story Time" includes an example of a story that can be passed on to children by parents, where the motivation for oral health is underlying. In the second section, "More Information", parents can find a very informative leaflet designed by the FDM-UCP, with accessible vocabulary suitable for younger age groups.

Finally, the last section of the page is aimed at kindergarten and elementary school teachers and is composed of three categories: "Classes and Lectures", "Theatre and Music", and "Share Your Opinion!". The role of teachers is vital to the cognitive development of children. In this part of the website, information is available in the form of presentations (prepared by the FDM-UCP for different learning levels/ages) that can be used by education professionals, as didactic material. Two equally dynamic and playful methods can be highlighted in this third section: theatre and music. Theatre and music go hand in hand in transmitting information in a fun and effective way. Examples of songs and puppet theatres notoriously recognized in the dental world and aimed at pre-school and school ages are available on the website. Both - theatre and music - are referenced on digital platforms available for free on internet. The last subdivision of this third section is titled "Share your opinion!". In this thread, kindergarten educators can share the most effective teaching methods in their daily practice. The purpose of this thread is to create a community that, in some way, helps not only the teachers engaged in the "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile) Program, but also all those at a national level who may be interested in joining the group. A national network base on knowledge-sharing will be widely supported.

Description of the clinical protocol

The program also gives the opportunity of developing a dental appointment by teledentistry method for the children and families involved, ensuring the possibility of having a diagnostic and preventive on-line appointment.

The *Google Meets* tool of *Google Classroom* is used due to its proven effectiveness as a digital teaching platform, and due to the sample's familiarity with the platform, which is defined by the Portuguese government for distance learning.

In a first contact with the sample, the program is presented, and its objectives defined. After the presentation, "Story Time" will begin, one of the playful contents developed to make children aware of the oral health issue.

At the end of the session, the interest and availability for participation is gauged, and those who respond positively receive the video tutorial.

Complementing the website created, and in a partnership with *Trinity College Dublin (TCD) - Department of Public & Child Dental Health*, a tutorial was created with the goal of instructing caregivers to photograph the children's oral cavity in frontal and occlusal views with lip separation to produce images enabling diagnosis. The cultural adaptation of the video was made, now in Portuguese from Portugal since there were already versions in British English and Brazilian Portuguese. Cross-cultural validation is a very useful process because it enables comparisons of data between countries, thus not requiring the creation of new tools for study, and it is possible to later relate data with studies that use the same tutorial. Considering that this process has already been used to adapt the tutorial for other languages and proved to be extremely satisfactory.

The video tutorial itself consists of the following steps:

Step 1 - The child must perform a prophylactic brushing.

Step 2 - The child must wash his hands since he/she is going to manipulate his own lips.

Step 3 - The child should place his/her fingers inside his/her mouth so that the mucous membrane is pulled apart, and he should occlude.

Step 4 - The use of a small mirror is promoted.

Step 5 - In order to photograph the upper jaw, the mirror is inserted into the child's mouth, and he/she is asked to lift his chin, and once it is well positioned, the photo is taken.

Step 6 - In order to photograph the lower jaw, the mirror is inserted into the child's mouth, and he/she is asked to lift his/her chin and retract his tongue.

The analysis of the intraoral photographs will be conducted by first evaluating whether they meet the minimum quality criteria to be analysed, after this evaluation the oral health evaluation form will be completed, based on the researcher's recommendation and the child will be referred for an online dental appointment.

The virtual appointment will give the opportunity for the caregiver and the patient to establish clinical and educational empathy with the dentist, to be able to expose their symptoms more openly, which consequently allows a more accurate diagnosis and a more appropriate treatment plan.

In this context, they are encouraged to expose any doubts, and, in cases where there is an indication, a small demonstration may be made on how to perform a correct oral hygiene, always appropriate to the age, needs, and conditions of the patient. Based on the observations made and data collected, the treatment plan is formulated, and the child is referred to a dentist, accordingly.

Conclusions

The *"Ser Criança"* Program is a pioneering initiative that intends to act in the detection of oral pathologies and its treatment in children, it also includes preventive strategies and access to oral health knowledge.

By conquering and establishing educational and interventional measures, it will be possible to change conceptions and paradigms, not only pre-established by parents but also by the children themselves. Anxiety and fear of the dentist are recurrent feelings in the office. Overcoming these obstacles is closely linked to the conduct of the major players in a child's life. Thus, a favorable interconnection of parents and teachers can be one of the key points for the healthy development and growth of children.

At the level of interventions, it is conclusive that most of the recreational activities are fruitful in transmitting motivational values. The use of didactic games, exploration of dental macro models, theatre, and songs are valid examples of these activities. Also, digital media-based interventions prove to be a constant demonstration of success for children's personal and cognitive growth. The development of a digital platform in pre-school and school education, opened an array of possibilities built on an easy and 24 h access format, in a child and family friendly way.

Abbreviations

WHO: World Health Organization; ADA: American Dental Association; FDM-UCP: Faculty of Dental Medicine of the *Universidade Católica Portuguesa*.

Declarations

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The research was approved by the Health Ethics Committee of the Universidade Católica Portuguesa (Approval number 30). Written informed consent was obtained from all participants.

Consent for publication

Not applicable.

Availability of data and materials

The data and additional information used to generate and support the protocol established are available from the corresponding author upon request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

NV, MJC, ACMM and ASD were responsible for the conceptualization and design of the project. BD, ACMM, PCouto, PCorreia and MO were responsible for the establishment of the protocols and writing of the manuscript. NV, MJC, ACMM, ASD, PCouto and PCorreia drafted the main manuscript and made major contributions to the revising of the manuscript. All authors read and approved the final manuscript submitted.

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Figures

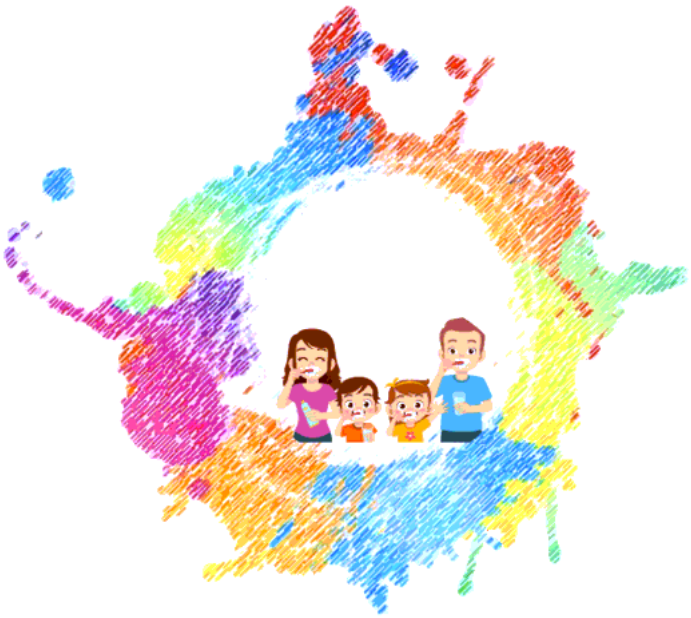

Figure 1

Logo of the Program "*Ser Criança – Aprender a Sorrir*" (A Child - Learn to Smile). Source: original from the author.

Figure 2

Site Overview. Source: original from the author.