

6-26-2023

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Collaborative Rehabilitation Therapy: A Novel Telehealth Delivery and Learning System

Larry M. Starr, PhD^a and Elliot Cole, PhD^b

Abstract

Over the past three decades, the *Institute for Cognitive Prosthetics* (ICP) has studied and reported^{1 2 3 4 5} a novel approach for treating patients with cognitive deficits following traumatic brain injury (TBI) and certain non-degenerative acquired brain injuries (ABI). A research and development enterprise, ICP's mission is to advance clinical outcomes by patient use of technology and by providing therapists with new tools that expand their ability to produce clinical outcomes. ICP subsequently established *Neuro-Hope* as the provider of the professional services now referred to as Collaborative Rehabilitation Therapy (CoRT). CoRT is designed to support patients with a broad range of challenges as well as their families who experience relationship disruptions following sudden brain injury in a loved one.

Introduction

We present the CoRT model framed as a delivery and learning system. As a system, CoRT is informed by cybernetic social systems theory,⁶ a transdisciplinary approach involving inputs, a transformation process occurring within an environmental context, outcomes, and circular causality, i.e., feedback loop. For more than 40 years, cybernetic models have been applied to improve understanding in a variety of domains including family therapy,⁷ management and organizations,^{8 9} pedagogy,¹⁰ pedagogical design,¹¹ and creative arts.¹² Figure 1 presents a simple model of a cybernetic social system and its components. Figure 2 adapts the model to Collaborative Rehabilitation Therapy.

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Figure 1. Simple Cybernetic Social System¹³

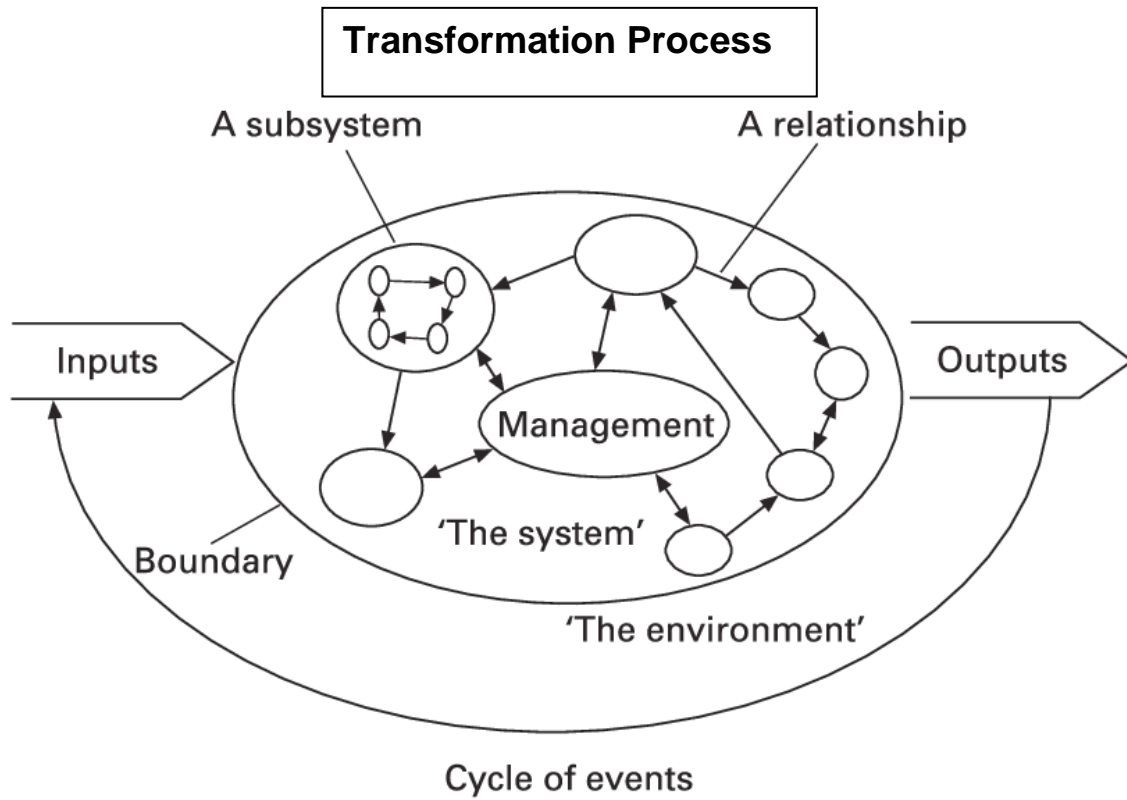
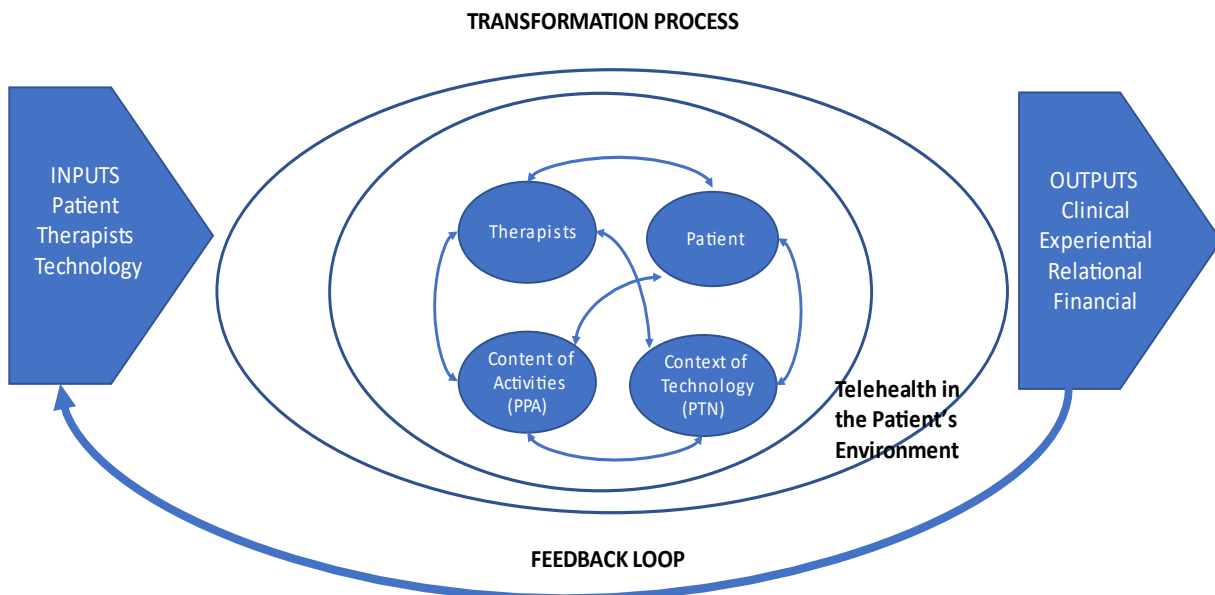


Figure 2. Collaborative Rehabilitation Therapy as a System



The **Inputs** to the CoRT system are the patient/client with cognitive challenges; Occupational Therapists (OT) and Speech/Language Pathology (SLP) therapists with traditional and specialized CoRT proficiencies; and information and communication technology (ICT), which refers to computer-based devices, applications (apps), and online services and organization intranets.

The **Transformation Process** involves interdependencies and interactions among four elements: client undergoing rehabilitation; therapists working with each other and with the client in the rehabilitation; content, referred to as the *personal priority activities* (PPA) which are experiences selected by the client, made central to the rehabilitation and currently requiring caregiver intervention for successful task completion; and the context of technology, referred to as the *personal technology network* (PTN) which are the devices, programs, and online services used by the client prior to the cognitive injury that are woven into the PPA and rehabilitation activities. The **Environmental Context** for these interactions and interdependencies is telehealth which refers to delivering CoRT entirely online with the client located in their personal environment, such as home or another setting, and the therapists participating from their clinical or office location.

There are four sets of **Outputs** of the system. Clinical outcomes are defined as the measurable changes in the client's pre-post-performance on *personal priority activities*. Experiential outcomes refer to the attitudes, beliefs, and perceptions by the client and vicariously¹⁴ by the client's family-supporters which emerge from the Transformation Process interactions. Relational refers to the changes in relationships between the client and family that emerge from the collaborations which were previously disrupted. Financial refers to the cost saving when support is shifted from traveling to and from a rehabilitation facility to CoRT delivery via telehealth.

The CoRT system's **Feedback** refers to the process of using the outputs as new inputs for subsequent activities. These are continuously applied to enable adjustment, improvement, and development. For example, each successfully completed PPA task or subtask provides tangible, relevant ongoing positive feedback to the client, increasing their independence from needed caregiver intervention and for the potential for self-sufficient activity performance. Feedback information is also shared and later applied to others when therapists discuss activities and insights across client systems.

Novel Rehabilitation

CoRT differs from conventional rehabilitation following TBI, stroke and other cognitive insults in four significant ways. First, rather than working with a client immediately after diagnosis or when outpatient rehabilitation is initially prescribed, CoRT begins when traditional rehabilitation has concluded. Cole² has described multiple research studies in which the most effective outcomes of advancing recovery of function and improving quality of life were generated in those for whom cognitive disabilities remained after completing conventional rehabilitation, placing limits on their activities. Effective outcomes also resulted for post-conventional rehabilitation patients who were previously high achievers, i.e., had demonstrated significant activities in their area of expertise.

Second, the selection and mode of activities in collaborative rehabilitation therapy differ from those in conventional rehabilitation therapy. The prevailing cognitive rehabilitation model involves cognitive skill exercises.¹⁵ In this standard approach, the therapist determines the content of the therapy by applying cognitive exercises and simulations, both relating to bodily structure and function, informed by the WHO International Classification of Functioning, Disability and Health.¹⁶ It would be exceptional for these to include personal priority activities; rather, they are primarily generic although they can be linked to a cognitive dimension and are aimed at engaging the patient in what the clinicians consider to be everyday activities.

CoRT takes a fundamentally different approach by addressing the client's actual activity, which is the behavioral manifestation of cognitive functioning. Furthermore, in CoRT, the rehabilitation is based on personal priority activities, i.e., those selected by the client. Through conversations with the therapists, the client defines with fine granularity the intervention that will likely achieve success. The therapists then refine the activities to meet rehabilitation objectives. Focus on personal priority activities, when rehabilitation is successful, increases both the level of function and the quality of life. For example, one activity enabled by CoRT was a client's insistence on wanting to remember to take out the trash each week without having his wife remind him, as she had to do for the previous 9 years. The importance of this activity *to the client* cannot be overstated.

Third, CoRT considers technology's primary role to increase the client's level of function above what their damaged cognitive abilities can achieve, as well as reducing the client's cognitive load for activities during waking hours. In the 21st century, information and communication technology, i.e., computers, smartphones and tablets, are ubiquitously used as powerful cognitive tools to increase cognitive performance while reducing cognitive load. Most people use multiple devices which form their Personal Technology Network. Furthermore, in response to the global

pandemic, communication via telehealth has become increasingly common and effective.¹⁷

As CoRT is delivered entirely online with the client in their home or other preferred environment, such as at work or school, and the therapist(s) is in their clinical setting, rehabilitation is not restricted by geographic or time boundaries. This flexibility enables the client and the therapist to collaborate while each is in a *preferred* location, even if one is traveling. Furthermore, the therapist can more easily support the client's efforts to carry out their PPA between therapy sessions. This makes the *telehealth environment* of CoRT not merely an artifact, but rather an explicit and essential contextual component of learning and development that contributes to quality improvement of the outcomes for patients with TBI, ABI, and other conditions. This therapeutic integration within the rehabilitation therapy process and context supports the view that technology cannot be viewed separately or in isolation; it must be considered part of the social relationship between patient and therapist and may be transforming in social dimensions.^{18 19}

Fourth, Collaborative Rehabilitation Therapy is a distinctive treatment modality in which there is a collaborative interdependency among the client, therapists, and technology to identify and solve problems, and to pursue functional and performance interests selected by the client. As a system, the interactions and interdependencies of these elements within the context of telehealth generate clinical, experiential, and relational outcomes beyond what may result in traditional rehabilitation. The functional gains (outcomes) CoRT provides become inputs for continuous developmental improvements for the client, therapists, and rehabilitation engineering specialists.

Summary

Collaborative Rehabilitation Therapy is informed by evidence-based rehabilitation therapy and is delivered by professionally qualified clinical therapists who collaborate with an interdisciplinary team drawn from behavioral neurology, neuropsychology, psychology, occupational therapy, speech/language pathology, rehabilitation engineering, clinical coaching, special education, and health system research and design. Research²⁰ has noted that in the future, "rehabilitation professionals will need to broaden their assessment procedures and widen their knowledge of devices like smart phone, smart speakers, apps, internet availability ... to provide a greater range of options for their clients." Collaborative Rehabilitation Therapy provides this today for the immediate benefit of clients and their families.

REFERENCES

- ¹ Cole, E., Petti, L., Matthews, Jr., M. & Dehdashti, P. (1994). Rapid functional improvement and generalization in a young stroke patient following computer-based cognitive prosthetic intervention. Presentation at the 1994 NIH Neural Prosthesis Workshop, October 19-21.
- ² Cole, E. (2013). *Patient-centered design of cognitive assistive technology for traumatic brain injury telerehabilitation*. Toronto: Morgan & Claypool.
- ³ Cole, E. & Starr, L. M. (2021). Collaboration therapy: telehealth principles and case studies. *Thomas Jefferson University School of Continuing and Professional Studies Faculty Papers*. Paper 9: <https://jdc.jefferson.edu/jscpsfp/9>.
- ⁴ Cole, E. (1999). Cognitive Prosthetics: An Overview to a Method of Treatment. *NeuroRehabilitation*, 12(1):39-51. <https://DOI.org/10.3233/NRE-1999-12105>.
- ⁵ Cole, E. (2021). Outcomes of a technology-enhanced, patient-centered cognitive rehabilitation therapy program delivered to the patient's natural environment via telehealth 9 years post injury. Institute for Cognitive Prosthetics, Working Paper 2021-3.
- ⁶ Ashby, W. R. (1956). *An introduction to cybernetics*. London: Chapman & Hall.
- ⁷ Keeney, B. (1981). Cybernetic patterns in family therapy: a Batesonian epistemology. Semantic Scholar, Corpus ID 152118235. Retrieved from: <https://www.semanticscholar.org/paper/CYBERNETIC-PATTERNS-IN-FAMILY-THERAPY%3A-A-BATESONIAN-Keeney/8367dc211352936efce6536c3687226277cb4f31>
- ⁸ Jackson, M. C. (2019). *Critical systems thinking and the management of complexity*. Hoboken, NJ: Wiley.
- ⁹ Ghiasi M, Shahrabi A, Siamian H. (2017). Relationship between cybernetics management and organizational trust among librarians of Mazandaran University of Medical Sciences. *Acta Inform Med*. 2017 Dec;25(4):247-249. doi: 10.5455/aim.2017.25.247-249
- ¹⁰ Sloan, A. (2019). *Art, cybernetics and pedagogy in post-war Britain*. London: Routledge Taylor & Francis.
- ¹¹ Fischer, T. & Herr, C. H. *Design cybernetics: navigating the new*. New York, NY: Springer Nature. DOI: <https://doi.org/10.1007/978-3-030-18557-2>
- ¹² Apter, M. J. (1969). Cybernetics and art. *Leonardo*, 2 (3): 257-265. DOI: <https://doi.org/10.2307/1572155>
- ¹³ Jackson, M. C. (2003). *Systems thinking: creative holism for managers*. London: Wiley.

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- ¹⁴ Roberts, D. (2010). Vicarious learning: a review of the literature. *Nurse Education in Practice*, 10(1):13-16. Doi: <https://doi.org/10.1016/j.nepr.2009.01.017>
- ¹⁵ Giles, G. M. (2010). Cognitive versus functional approaches to rehabilitation after traumatic brain injury: commentary on a randomized controlled trial. *American Journal of Occupational Therapy*, 4(1):182-5. DOI: [10.5014/ajot.64.1.182](https://doi.org/10.5014/ajot.64.1.182)
- ¹⁶ Üstun, T.B., Chatterji, S., Bickenbach, J., Kostanjsek, J. & Schneider, M. (2003). The International Classification of Functioning, Disability and Health: a new tool for understanding disability and health. *Disability and Rehabilitation*, 25:11-12, 565-571, [https://DOI:10.1080/0963828031000137063](https://doi.org/10.1080/0963828031000137063).
- ¹⁷ Gajarawala SN, Pelkowski JN. (2021). Telehealth Benefits and Barriers. *J Nurse Pract.* Feb;17(2):218-221. doi: 10.1016/j.nurpra.2020.09.013. Epub 2020 Oct 21. PMID: 33106751; PMCID: PMC7577680.
- ¹⁸ Hirschhorn, L., & Gilmore, T. (1992). The new boundaries of the “boundaryless” company. *Harvard business review*, 70(3), 104-115.
- ¹⁹ Henfridsson, O. (1999). IT-adaptation as sensemaking: inventing new meaning for technology in organizations. *Semantic Scholar*, Corpus ID 108241070. Retrieved from: <https://www.semanticscholar.org/paper/IT-adaptation-as-sensemaking%3A-inventing-new-meaning-Henfridsson/151ac721450ca38d940cbaf94fc13eeedd4a04de>
- ²⁰ Quamar, Abbas H., Schmeler, Mark R., Collins, Diane M. & Schein, Richard, M. (2020) Information communication technology-enabled instrumental activities of daily living: a paradigm shift in functional assessment, *Disability and Rehabilitation: Assistive Technology*, 15:7, 746-753, DOI: 10.1080/17483107.2019.1650298. Retrieved from: <https://doi.org/10.1080/17483107.2019.1650298>.