

DESIGN
INSIGHTCarla Langella¹, Salvatore Carleo², Marianna De Luca³

1. Department of Architecture, University of Naples Federico II, Naples, Italy
2. Department of Architecture and Industrial Design, Università della Campania Luigi Vanvitelli, Naples Italy
3. Azienda Sanitaria Locale Napoli 2 Nord, Naples, Italy

To Cite: Langella C, Carleo S, De Luca M. Design and optimisation of praxis care tools. JHD. 2023;8(2):575–580. <https://doi.org/10.21853/JHD.2023.208>

Corresponding Author:

Carla Langella
Department of Architecture
University of Naples Federico II
Naples, Italy
carla.langella@unina.it

Copyright:

©2023 The Authors. Published by
Archetype Health Pty Ltd. This is an open
access article under the [CC BY-NC-ND
4.0 license](https://creativecommons.org/licenses/by-nc-nd/4.0/).

SUMMARY

In recent decades, the relationship between design and medicine has become increasingly reciprocal and active. Speech therapy is among the branches less explored by design. The tools usually used for speech therapy are often handcrafted by therapists and have several problems, including replicability of treatments and comparability of results. Considering this new area of opportunity, this article presents the *Design for Speech Therapy* project in which design intervenes in the creation of tools and products dedicated to in-presence speech training for praxis care.

Key Words

Health design; assistive technology; clinical applications of speech technology; speech training product; human-centred design

INTRODUCTION

In recent decades, the relationship between design and medicine has expanded gradually to become increasingly reciprocal and active. Speech therapy is one field underexplored by, but which could benefit from, the design discipline.

The proposed research focused on the design of devices and tools for performing speech exercises useful for the acquisition of oral-mouth-facial praxis skills and language skills in all levels of language (phonetic-phonological, meta-phonological, semantic-lexical, morphosyntactic, pragmatic).¹

We carried out the *Design for Speech Therapy* project to investigate the possibility of design intervening in the development of tools for speech training therapy in the specific area of praxis care. The research outcome is the result of an interdisciplinary collaboration between designers and speech therapists. The project offered an opportunity to develop an interdisciplinary method to foster and facilitate collaboration between distant and diverse disciplines. For this project, the designers integrated the Design Thinking methodology with methodologies employed by speech therapists.²

SUMMARY

The result of the research is a multifunctional tool that uses a bidirectional, semitransparent, reflective mirror to enable various types of exercises called *Giocostorie*. The therapist mimics the facial movements required by the type of therapy, and the patient can observe and imitate the therapist's movements by verifying the success of the exercises thanks to the superimposition of the therapist's face observed through the mirror and their own reflection. This visual interaction

stimulates the activation of mirror neurons to foster empathy, facilitate exercise learning, participation, and collaboration.³

Several studies have also highlighted the fundamental role of this class of neurons to learning by imitation, which is especially important in early childhood.⁴ Several studies have also highlighted the fundamental role of these neurons in learning by imitation, which is also crucial in early childhood.

The use of the mirror in these exercises is essential because it allows the child to look at themselves, look at the therapist, and self-correct their own motor execution. Performing exercises in front of a mirror promotes functional improvement at the motor, sensory, and attentional levels with the aim of stimulating the mirror neuron system.

The developed tool includes several components that can be used together in different combinations to exploit its full potential and utility:

- A structure consisting of a frame and a base.
- A frame hinged in the lateral vertical elements of the structure by way of hinges that rotate around a pivot provided with a double slot into which a bidirectional mirror and masks can be inserted.
- A bidirectional mirror that is inserted into the frame by sliding through slots of appropriate thickness and has simultaneous reflective and visibility capabilities. The rotation of the mirror by the therapist makes it possible to change the inclination and use of the mirror, depending on the specific needs of therapy. The instrument should be placed on the table in an intermediate position between the therapist and the patient. It can be used in different types of therapeutic exercises: to show the face of the speech therapist to the patient to facilitate the patient's imitation of the mouth, lip, cheek, and tongue movements proposed by the therapist; and to reflect the patient's image, giving the patient the opportunity to look at themselves and carry out a continuous check of the correspondence of their movements with those of the therapist, having immediate feedback (Figure 1, Figure 5).
- Interchangeable masks (Figure 2) depicting landscapes, contexts, and characters that can be integrated into the mirror and are useful for engaging the patient during therapy. The masks fit into the frame by sliding through a slot of appropriate thickness. Such masks allow the patient to impersonate the characters and immerse themselves in the contexts with imagination, feeling like the protagonist of the stories co-designed with the therapist to encourage the acquisition of the skills required by the therapy through play and creativity.
- A sliding drawer, integrated with the supporting structure, which can store therapy aids such as masks and playing cards.
- Illustrated playing cards (Figure 2, Figure 3) depicting objects, actions, contexts, and characters to be used in the construction of tales and stories co-designed by the patient and therapist to encourage patient involvement during therapy. Such cards depict actions to be reproduced or images/characters with the function of stimulating the production of onomatopoeic sounds. They are made in a simple, yet graphically appealing style with no distractors to facilitate visual attention—which is the child's ability to pay attention to a visual stimulus. Unlike existing storybooks, in which predefined stories are represented with the performance of nonverbal praxis and/or onomatopoeic sounds, which are limiting from the point of view of storytelling, the card game we propose allows for the creation of stories that

are always new and “tailored” to the patient’s needs, thanks to the absence of a single plot and the presence of different associations and combinations that the therapist is free to create depending on the treatment goals.

- The cards can be divided into three different groups depending on the oral district and the treatment goal: lips, tongue, cheeks. There is another group of cards related to the production of onomatopoeic sounds. In addition, to allow the therapist the freedom to create new characters and/or stories that follow the child’s preferences and interest, a defined number of blank cards are also included.

Figure 1: Giocostorie—postures



The speech therapist uses the two-way mirror to show the patient the postures. The patient observes and imitates the speech therapist and visually checks the compliance of their gestures. (Photo credit: S. Carleo, 2022).

Figure 2: Giocostorie—cards and masks



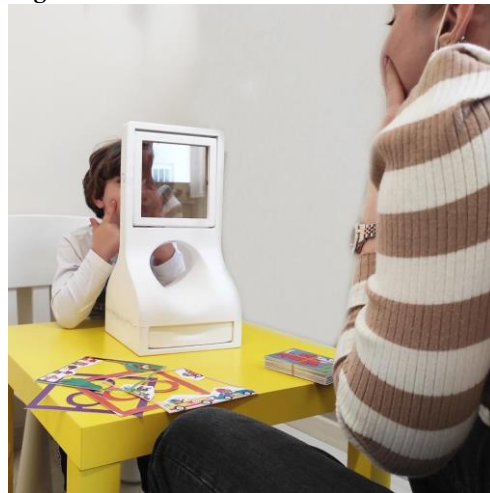
Cards and masks are used during therapy to build the stories that support the facial expressions and postures (Photo credit: S. Carleo, 2022)

Figure 3: Giocostorie—stories



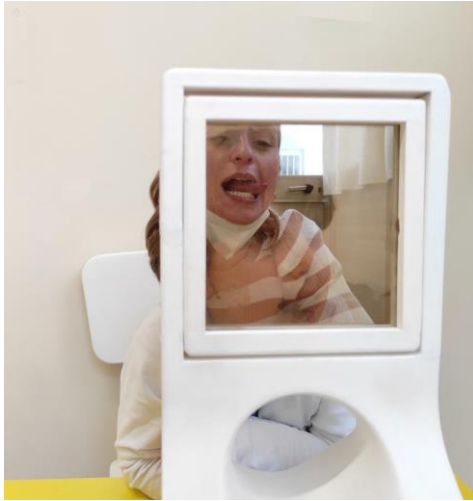
The patient can use playing cards to personalise their story. Involving the child in the choice of stories aims to reduce the risk of boredom and fatigue. (Photo credit: S. Carleo, 2022)

Figure 4: Giocostorie—facial reflection



The reflection of the speech therapist’s face is superimposed on the patient’s transparency image due to the mirror’s semi-reflective properties. Both the patient and the speech therapist can simultaneously compare the facial exercises performed by the other. (Photo credit: S. Carleo, 2022)

Figure 5: Giocostorie—tool



The window that includes the mirror allows attention to be focused on the faces of the patient and therapist without being distracted by other elements. The hole at the bottom serves to pass cards as a kind of magic portal that intrigues the child to counteract boredom and fatigue. (Photo credit: S. Carleo, 2022)

Note: The study authors have written consent to use patients' and therapists' faces in the photos.

LESSONS LEARNED

We found the stories' definition logic to be useful for both language stimulation and onomatopoeic sound⁵ production in younger children. The combination of mirror, masks, and cards makes it possible to work practically, motivationally, and linguistically in different ways for different age groups.

The card game not only makes therapy easier and more enjoyable for the patient, it also simplifies the speech therapist's work. The card game includes a scheme that supports the speech therapist in creating an engaging story for the patient in a short time, helping to maintain a medium to high level of attention that is beneficial for the success of therapy.⁴

The speech therapist can pre-select the cards and use them to create different stories with the patient to focus the practices being treated. The cards stimulate the imagination and creativity of older children while also encouraging work on narrative and morphosyntactic skills, as well as praxis production.

Therapists involved in the research project have provided overwhelmingly positive feedback. They report the following benefits:

- The convenience of using the mirror for the patient to stand in a frontal position rather than to the side of the therapist. This promotes imitation and reciprocity, which are facilitated by the action of mirror neurons (Figure 4).
- Increased participation of young patients due to a motivating context. The motivational drive is the fundamental "engine" for the success of the treatment, and it is necessary to spark and indulge the child's interest to foster greater collaboration and therapeutic alliance.⁵
- The versatility of the mirror and cards that allow for the possibility of changing the masks and settings and/or creating different stories and adapting them to the individual patient.

- The “specificity” of the tool that was created specifically for the use of speech therapies and therefore does not require special adaptations.

The goal of this research was to improve the effectiveness of therapy by using the latest neuroscientific knowledge, which shows that mirror neurons are activated through an empathic relationship, motivation, and patient involvement, leading to significant improvements in cognitive, emulative, communicative, and learning processes. The developed product offers a solution to the technical problem of providing therapists with a single, integrated, and standardised multi-therapeutic product that allows them to offer various speech exercises useful for the acquisition of oral-mouth-facial praxic skills and language skills at all levels (phonetic-phonological, meta-phonological, semantic-lexical, morphosyntactic, pragmatic). This eliminates the need for additional aids or different tools that would otherwise have to be handcrafted by therapists with inappropriate materials and techniques. The kit has been protected with a utility patent in Italy.

DESIGN INSIGHT

This paper presents a great example of the development of a tangible product to help with speech therapy and regimes that link to oral-mouth-facial praxis skills and language skills in all levels of language (phonetic-phonological, meta-phonological, semantic-lexical, morphosyntactic, pragmatic). The development of a physical/tangible output rather than a technology-focused product has ensured that the desired speech therapy and regimes can be accessed by all and as such providing therapists with a single, integrated, and standardised multi-therapeutic product. The team approached the design problem and produced an interesting outcome that solved the identified problem demonstrating that a solution to a technical problem can be found when combining the skill sets of designers and medical professionals. This demonstrates the ever-growing relationship between design and medicine, which is becoming increasingly reciprocal.

The lessons learned from the approaches undertaken are valuable to designers and medical professionals in the development of a new therapeutic product. The authors recognise the value of Design Thinking and the activities involved to support product development, including acquiring the appropriate feedback from the relevant stakeholders. Designers and healthcare providers must fully understand the value proposition of a new product, balancing the need for lower-cost non-technology driven solutions in comparison to a technology-driven solution. This research is a great example of the creation of a product that provides patient and therapist engagement without overcomplicating the speech therapy landscape.

REFERENCES

1. Morris D. 2013. *Dictionary of Communication Disorders*. New York: John Wiley & Sons.
2. Ku B, and Lupton, E. 2022. *Health Design Thinking: Creating Products and Services for Better Health*. Cambridge, MA: MIT Press.
3. Hickok G. 2014. *The Myth of Mirror Neurons: The Real Neuroscience of Communication and Cognition*. New York: WW Norton & Company.
4. Raph J. B. 1960. Determinants of motivation in speech therapy. *Journal of Speech and Hearing Disorders*. 1960 Feb;25:13-7. doi: 10.1044/jshd.2501.13

5. Larsson M. 2015. Tool-use-associated sound in the evolution of language. *Anim Cogn.* 2015 Sep;18(5):993-1005. doi: 10.1007/s10071-015-0885-x

ACKNOWLEDGEMENTS

The authors would like to acknowledge the speech therapist Martina De Luca and Giuseppina Nasti for their contribution in the experimental test of the Giocostorie kit.

PEER REVIEW

Not commissioned. Externally peer reviewed.

CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

FUNDING

None

ETHICS COMMITTEE APPROVAL

Not required as this article focuses on the design aspects of the research, not the human aspects.