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Effective Design of Serious Games for Children with Chronic Diseases: The Role of Parents and Caregivers

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Abstract. Research on digital games explicitly designed for medical or health-related purposes has grown rapidly over the past years. Serious games have been used to convey health-related information to children, to engage them in health decision making, to promote healthy behaviours, and to influence health outcomes. In this process, parents represent an important, yet often neglected, target audience. Studies increasingly stress the importance of engaging parents and caregivers as agents to support their children, and of involving them directly in some part of gameplay. The present work reviews the latest research on games for children with chronic diseases from the perspective of parents and caregivers, concluding that further research is needed, in order to create evidence-based games that are tailored to the specific challenges faced by both paediatric patients and their parents.

Keywords. Serious Games, Chronic diseases, Parents, Caregivers

1. Introduction

The term serious games (SGs) refers to games specifically designed for purposes other than mere entertainment. They are developed according to pedagogical principles and serve education and training purposes, supported by gaming techniques and entertainment [1]. Serious games are considered a useful tool to bring about better outcomes in healthcare. Research on digital games explicitly designed for medical or health-related purposes has grown rapidly over the past years, targeting diverse clinical areas [2]. Baranowski et al (2016) noted that SGs "offer exciting, innovative, potentially highly effective methods for increasing knowledge, delivering persuasive messages, changing behaviours, and influencing health outcomes" [3]. A substantial number of studies have thus been published on SGs addressing diverse aspects of health and care. Important application areas include health communication, health promotion and preventative care, health management and rehabilitation and behaviour modification for patients and education for medical professionals. Given the interwoven nature of child health and support environment, parents and caregivers play

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an important role in game-based interventions for children with chronic physical or psychological health problems. The present work investigates the gap in past studies related to the analysis of the role of parents and caregivers in SGs interventions reviews.

2. Methods

We conducted an exploratory review of the literature through searches in 2 scientific electronic databases (ScienceDirect, and PubMed). We used keywords in various combinations such as Serious Games and parents, caregivers. For inclusion, articles had to: (1) be relevant to the role of parents, caregivers in serious games for Children with chronic diseases (2) be published in English and in scientific peer-reviewed journals.

We identified and examined 86 articles deemed to be relevant. Of these, we excluded 56 out of 86 because they did not satisfy one or more of the requirements, particularly papers that made no concrete reference to the role of parents or caregivers in the design, implementation and/or validation of the SG intervention. Hence the high number of exclusions. Additional papers were consulted from citation snowballing and the final review comprised.

3. Results

Parents are an important target audience of games for children with chronic health conditions. However, the role of parents or caregivers in SGs-based interventions for children's health is not properly analysed. No dedicated study was found on the subject. Nonetheless, SGs studies often encourage the involvement of parents or caregivers in gameplay, given that they typically play a significant role in managing children's health, particularly in the case of young children [4]. Besides games directly targeting young people and the emergence of dedicated solutions for parental education on managing children's chronic condition [5], [6], studies increasingly stress the importance of engaging parents as agents to support their children or involving them directly in some part of gameplay [7], [8].

In the case of young asthma patients, researchers conclude that games alone are unlikely to yield a positive behaviour change and that the child's environment must also be influenced [9]. Asthma studies explicitly involved parents in some part of gameplay. With the active involvement of parents, gaming platforms can enable home-based intervention for children with autism (Autism Spectrum Disorder, ASD) [5]. Joint parent-child programs are deemed beneficial in the case of children and adolescents suffering from anxiety [10]. Similarly, games can help reduce the burden of medical procedures on patients, parents, and clinical care providers [11]. Parental involvement is expected to enhance potential benefits and increase adherence in exergaming programs that promote physical activity in children for prevention, treatment or rehabilitation [12]. Complementary activities involving parents are encouraged, as a means to enhance consolidation of taught material using the "Emotiplay" game for learning about emotions in children with autism [13]. Solutions to improve parental communication skills are expected to help parents become effective support agents for their children, and thus enhance the benefits of SGs programs [7].

SCERTS model educational approach is considered as very important, sharing the goals of learning between parents and children with chronic diseases, through collaboratively creating learning experiences [14]. The simultaneous use of two digital tablets proposed as an innovation aspect of an automated serious gaming platform GOLIAH to deliver intervention at home for Autism, since can provide interaction between children and parents. The same feature appears only in the game of ComFim [15]. Although teachers and parents are eager to use technology to support learning of children's with autism, there are just a few related applications involving parents and caregivers [16]. In the case of Junior Detective Training Program (A multi-component social skills intervention) the participation of parents is also limited to helping children in a part of the game. Furthermore, in the case of "Let's Face it" (Using computerized games) parents are restricted only to send log data since the game was designed not directly involving parents or caregivers. The role of guidance that provides feedback to the participants is the main implication of therapists during game sessions.

Only in case of GOLIAH there are games dedicated to collaborative actions between children and their parents or therapist or caregiver. Furthermore, GOLIAH according to literature seems to be the only gaming platform that involves clinicians at the hospital with parents at-home [17]. In case of children with Attention Deficit Hyperactivity Disorder (ADHD) the involvement of their parents in the joy of achievement in a serious game could have enhanced the child's appraisal of the game's positive feedback and its effect on his/her self-esteem. (Improving executive functioning in children with ADHD).

4. Discussion

This review has some limitations. First, we included only games that were described in the scientific literature. Second, conclusions were drawn on a small number of game studies, as fewer data exist for programs for children with chronic diseases. Furthermore, these studies are typically small in scope and not conclusive.

Often the issue of games for children's health is approached from a narrow perspective, resulting in its diverse facets not being properly analysed. Child patients are not the same as adult patients. Evidence shows that the child's environment must also be taken into consideration. Appropriate measures to influence the child's environment are needed, most importantly their parents. Parents need to be empowered for the continued management of their child's chronic condition.

There is limited evidence to support the effectiveness of serious games used to care for and support children with physical or mental disabilities. The effectiveness of interactive media to educate the parents of children with chronic conditions is also questioned [6]. Studies, however, reveal important trends that should be explored further. Games for health alone are unlikely to be the sole factor behind any positive behaviour change. The child's environment must also be influenced, therefore the inclusion of a parent or an adult into the serious game seems to indicate that this may be key to finding improvements. While the child may look outside to their peers for social cues, parents still have a strong influence on their child's behaviour. Additionally, the inclusion of the parent may introduce other elements into the environment once they are finished playing the game. For instance, conversations between the parent and the child could be around a situation from the game and not from ''real life.'' This may alleviate some stress in the conversations.

5. Conclusions

Future research into this relationship will be important to understand the key mechanisms into parent involvement and develop evidence-based games tailored to the specific challenges of children and their parents. A limited understanding of proper design principles among the development and implementation side can compromise the use of a medical serious game. Our recommendation would be to include parents in the design, implementation and validation of SGs interventions for children health.

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