EPTRI
EUROPEAN PAEDIATRIC TRANSLATIONAL RESEARCH INFRASTRUCTURE

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Design of Technologies for Children: User Needs as a Starting Point

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User needs are the starting point — not a validation checkpoint

Across pediatric rehabilitation technology, the difference between sustained adoption and quiet abandonment traces back to one question:

What do children, caregivers, and clinicians actually need — as voiced in their own words & in their own real-world context?

This needs to be asked and asked yet again throughout the child's rehabilitation (and beyond)

Five Stages of Product Design

Primary stakeholders at each stage

1. Identify Unmet Needs
2. Co-design & Specification
3. Iterative Prototype Testing
4. Implementation Support & Adoption Planning
5. Early Validation & Evidence Generation

Whose needs? Three user types three different lenses

Children

Engagement & accessibility

Caregivers

Burden & feasibility

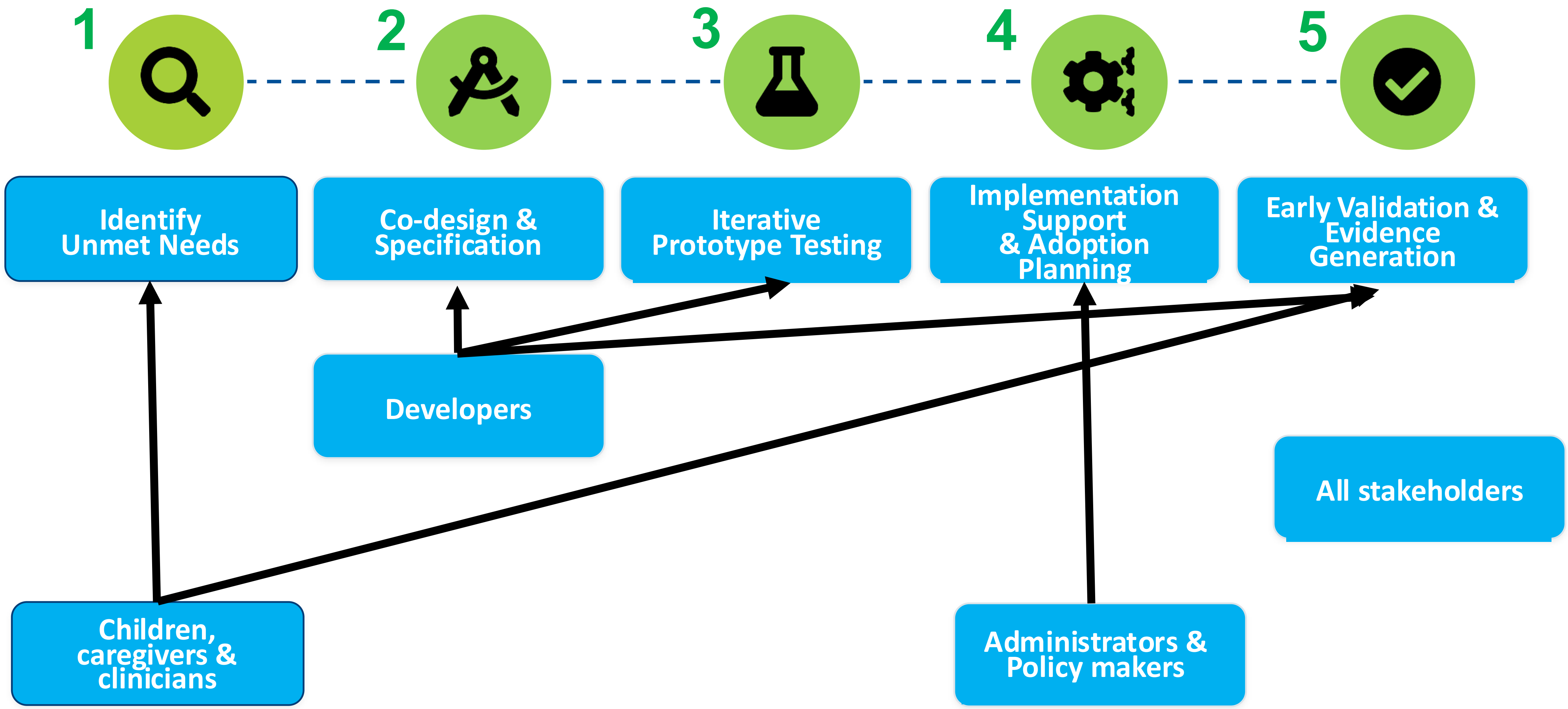
Clinicians

Workflow & therapeutic relevance

Effective co-design must satisfy all three simultaneously — and reconcile their real-world experience when priorities diverge

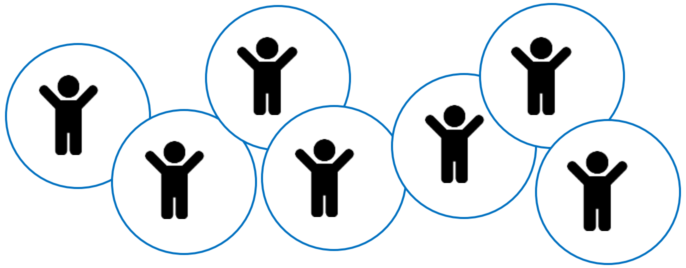
Five Stages of Product Design

Primary stakeholders at each stage



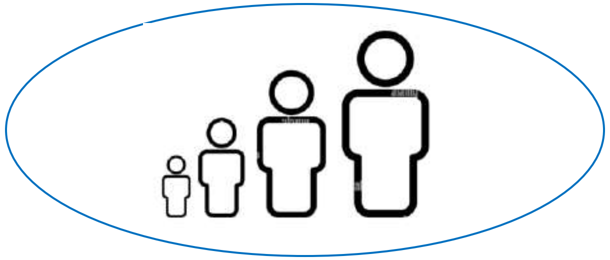
The Challenge: Pediatric user needs are unusually hard to pin down

- Digital and assistive rehabilitation technologies are expanding rapidly — yet many never achieve sustained clinical use
- Root cause is rarely the engineering
- It's that the need was never fully captured in the first place



Not one user, but many

Children, caregivers, and clinicians are simultaneous end users — with different, sometimes conflicting, needs



Needs shift with development

Heterogeneity in diagnoses and developmental stages means a need at for a child with CP at age 4 may not hold for a child with ABI at age 10

Needs are context-dependent

A need identified in clinic may look completely different at home or at school

How to Identify unmet needs

- Determine who is the target population and context of use — clinic, school, or home
- Define the clinical problem directly with end users, informed by their lived experience
- Assess whether existing solutions are adequate; identify gaps and constraints
- Translate needs into functional requirements and safety considerations

Methods that generate real evidence of need

Clinical observation

of real-world use, not staged demonstrations

Methods that generate real evidence of need

Focus groups

Identifying needs no single stakeholder sees alone

Focus Groups of Professional Experts

Methods that generate real evidence of need

Needs-assessment interviews
with children, caregivers & clinicians

Task-specific activities
across clinic, school & home contexts

Summary of Methods to.....

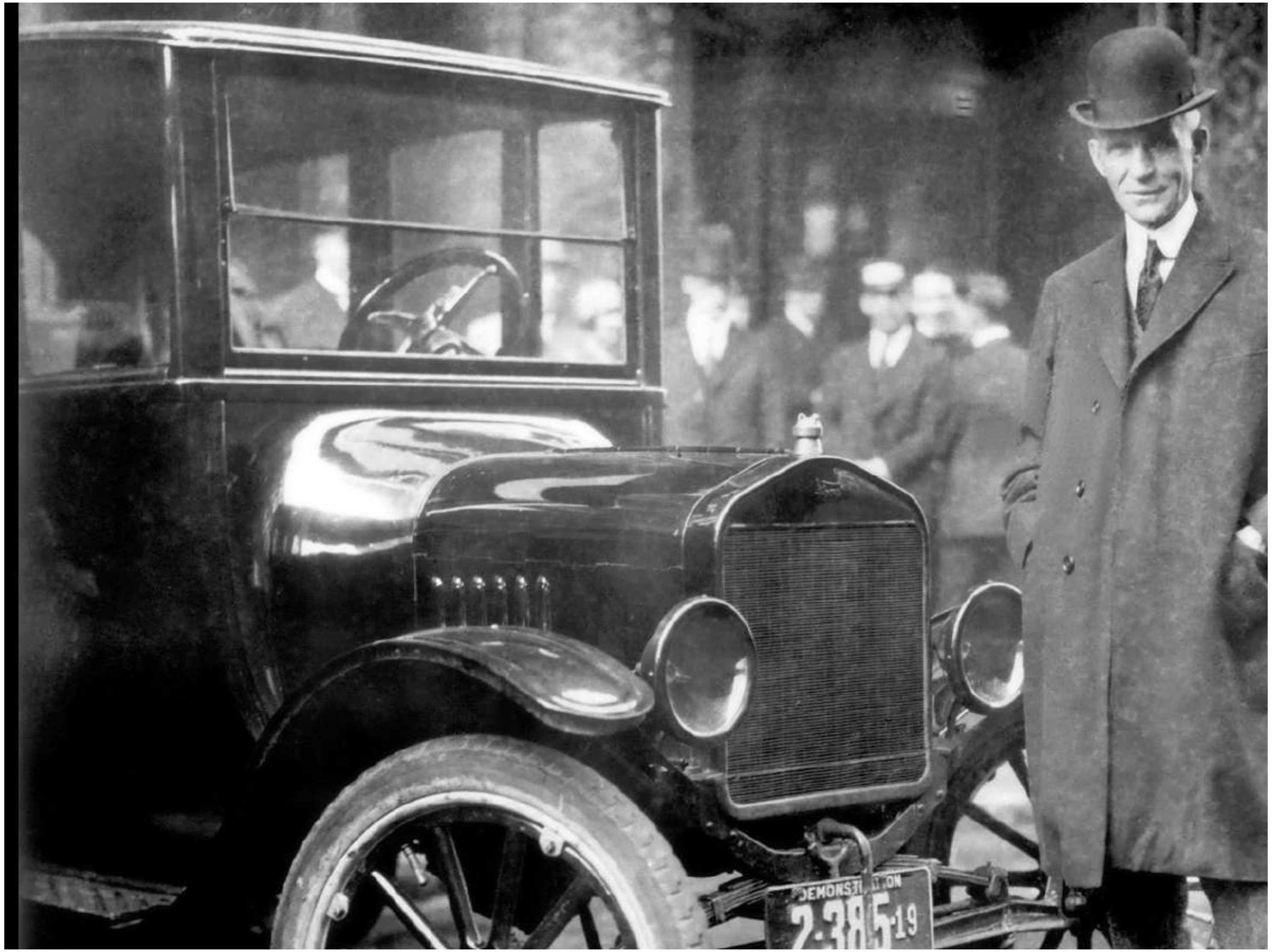
Explore needs	Translate needs into design features	Evaluating whether need was met
Ethnography	Written Storyboards	Verbal Protocol Analysis
Interviews	Pictorial Storyboards	Usability tests
Diary keeping	Physical models	Performance trials
Cultural probes	Mock-ups	Wizard of Oz trials
Focus groups	Simulations	Interviews
Observations	“Wireframe” prototypes	Questionnaires
Task Analysis	Functional prototypes	
	High-fidelity prototypes	

Summary of many available methods in *McClelland & Fulton Suri (2005)*

However .....

Designers and users do not necessarily know how to communicate with each other

Or they think they know best .....



"If I'd asked people what they wanted, they'd have said faster horses".

Henry Ford

Or they think they know best .....

January 9, 2007, Apple's Macworld Conference & Expo, San Francisco

AP / Paul Sakuma

"It's really hard to design products by focus groups. A lot of times, people don't know what they want until you show it to them."

Steve Jobs, BusinessWeek
May 25, 1998".

Example 1 — NEEDS IDENTIFICATION

The unmet need: Solving cold weather's threat to independent powered wheelchair mobility

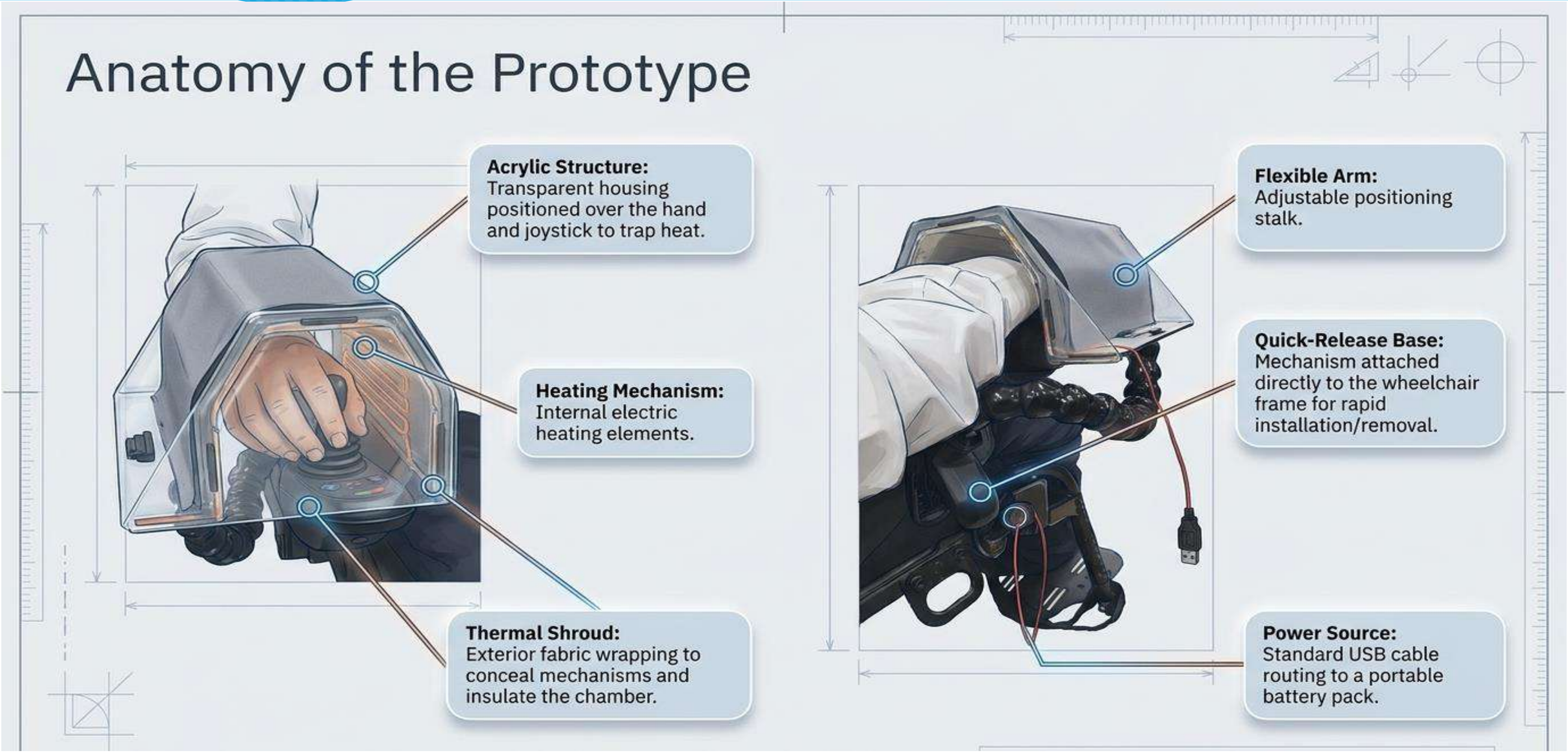
Example 1 — NEEDS IDENTIFICATION

Results from interviews and focus groups with 13 males with Duchenne Muscular Dystrophy, aged 15-43 years

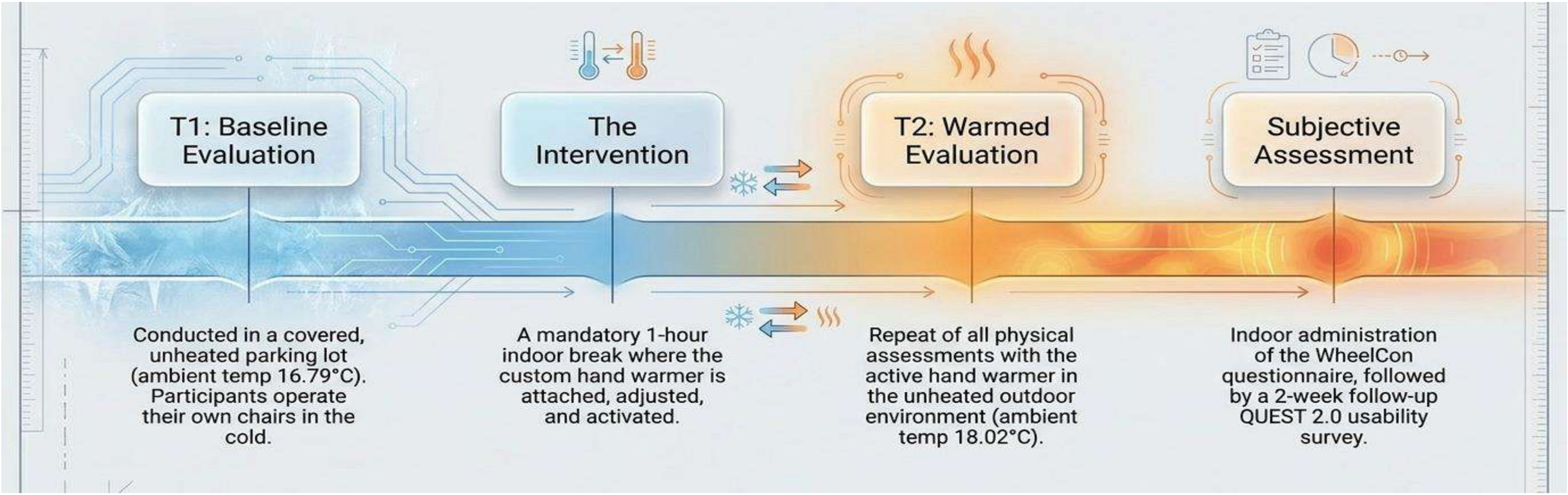
- Cold weather (<17°C) rapidly worsens hand & grip fatigue, especially after age 12
- Reduced grip control threatens safe, continuous powered-wheelchair operation
- Ordinary mittens and gloves don't preserve joystick dexterity
- Repeated loss of outdoor mobility limits community participation

Gefen & Rosenberg, 2026

Translating user need → Design requirement → Production



Evaluating the Product



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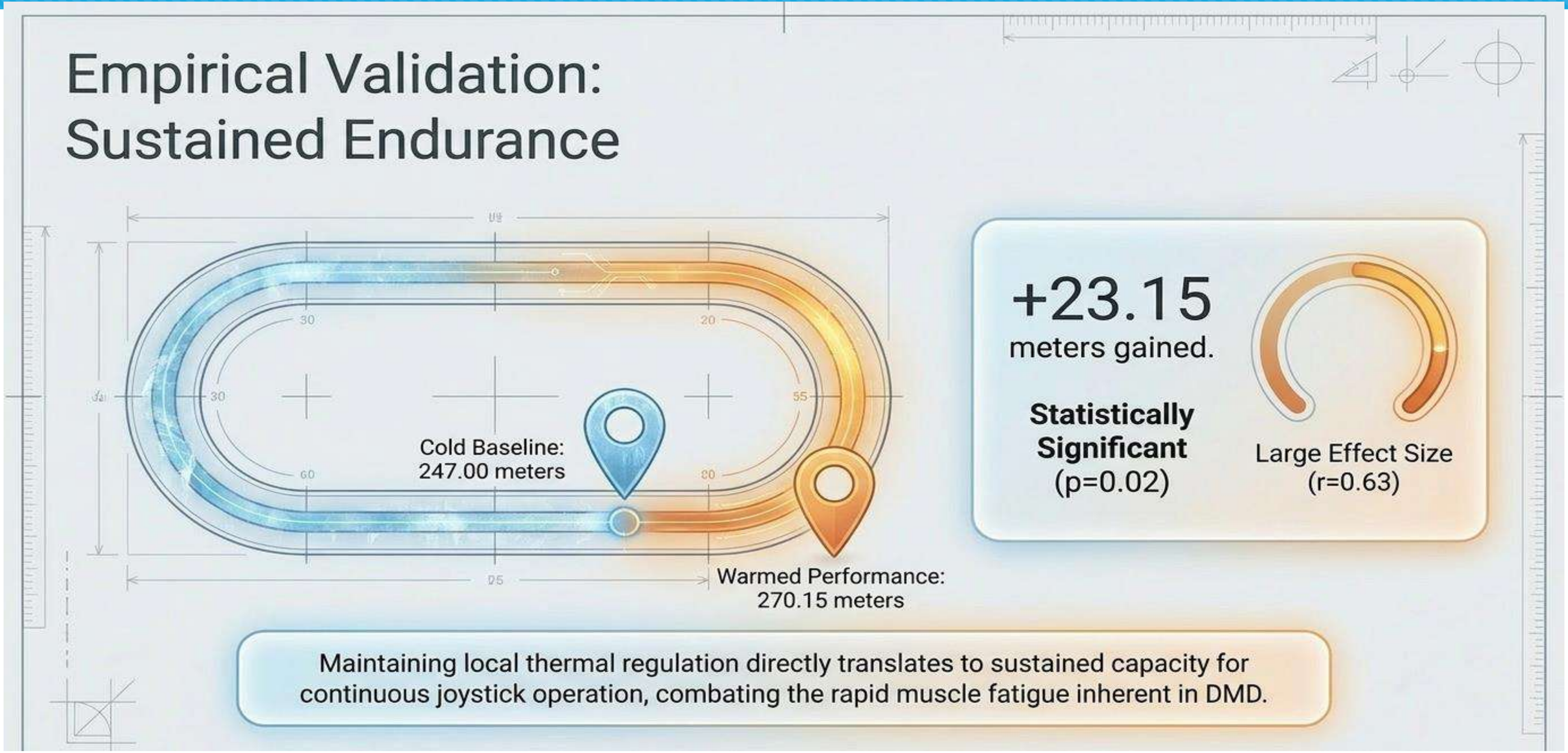


Evaluating the Product

But there are limitations

> *The hand returned to itself... it's nice, it warms the hand and it's not cold.*

The thermal theory is definitively proven. The biological barrier of cold can be mitigated by localized heat.

> *It's difficult in narrow spaces. The problem is that the device moves all the time... it wasn't stable.*

The physical form factor creates secondary environmental barriers. True assistive technology must integrate seamlessly into spatial environments.

Example 2 — NEEDS IDENTIFICATION

The unmet need: Lack of biomarkers to guide medication & treatment during rehabilitation of children with Acquired Brain Injury (ABI)

Example 2 — NEEDS IDENTIFICATION

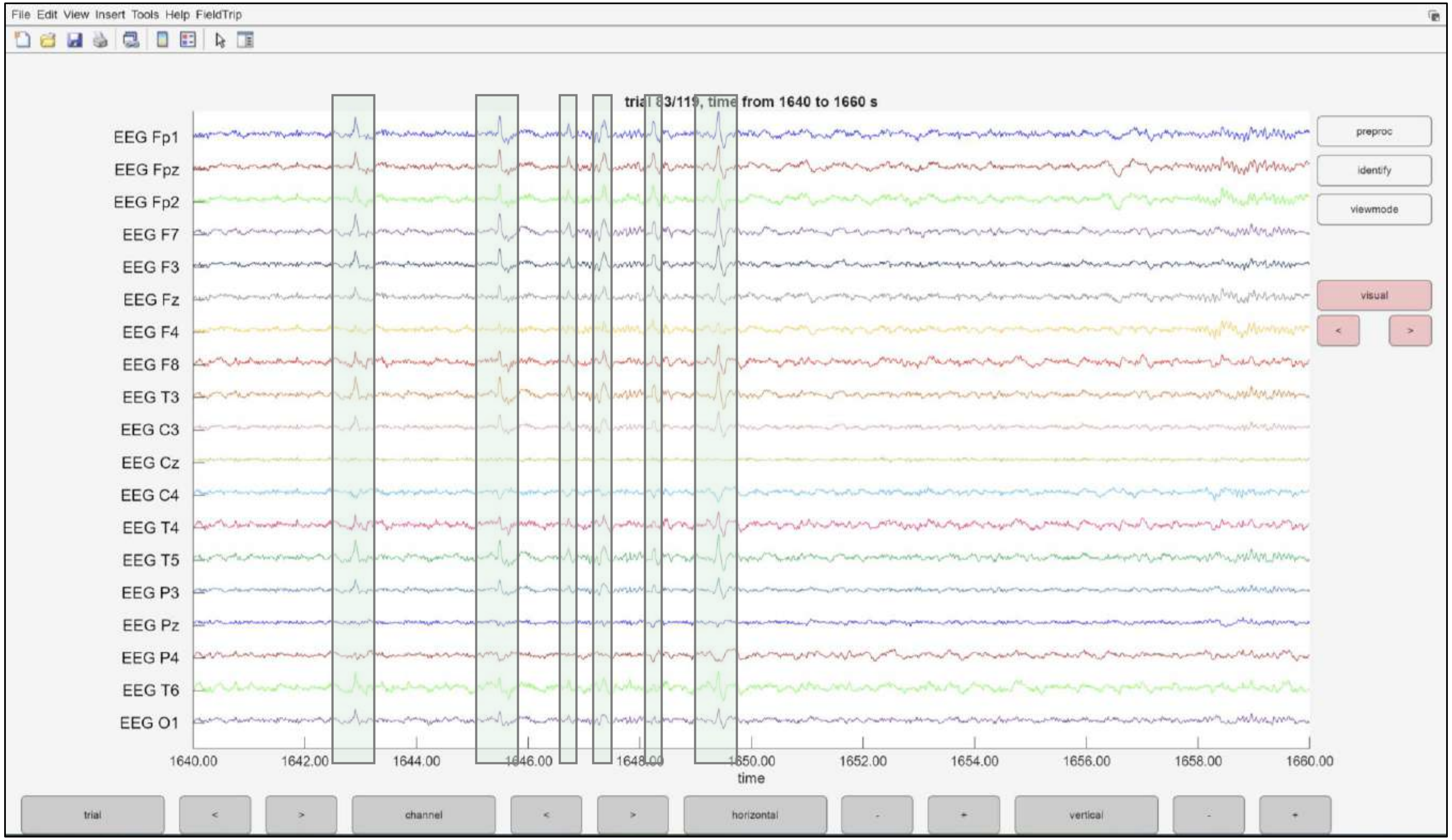
Results from 1-year retrospective review of 31 children with moderate–severe ABI and parental questionnaires

- Post-injury epilepsy & neuropsychiatric morbidity are common after pediatric ABI
- Typically EEG is recorded at start of rehabilitation & not repeated
- At ALYN, multiple EEG recordings made over 1-year of rehabilitation to identify potential EEG-based biomarkers for clinical prognosis, response to medication, long-term functional outcomes
- Mean age at injury of this cohort = 9 years; median Glascow Coma Scale 7; 71% of ABI was blunt trauma

Politi et al., 2026

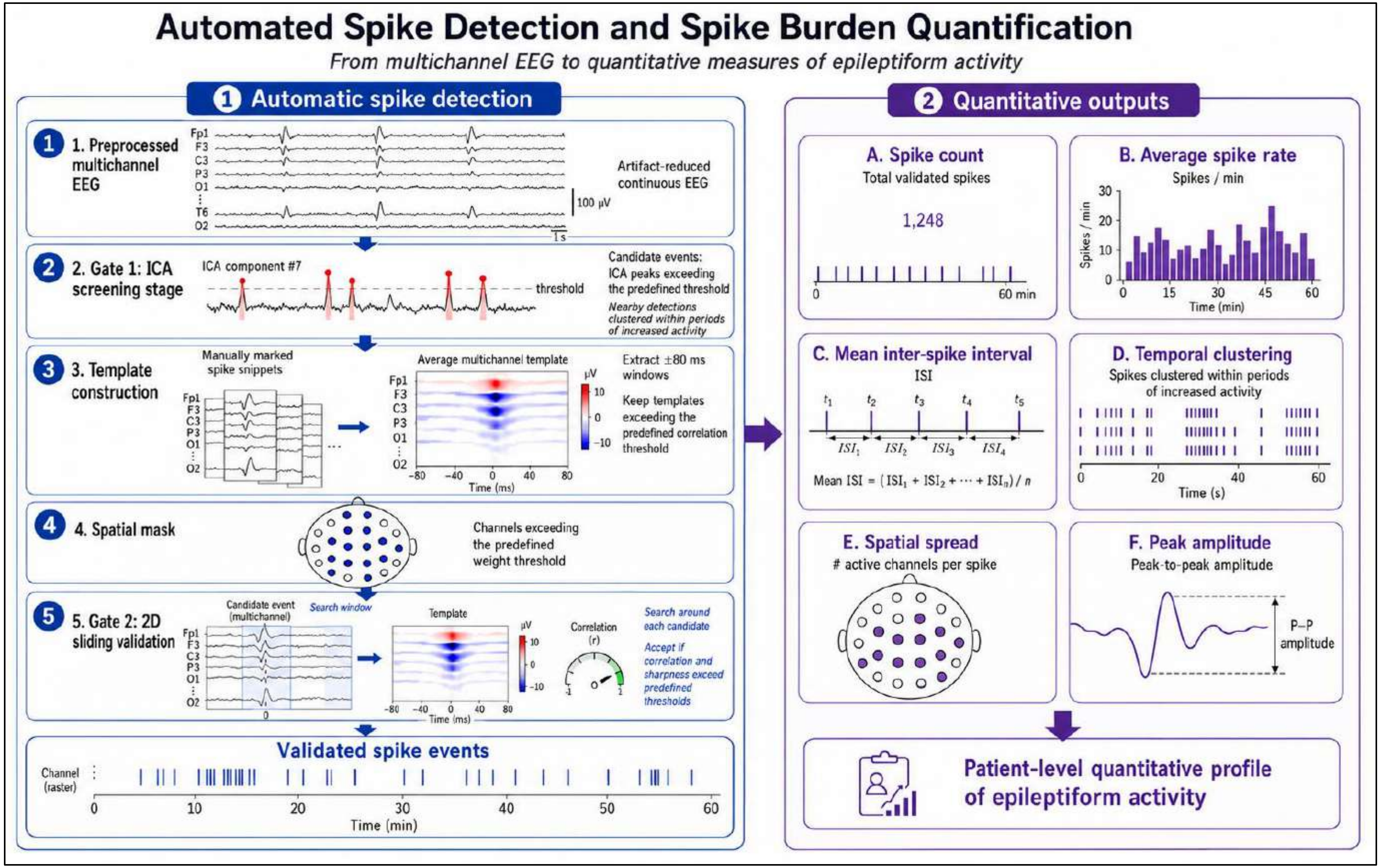
EEG Data analysis: Identifying features of interest

EEG recording from 1 patient



Politi et al., 2026

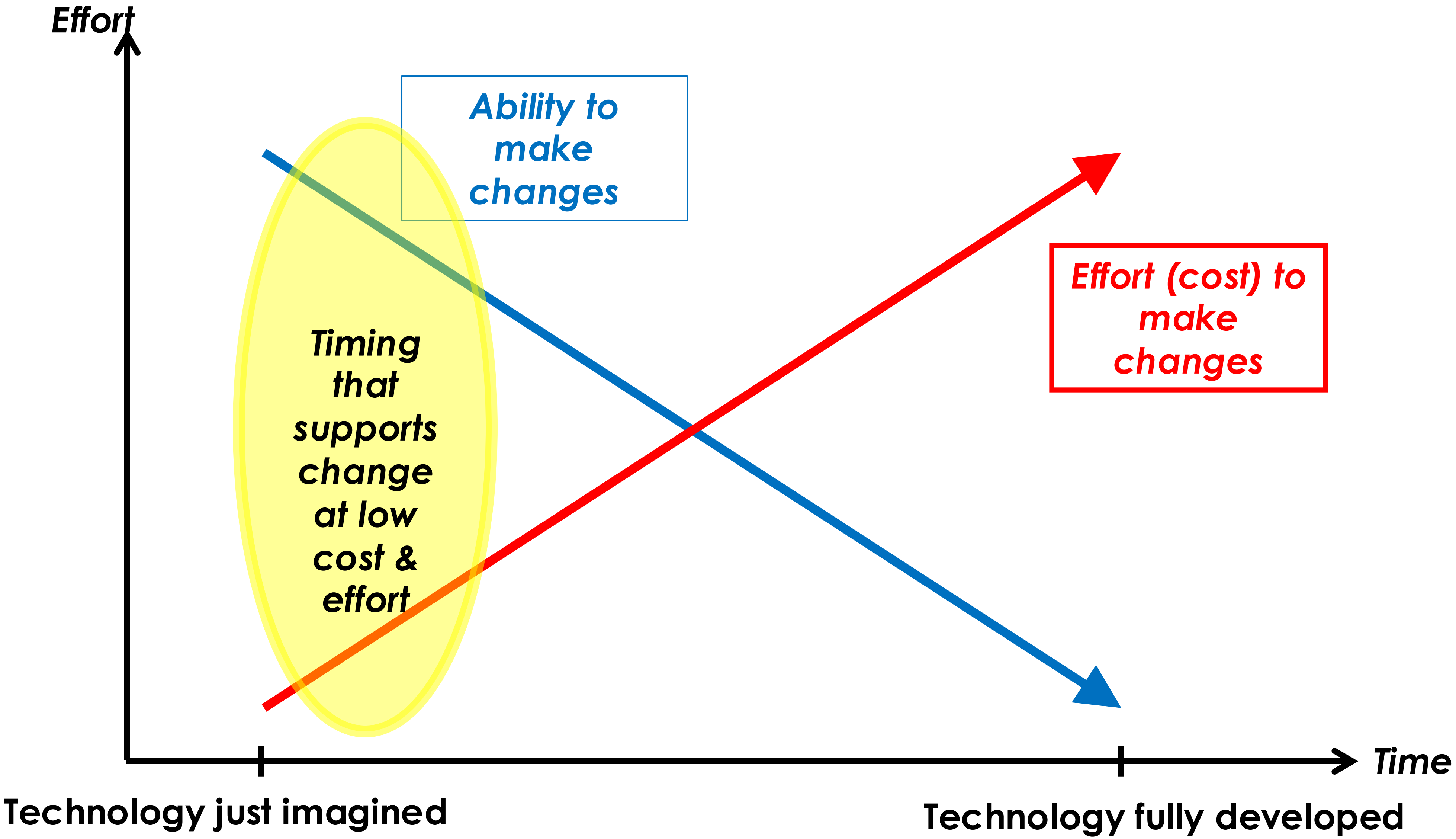
How EEG biomarker quantification responded to need



What EEG biomarker quantification has revealed (to date)

- higher rate of late-onset seizures & psychiatric complications when EEG showed emergent epileptiform activity
- EEG normalization at follow-up was associated with more favorable clinical recovery — the EEG trajectory itself behaves like a biomarker of need

Timing of identifying user needs in co-design



In summary

1. Begin with validated unmet needs & measurable clinical objectives — before building anything
2. Engage children, caregivers & clinicians throughout all five stages, not just at kickoff
3. Document how each need became a design requirement, for traceability & regulatory alignment
4. Revisit needs iteratively — lived & clinical experience will identify needs not seen at first

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