

Serious Games in Orofacial Myofunctional Disorder Therapy for Children: An Expert Survey

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Abstract. Orofacial Myofunctional Disorder (OMD) is believed to affect approximately 30-50% of all children. The various causes of OMD often revolve around an incorrect resting position of the tongue and cause symptoms such as difficulty in speech and swallowing. While these symptoms can persist and lead to jaw deformities, such as overjet and open bite, manual therapy has been shown to be effective, especially in children. However, much of the therapy must be done as home exercises by children without the supervision of a therapist. Since these exercises are often not perceived as exciting by the children, half-hearted performance or complete omission of the exercises is common, rendering the therapy less effective or completely useless. To overcome this limitation, we implemented the LudusMyo platform, a serious game platform for OMD therapy. While children are the main target group, the acceptance (and usability) assessment by experts is the first milestone for the successful implementation of an mHealth application for therapy. For this reason, we conducted an expert survey among OMD therapists to gather their input on the LudusMyo prototype. The results of this expert survey are reported in this manuscript.

Keywords. Gamification, Serious Game, mHealth Application, Orofacial Myofunctional Disorder, Expert Survey

1. Introduction

Orofacial myofunctional disorder (OMD) is estimated to affect 30-50% of children [1,2]. The causes of OMD are manifold [3,4] and can manifest in a wide variety of symp-

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toms. These symptoms include abnormal resting position of the tongue [5], swallowing problems, speech defects [6,7], and jaw misalignment, which can lead to a variety of problems such as difficulty breathing [8].

Specialized manual Myofunctional Therapy (MFT) has been shown to be effective in overcoming the symptoms of OMD [9,10]. This therapy heavily relies on exercises that children perform at home. However, these exercises are often not perceived as interesting or fun by children and are therefore performed half-heartedly or not at all, resulting in a prolonged therapy process. Therapists rely on personalized feedback from the children and their parents about the exercises to determine their effectiveness and performance.

These limitations can be overcome with an app-based approach (i.e., mHealth application) that motivates children using gamification elements and serious games and allows therapists to track exercises easily. An example of the successful implementation of such an approach in speech therapy is the neolexon app, which is available for patients with aphasia and apraxia of speech [11]. The latter provides serious games for the children with therapeutic measurements and allows therapists to track their progress continuously. The prototype of the LudusMyo mHealth application [12] provides similar functionality for OMDs. Instead of touch or voice input, the games are played with the sound of a whistle, a common tool used in MFT.

The successful implementation of new therapeutic approaches, mHealth applications, and software, in general, requires the involvement of many stakeholders [13,14]. While patient acceptance is ultimately critical to success, it can be argued that therapist acceptance is of paramount importance. For an actively used therapeutic application, it must be endorsed by the therapists themselves and integrated into the therapy process.

Following the methodology of Kalayou et al. [15], we evaluate the acceptance of the LudusMyo application by MFT therapists and identify the weaknesses of the prototype.

2. Methods

An expert survey was conducted as a qualitative survey with one pretest (E1) and 7 participants (E2 - E8, see Table 1). Four experts work for the same employer, two work for another employer, and one is self-employed. No major problems were found in the pretest and only minor changes were applied to the interview. The survey was conducted in person with five experts and online via Zoom with two experts. No major differences in response behavior were found between the two interview methods. All interviews were conducted in German. The results were translated into English for this paper.

The modified Technology Acceptance Model (TAM) of Kalayou et al. [15] was used as a guideline for the survey. This version of the TAM was created to specifically test the behavioral intention to use eHealth systems, given IT literacy and available infrastructure. The model assigns its questions into the following six categories: Perceived Usefulness (PU), Users Perceived Ease of Use (PEU), Attitude Towards Using eHealth (ATT), Staff IT Experience (ITE), Technical Infrastructure (TI), and finally, the Behavioural Intention (BI). The primary research question to be answered with this survey was: *"Is the prototype of the LudusMyo platform suitable to be used in speech therapy treatment of children with OMD?"*.

The interview was divided into an audio-guided presentation of the prototype and the qualitative interview itself. The presentation was done using a PowerPoint presenta-

Table 1. Demographic Data of Survey Participants

#	Age (Years)	Experience (Years)	Specialization	OMD Patients (in %)
E1	58	35	Children with disabilities, supported communication	-
E2	27	3	Speech disorders, neurological disorders	10 - 20%
E3	23	1	None	50%
E4	32	4	None	10 - 20%
E5	26	3.5	Neurology	30%
E6	59	36	Speech therapy	25%
E7	31	8	MFT, supported communication	20%
E8	50	31	MFT, severe disabilities	5%

tion with voice-overs to ensure the exact same introduction to the application for each participant (i.e., speech therapists). The user interface of the application was presented, showing its landing page, various games, achievements, and mascot. Also, an overview showing statistics and progress was presented. The use of the whistle as an input device was also demonstrated. The qualitative interview itself was conducted as a guided interview with open-ended questions to collect opinions about the LudusMyo mHealth application in MFT and the reasons for them.

All interviews were recorded and automatically transcribed using Trint software and manually checked according to the transcription guidelines of Kuchartz et al. [16]. All participants gave their informed consent.

3. Results

All experts indicated that the technical infrastructure for using the LudusMyo mHealth application was available in their work and for their patients (TI) and that a digital addition to therapy was highly feasible. Some therapists were already conducting fully digital therapies using online conferencing tools (ITE). The experts perceived the usability of the application as intuitive and self-explanatory (PEU). Explaining the correct use to parents and children was not seen as a problem. The potential benefits were clearly seen by the experts, who stated that the application could reduce the duration of therapy by making it more effective and efficient (PU). However, the use of the application for children with disabilities was seen as a major problem and not applicable (PEU). All experts had a very positive attitude towards the prototype and expressed interest in testing it in a real-life therapy setting (BI, ATT).

The main benefits for therapy were identified as an improved motivation of the children to exercise due to the serious games and gamification aspects and a better traceability of their exercises due to the statistics available to the therapists (PU).

In addition to the generally positive feedback, all experts pointed out two limitations with respect to the usefulness of the application (PU). Although they are able to track the exercises performed by the children, they are still unable to determine the quality of the exercises performed. The use of computer vision to track the children's faces during the exercises was a requested feature that may resolve this issue. Furthermore, the

whistle used can only cover about 5% of the exercises in MFT (PU). Therefore, other input devices are needed for a comprehensive MFT with LudusMyo. Recommendations from therapists were pressure sensors used in the oral cavity and again computer vision algorithms to detect facial expressions.

Another potential limitation mentioned by many experts was the issue of financing. If therapists have to buy the application for their patients, their acceptance to use it would decrease (BI). On the other hand, if patients have to buy the application, this could increase the injustice between wealthy and less wealthy patients, as some might not be able to afford the application.

Finally, many experts mentioned that more and more MFT patients are teenagers rather than children. While therapists believe the application will also work for teens, the mascot was identified as a potential problem, as the latter was designed with children in mind. Teens may feel that they are not being taken seriously, which could reduce their willingness to train and use the application. An alternative mascot was recommended for teenagers.

4. Discussion

The statement that the whistle is only applicable to about 5% of therapy exercises was a valuable finding of the survey. Since the LudusMyo mHealth application is designed to be extensible, both in terms of content and input devices, this limitation can easily be addressed in future versions. The focus will now be on working with therapists to identify devices that can handle the remaining exercises and whose output can be converted to a digital signal that can be added as an input handler.

A solution to the possible financial injustice mentioned by the therapists could be registering the application as a Digital Health Application (DiGA) in Germany. DiGAs are paid for by insurance companies in Germany rather than patients, allowing access regardless of personal financial situation. However, the development of such DiGAs is challenging and a complex endeavor [17].

The primary limitation of the survey is the selection of experts. While there are experts early in their careers and experts nearing the end of their careers, no experts are in the middle of their careers. Nevertheless, the responses were very consistent across all experts regardless of their age. A future survey should target more experts of all age ranges for a more reliable overview.

5. Conclusion

A first expert survey for the LudusMyo mHealth application was conducted to assess the acceptance of the application by therapists and to identify the strengths and limitations of the current concept. While the application was perceived very positively, the chosen input device in the form of a whistle was found to be insufficient for a successful therapy. The whistle covers only about 5% of the required exercises, thus currently limiting the application to a very small part of established therapy forms. Therefore, further work should focus on identifying new inputs for the application in close collaboration with therapists. In addition, a new mascot needs to be created to appeal to the teenage

target group identified in the survey, and a more adult design of the application should be provided as an alternative. After expanding the application with new input handlers, mascots, and designs, a follow-up survey with therapists should be conducted before expanding testing to children and adolescents.

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