INSTITUTE
OF MANAGEMENT

Sant'Anna
School of Advanced Studies – Pisa

Connettere il cervello:
Tecnologie per innovare le cure primarie e comprendere meglio il paziente.

Firenze – 21 giugno 2025

Andrea Bazzani

Medical Doctor – **University of Pisa**

Master in psychiatry (autism) – **University of Pisa**

PhD (decision neuroscience) – **Sant'Anna School of Advanced Studies –** Pisa

***Visiting Researcher**:*

- **INSEAD** – Marketing Department – Decision Neuroscience Lab (Prof. Hilke Plassmann)
- **Paris Brain Institute** (Sorbonne University) – Cognition Interoception Attention Lab
- Neuroeconomics Summer School – hosted by **University of Pennsylvania** (co-organized by Wharton Neuroscience Initiative, INSEAD, NYU, Princeton & University of Sydney)

Motivazione

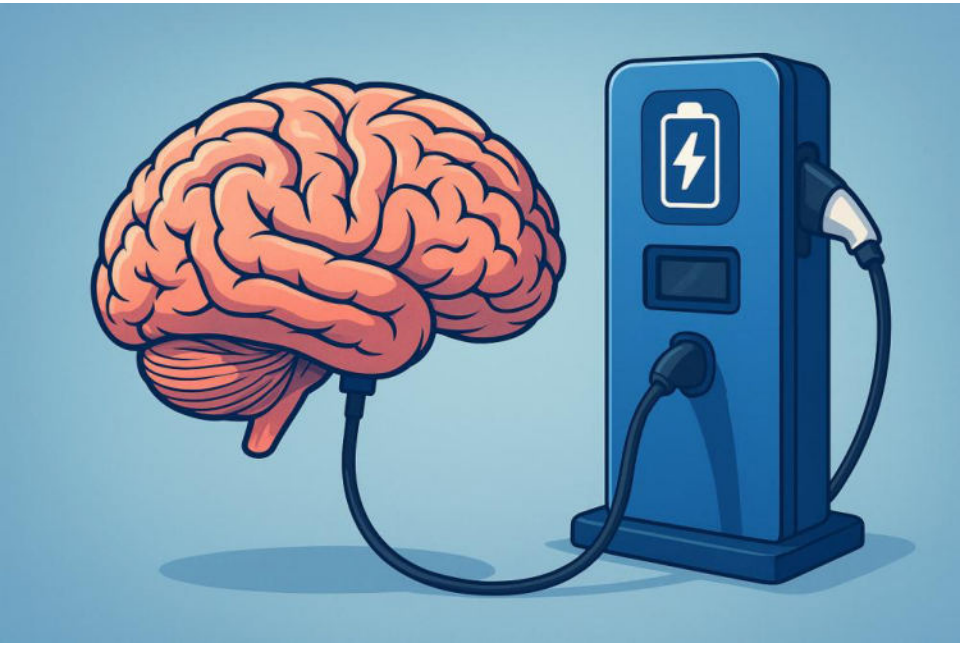
Sedulo curavi humanas actiones non ridere, non lugere, neque detestari, sed intelligere.

Spinoza

Motivazione

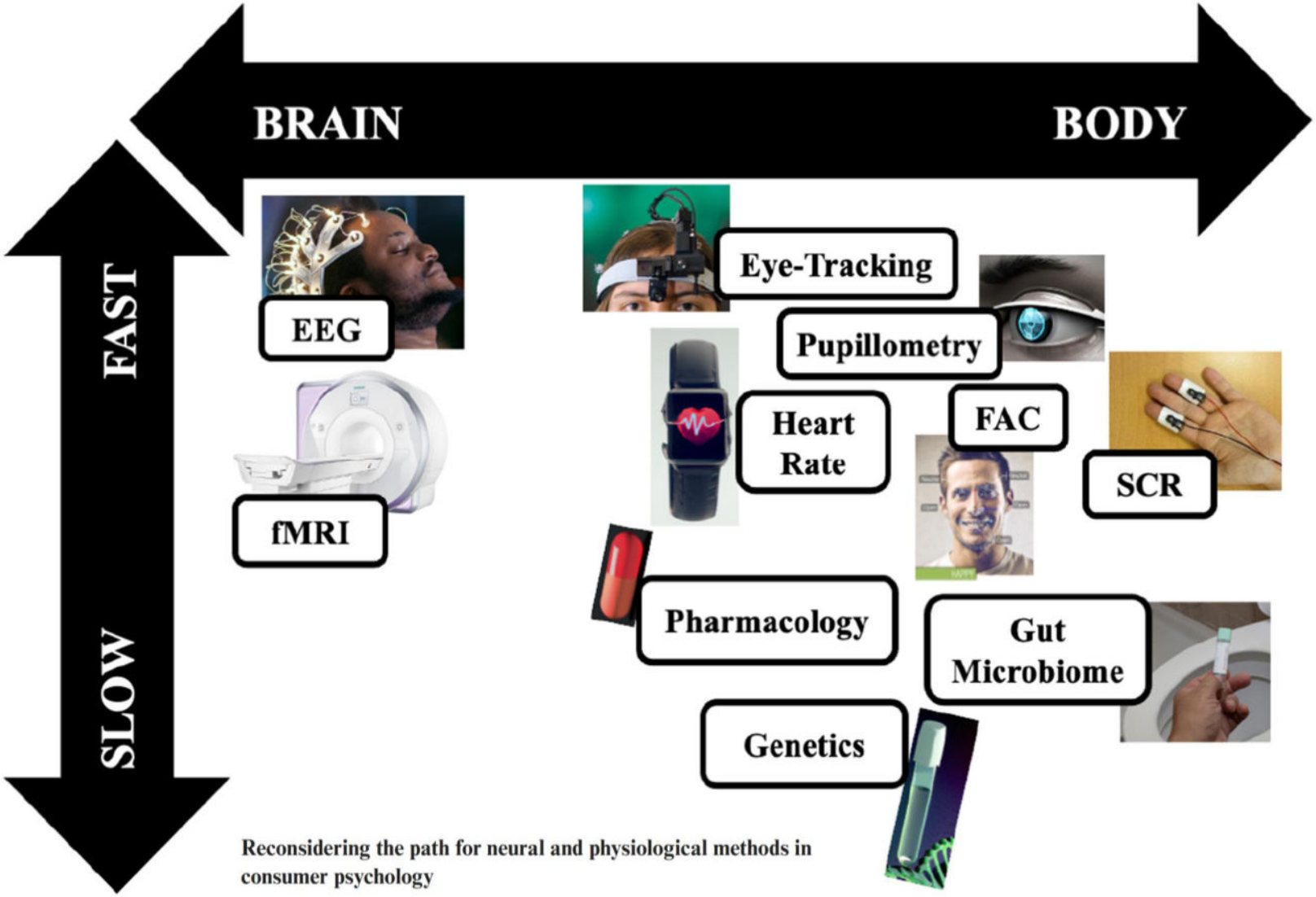
Sedulo curavi humanas actiones non ridere, non lugere, neque detestari, sed intelligere.

Spinoza



Capire ciò che le persone non riescono (o non vogliono) sempre comunicare. La tecnologie ci può aiutare a studiare i ritmi, gli stili decisionali, e i processi cognitivi ed emotivi dei pazienti.

Stato dell'arte



Reconsidering the path for neural and physiological methods in consumer psychology

John A. Clithero[1] | Uma R. Karmarkar[2] | Gideon Nave[3] | Hilke Plassmann[4]

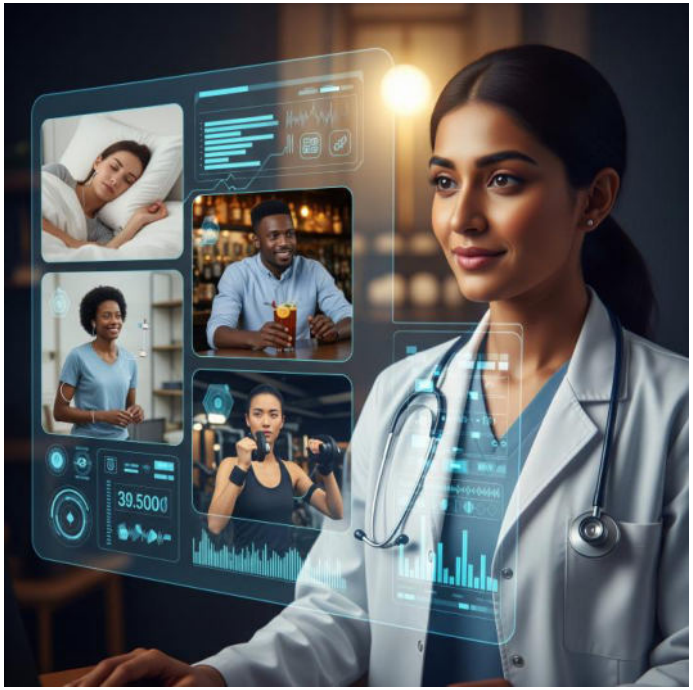
Sfida

prossimità fisica

prossimità relazionale

Esempi di Trasferimento dei Risultati della Ricerca

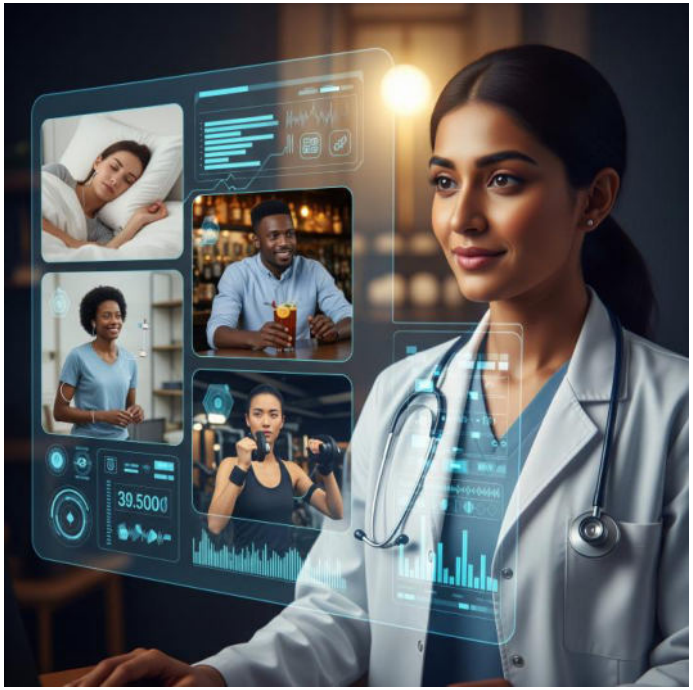
Esempio 1: monitorare nel tempo in un contesto ecologico



Esempio 2: studiare le barriere implicite nelle dinamiche relazionali tra operatore sanitario e paziente/care-giver

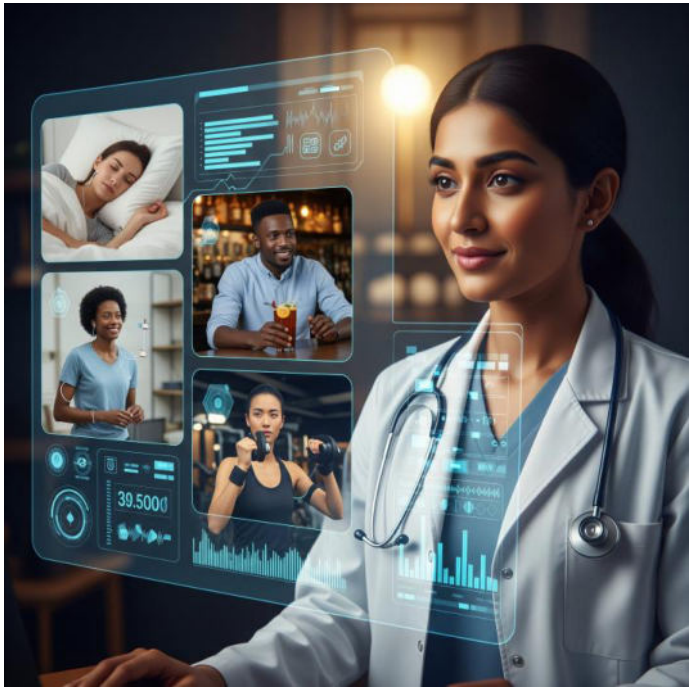
Esempi di Trasferimento dei Risultati della Ricerca

Esempio 1: monitorare nel tempo in un contesto ecologico



Esempi di Trasferimento dei Risultati della Ricerca

e-Health per il Sonno



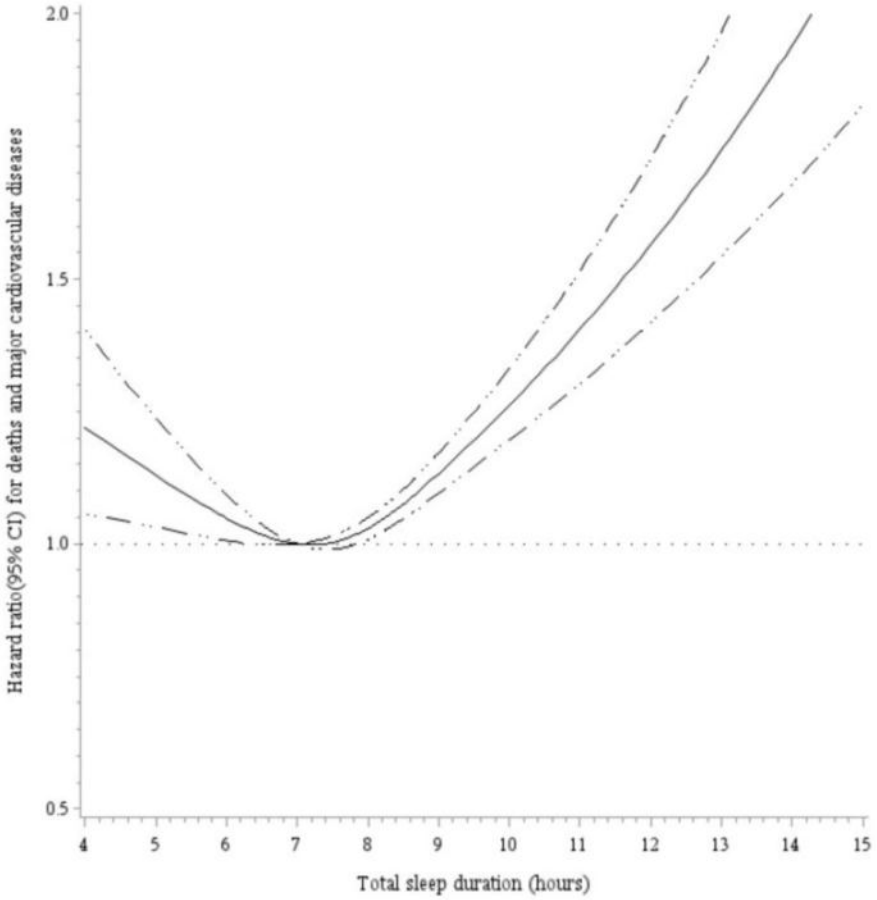
e-Health per il Sonno

ESC European Society of Cardiology
European Heart Journal (2019) **40**, 1620–1629
doi:10.1093/eurheartj/ehy695

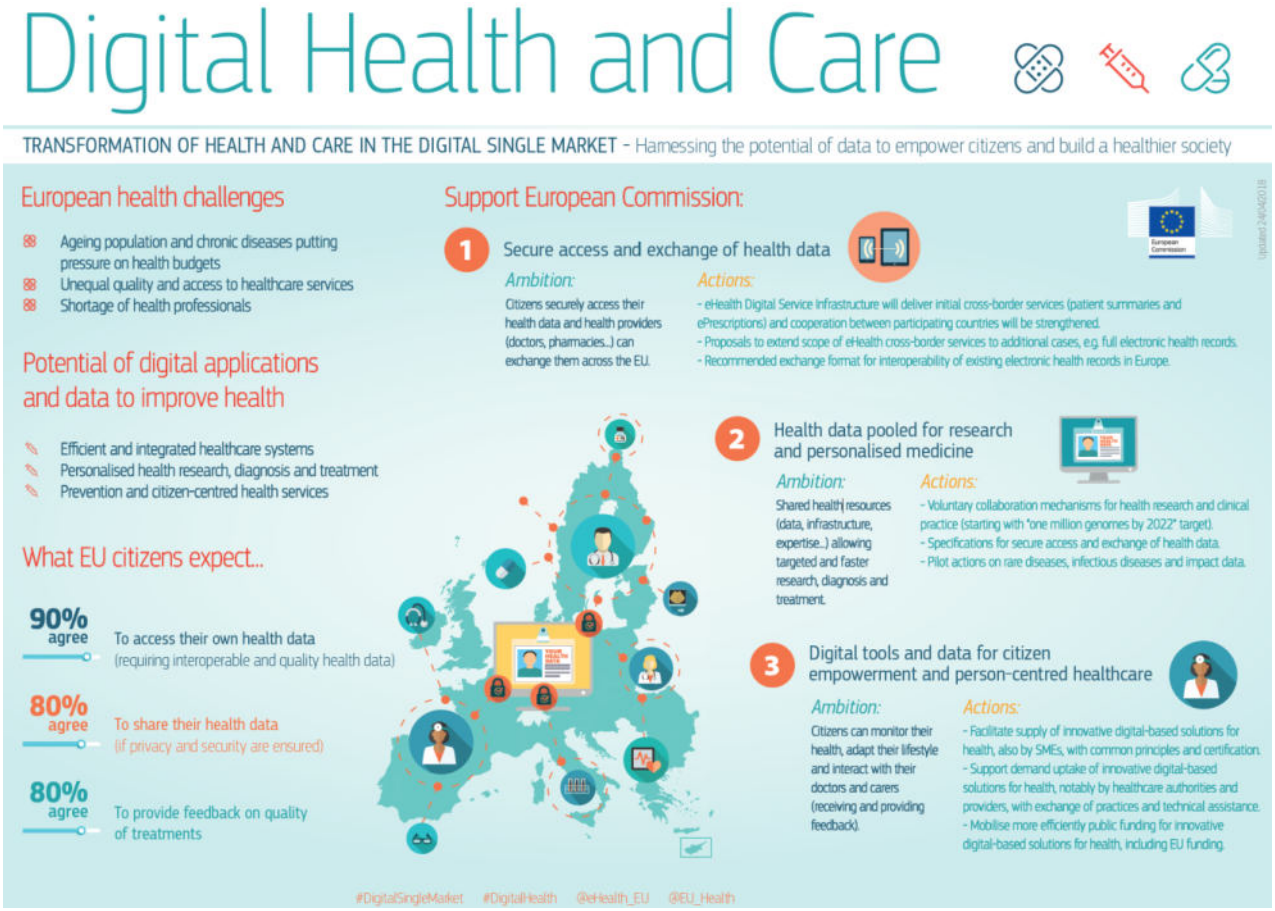
CLINICAL RESEARCH
Prevention and epidemiology

Association of estimated sleep duration and naps with mortality and cardiovascular events: a study of 116 632 people from 21 countries

Chuangshi Wang[1,2], Shrikant I. Bangdiwala[1], Sumathy Rangarajan[1], Scott A. Lear[3], Khalid F. AlHabib[4], Viswanathan Mohan[5], Koon Teo[1], Paul Poirier[6], Lap Ah TSE[7], Zhiguang Liu[7], Annika Rosengren[8], Rajesh Kumar[9], Patricio Lopez-Jaramillo[10], Khalid Yusoff[11], Nahed Monsef[12], Vijayakumar Krishnapillai[13], Noorhassim Ismail[14], Pamela Seron[15], Antonio L. Dans[16], Lanthé Kruger[17], Karen Yeates[18], Lloyd Leach[19], Rita Yusuf[20], Andres Orlandini[21], Maria Wolyniec[22], Ahmad Bahonar[23], Indu Mohan[24], Rasha Khatib[25], Ahmet Temizhan[26], Wei Li[2]*, and Salim Yusuf[1]*; on behalf of the Prospective Urban Rural Epidemiology (PURE) study investigators



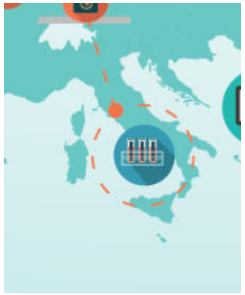
e-Health per il Sonno



Source:

https://www.who.int/observatories/global-observatory-for-ehealth
https://health.ec.europa.eu/ehealth-digital-health-and-care/overview_en

e-Health per il Sonno



Source:

https://www.salute.gov.it/portale/ehealth/homeEHealth.jsp

e-Health per il Sonno

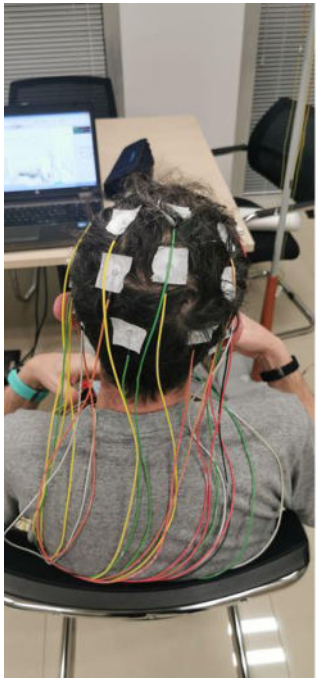
Business / Tech

Samsung's big plan to compete with the Apple Watch: keeping you healthy as you age

By Lisa Eadicicco, CNN

4 minute read · Published 9:00 AM EDT, Mon June 16, 2025

e-Health per il Sonno



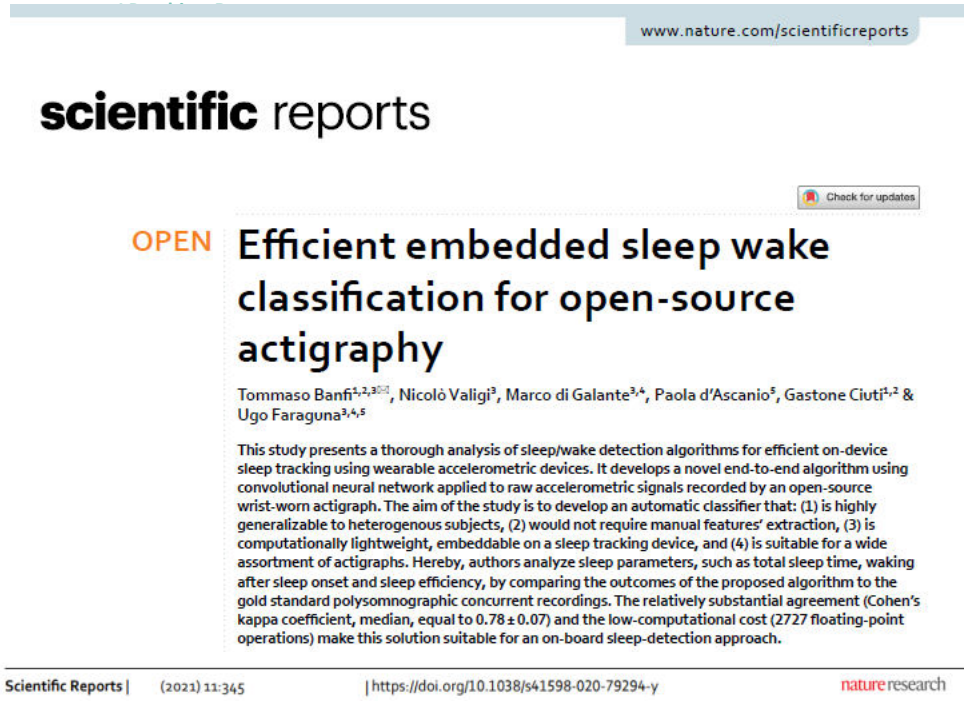
Consumer-grade

e-Health per il Sonno

- Dovremmo fidarci dei dispositivi di monitoraggio del sonno per i consumatori?
- Il dispositivo CST è validato?
- Esiste un ruolo clinico per le tecnologie del sonno destinate ai consumatori?

e-Health per il Sonno

Journal of Affective Disorders Reports
Volume 14, December 2023, 100660
Bipolar disorder and delayed sleep-wake phase disorder: Findings on sustained attention, sleep, and circadian rhythm parameters



www.nature.com/scientificreports

scientific reports

Check for updates

OPEN

Efficient embedded sleep wake classification for open-source actigraphy

Tommaso Banfi[1,2,3✉], Nicolò Valigi[3], Marco di Galante[3,4], Paola d'Ascanio[5], Gastone Ciuti[1,2] & Ugo Faraguna[3,4,5]

This study presents a thorough analysis of sleep/wake detection algorithms for efficient on-device sleep tracking using wearable accelerometric devices. It develops a novel end-to-end algorithm using convolutional neural network applied to raw accelerometric signals recorded by an open-source wrist-worn actigraph. The aim of the study is to develop an automatic classifier that: (1) is highly generalizable to heterogenous subjects, (2) would not require manual features' extraction, (3) is computationally lightweight, embeddable on a sleep tracking device, and (4) is suitable for a wide assortment of actigraphs. Hereby, authors analyze sleep parameters, such as total sleep time, waking after sleep onset and sleep efficiency, by comparing the outcomes of the proposed algorithm to the gold standard polysomnographic concurrent recordings. The relatively substantial agreement (Cohen's kappa coefficient, median, equal to 0.78 ± 0.07) and the low-computational cost (2727 floating-point operations) make this solution suitable for an on-board sleep-detection approach.

Scientific Reports | (2021) 11:345 | https://doi.org/10.1038/s41598-020-79294-y nature research

Nature and Science of Sleep
2022 May 18, Volume 2022:14 Pages 941—956.
Obstructive Sleep Apnoea Syndrome Screening Through Wrist-Worn Smartbands: A Machine-Learning Approach

Journal of Alzheimer's disease
2020;78(4):1707-1719. doi: 10.3233/JAD-200632.
Multicenter Study on Sleep and Circadian Alterations as Objective Markers of Mild Cognitive Impairment and Alzheimer's Disease Reveals Sex Differences

Journal of sleep research
2021 Dec;30(6):e13346. doi: 10.1111/jsr.13346. Epub 2021 Apr 10.
Heart rate detection by Fitbit Charge HR™ : A validation study versus portable polysomnography

Scientific Reports
2021 Jan 11;11(1):345. doi: 10.1038/s41598-020-79294-y.
Efficient embedded sleep wake classification for open-source actigraphy

Acta Diabetologica
2022 Apr 9. doi: 10.1007 s00592-022-01882-3.
Impact of intermittently scanned continuous glucose monitoring with alarms on sleep and metabolic outcomes in children and adolescents with type type 1 diabetes

e-Health per il Sonno

SLEEP, 2023, XX, 1–2
https://doi.org/10.1093/sleep/zsac304
Advance access publication 5 January 2023
Letter to the Editor

Letter to the Editor

Call to action: an open-source pipeline for standardized performance evaluation of sleep-tracking technology

Davide Benedetti[1,2,*], Luca Menghini[3], Raphael Vallat[4], Remington Mallett[5], Orsolya Kiss[1], Ugo Faraguna[2,6], Fiona C. Baker[1] and Massimiliano de Zambotti[1]

[1]Center for Health Sciences, SRI International, Menlo Park, CA, USA,
[2]Department of Translational Research and of New Surgical and Medical Technologies, University of Pisa, Pisa, Italy,
[3]Department of General Psychology, University of Padova, Padova, Italy,
[4]Center for Human Sleep Science, Department of Psychology, University of California, Berkeley, Berkeley, CA, USA,
[5]Department of Psychology, Northwestern University, Evanston, IL, USA and
[6]Department of Developmental Neuroscience, IRCCS Fondazione Stella Maris, Pisa, Italy

Esempi di Trasferimento dei Risultati della Ricerca

Esempio 2: studiare le barriere implicite nelle dinamiche relazionali tra operatore sanitario e paziente/care-giver

Esempi di Trasferimento dei Risultati della Ricerca

Sinergie SIMA Management Conference

Combining Consumer Neuroscience and TAM to Assess the Adoption of Robotic Rehabilitation Devices in Healthcare.

Gia Long La, Andrea Bazzani*, Giuseppe Turchetti

Definizione del Bisogno

Definizione del Bisogno

Stato dell'Arte

Categorizzazione dell'IA in Sanità:

- Robotica
- Virtuale
- Embedded

Glikson and Woolley (2020)
Yang et al. (2024)

Stato dell'Arte

Categorizzazione dell'IA in Sanità:

- **Robotica**
- Virtuale
- Embedded

Glikson and Woolley (2020)
Yang et al. (2024)

I dispositivi robotici per la riabilitazione (RRD) possono svolgere compiti di natura meccanica o orientati all'interazione sociale, come la chirurgia, la guida automatizzata, la **riabilitazione fisica** e l'erogazione di servizi assistenziali.

Stato dell’Arte – Sfida

Il mercato globale dei robot medicali è destinato a raggiungere una valutazione di **38,7 miliardi di dollari entro il 2034**.

Medical Robots Market
Growth & Forecast 2024-2034
(2024)

Stato dell'Arte – Sfida

- Costi
- Sicurezza
- Efficacia
- Minacce percepite
- Facilità d'uso

(Laut et al., 2016; Silvera-Tawil, 2024)

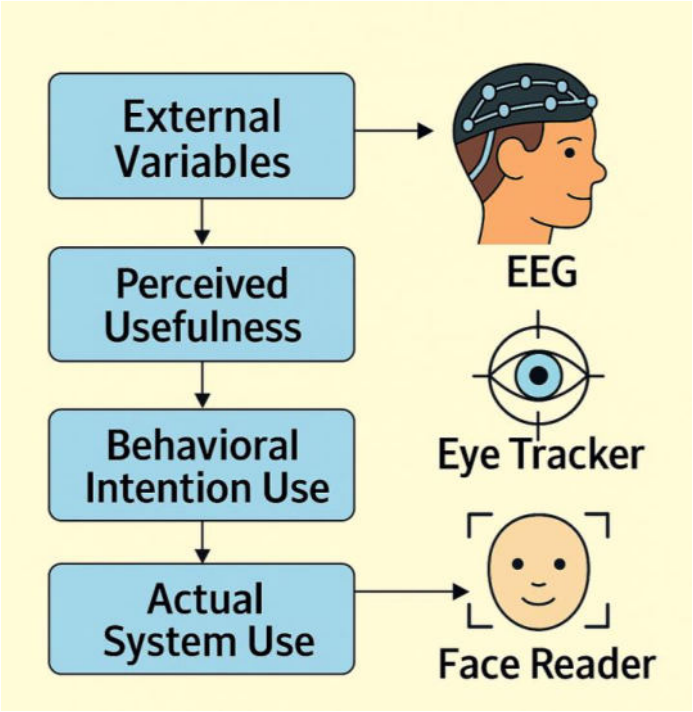
Di conseguenza, **solo circa il 10% delle persone ha accesso ai RRD di cui avrebbe bisogno**. La percentuale è ancora più elevata nei Paesi a basso e medio reddito.

(Global Report on Assistive Technology, 2022)

Motivazione dello Studio

Sono necessarie ulteriori ricerche per comprendere la resistenza degli operatori sanitari all'adozione dei dispositivi robotici per la riabilitazione (RRD).

Conceptual Framework



Is EEG Suitable for Marketing Research? A Systematic Review

Andrea Bazzani [1†], Silvio Ravaioli [2†], Leopoldo Trieste [1], Ugo Faraguna [3,4‡] and Giuseppe Turchetti [1‡]*

[1] Institute of Management, Scuola Superiore Sant'Anna, Pisa, Italy, [2] Department of Economics, Columbia University, New York, NY, United States, [3] Department of Translational Research and New Technologies in Medicine and Surgery, University of Pisa, Pisa, Italy, [4] Department of Developmental Neuroscience, Istituto di Ricovero e Cura a Carattere Scientifico (IRCCS) Fondazione Stella Maris, Pisa, Italy

Limiti del modello TAM:

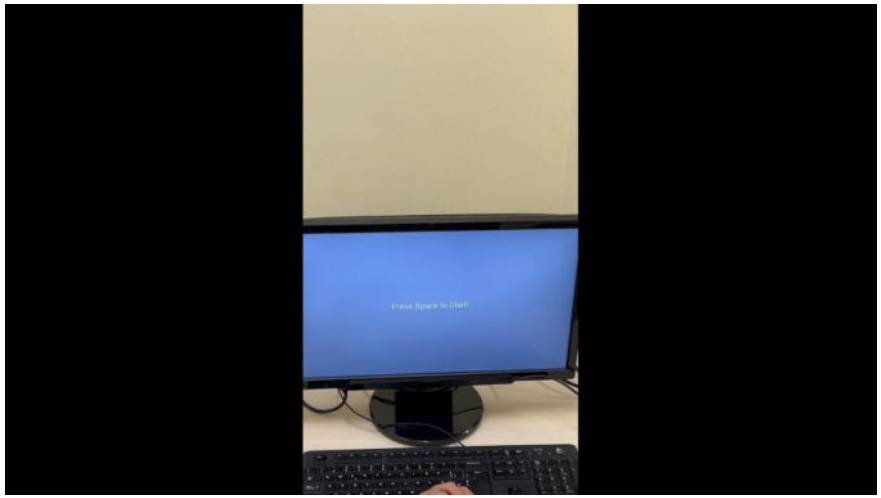
- Assume che gli umani sia decisori **razionali**
- PU e PEOU sono *black boxes*
- **Self-report**

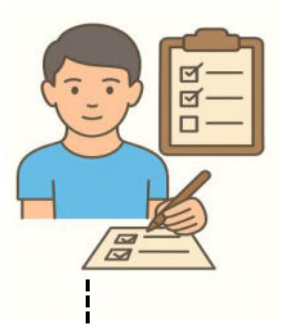
Combinando il **Technology Acceptance Model** (TAM) con tecniche di **decision neuroscience** possiamo rivelare elementi subconsci (che influenzano l'accettazione degli RRDs.

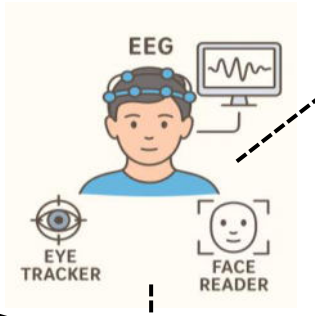
Protocollo Sperimentale

FIT4 MED ROB
Fit for Medical Robotics

Control group

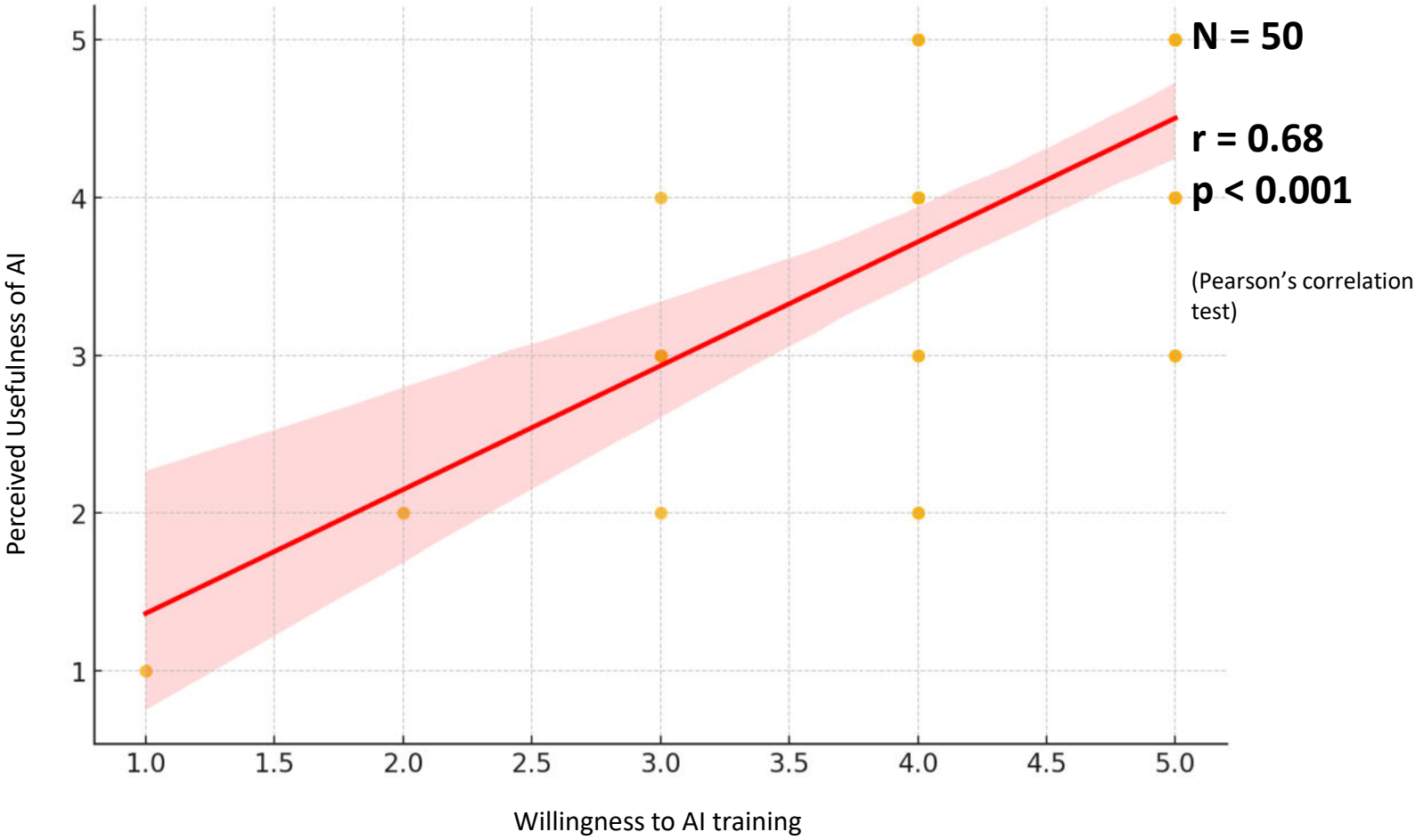




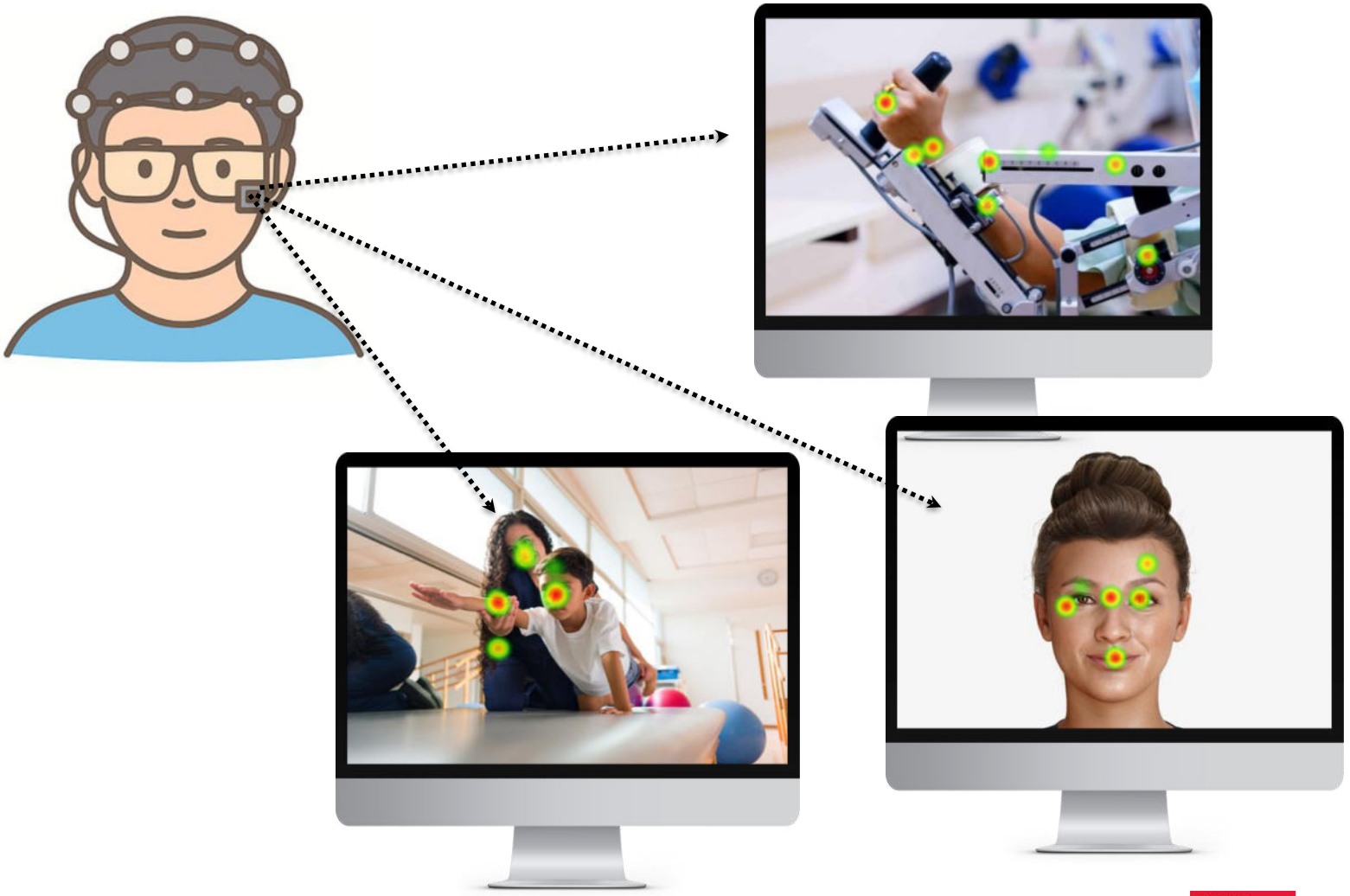


Studio Empirico - Survey

Correlazione tra disponibilità ad AI training e Perceived Usefulness di AI



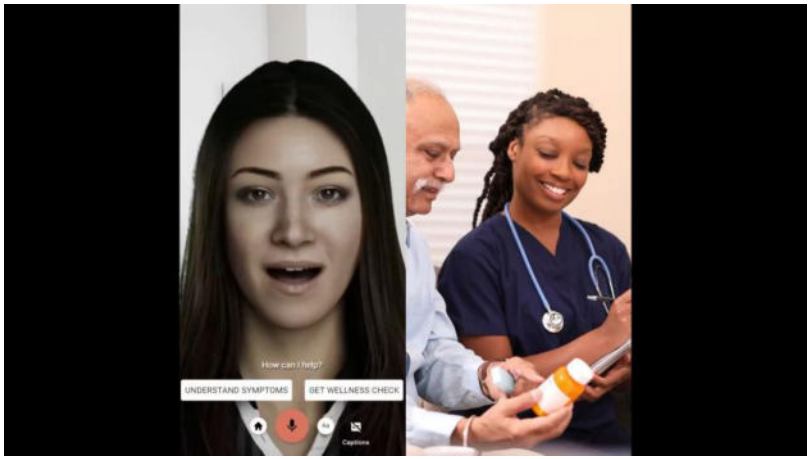
Studio Empirico - sul campo

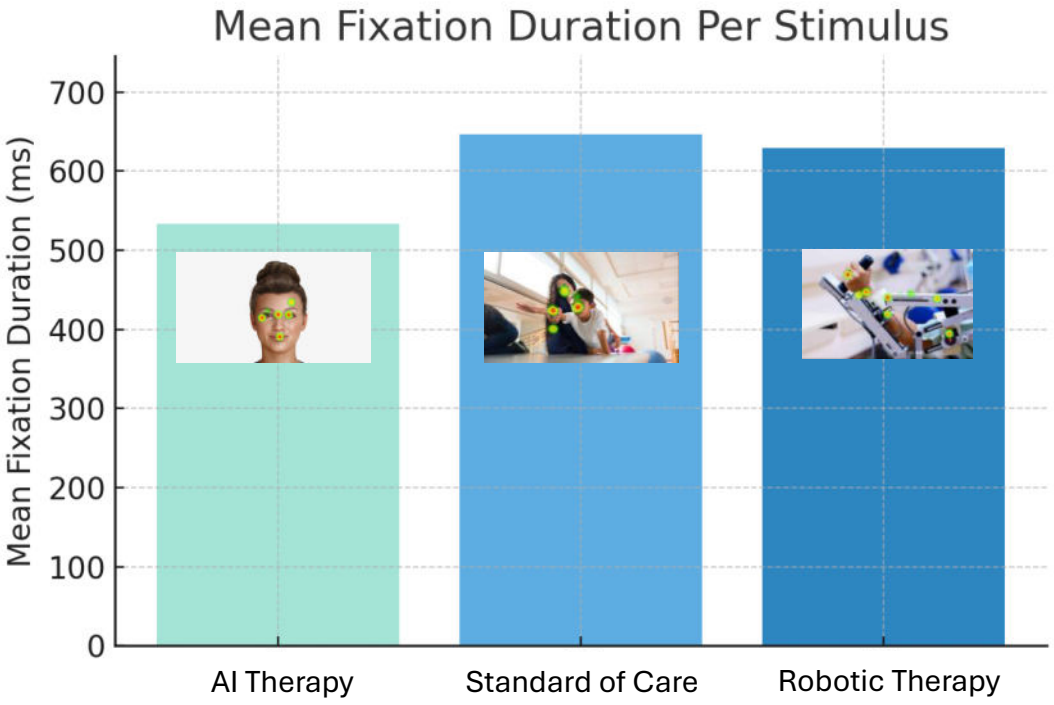


Studio Empirico - sul campo

AI

Standard of Care





N = 30

p < 0.001 (ANOVA)

Implicazioni Manageriali

Lato Paziente:

- Utilità percepita e facilità d'uso
- Motivazione e coinvolgimento
- Aderenza alla terapia e soddisfazione

Decisori in ambito sanitario:

- Ottimizzazione delle risorse tramite identificazione precoce delle barriere
- Maggiore coinvolgimento dei professionisti attraverso strategie mirate

Produttori di tecnologia:

- Ricerca e sviluppo guidati dai bisogni e dalle preferenze degli utenti
- Miglioramento del ritorno sull'investimento (ROI)

Survey

Vuoi partecipare alla nostra raccolta dati? Bastano 3 minuti!

Scansiona il QR code, condividi la tua opinione e fornisci la tua mail per contribuire allo studio!

Aiutaci con il nostro studio!

andrea.bazzani@santannapisa.it

Grazie.