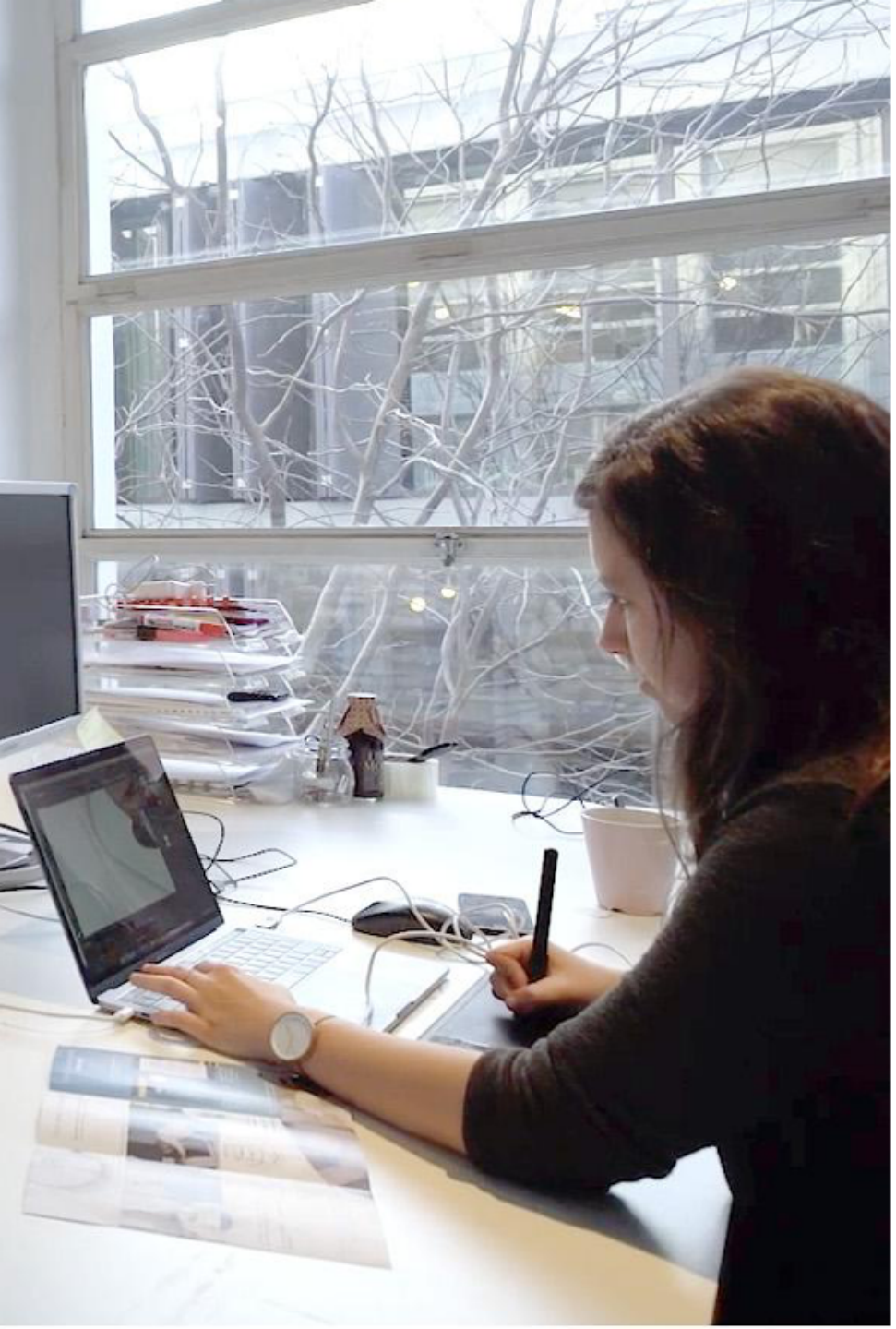
University of Antwerp
Faculty of Design Sciences

Research en incontinentie bij kinderen

Lola Bladt – PhD candidate UAntwerpen

Background

Design sciences and health sciences



Background

- Master in Science in **Product Development**, Faculty of **Design Sciences**, University of Antwerp
- **Minze Health, R&D Manager** since 2015
- **PhD Candidate** since 2022
  - Design Sciences: Prof. Dr. Van Campenhout
  - Health Sciences: Prof. Dr. De Win & Prof. Dr. Vermandel
  - Minze Health: MSc Vermeulen

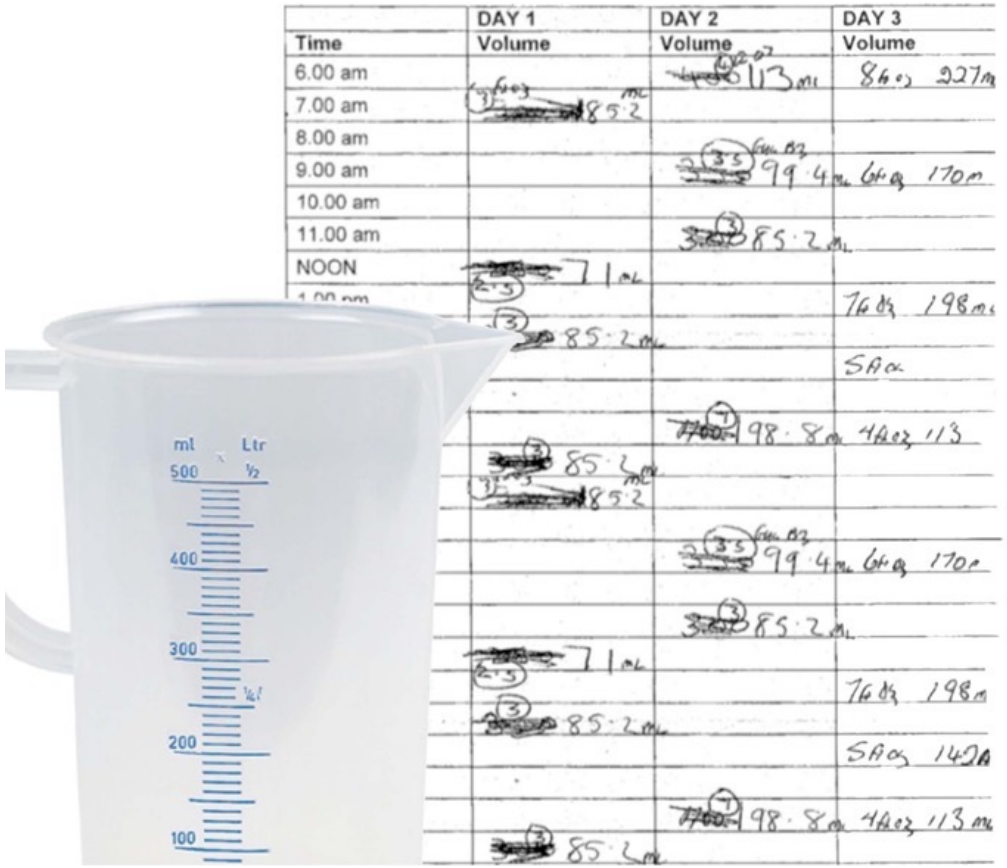
Universiteit Antwerpen

Minze health at home

Minze Health

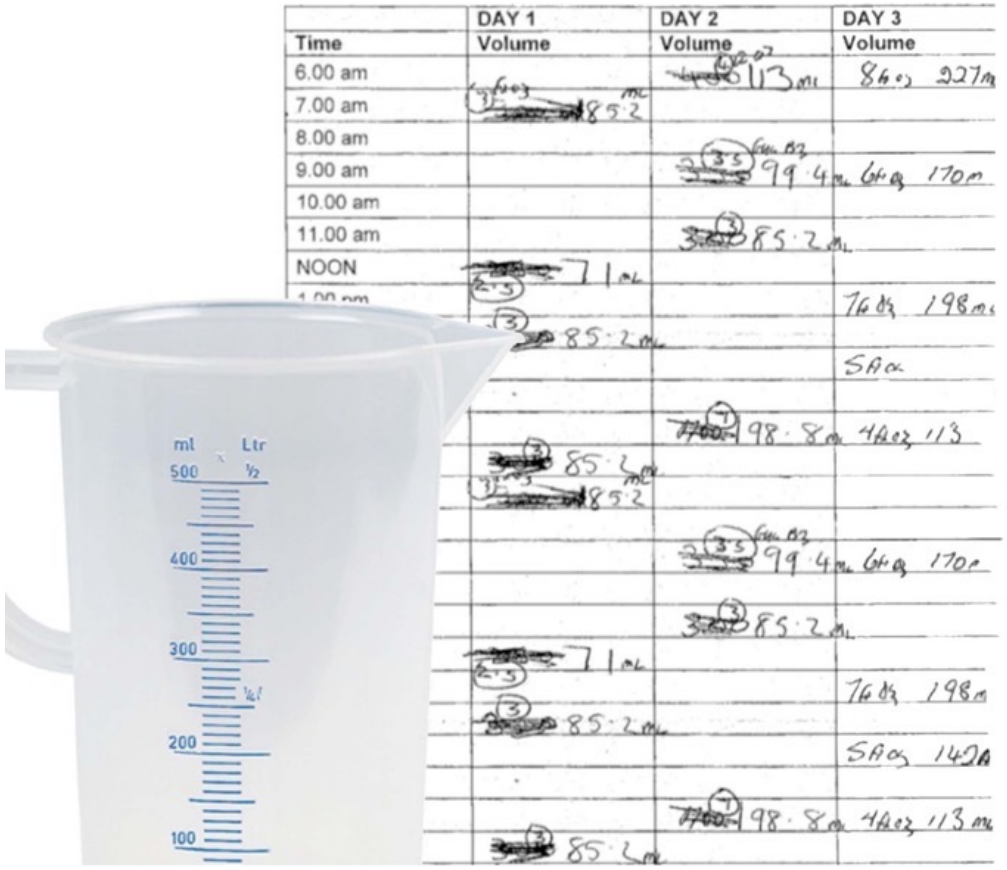
Digital-health

Paper bladder diary

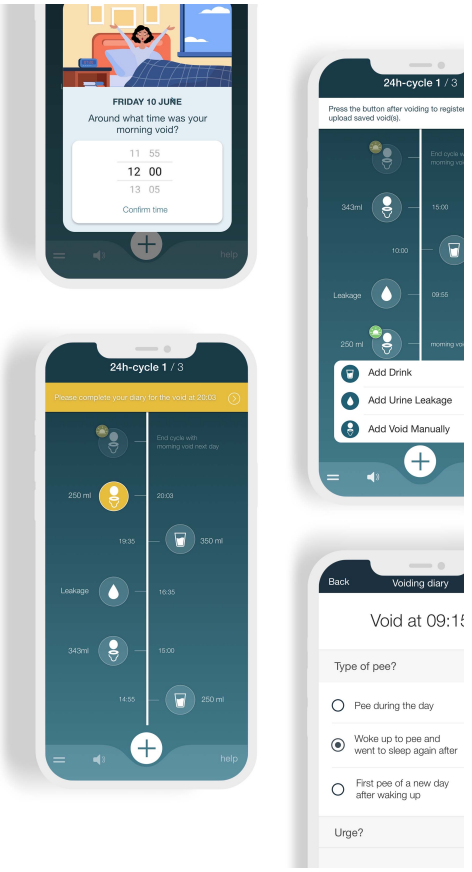


Automated bladder diary

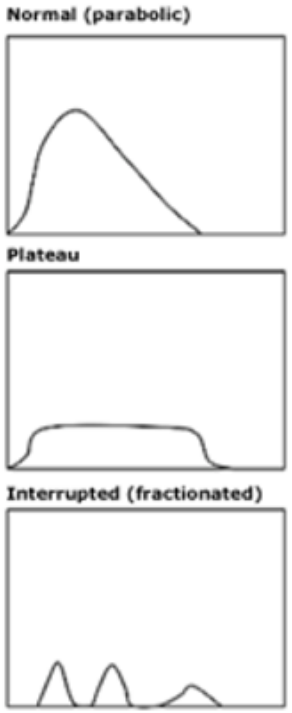
Paper bladder diary



Automated bladder diary

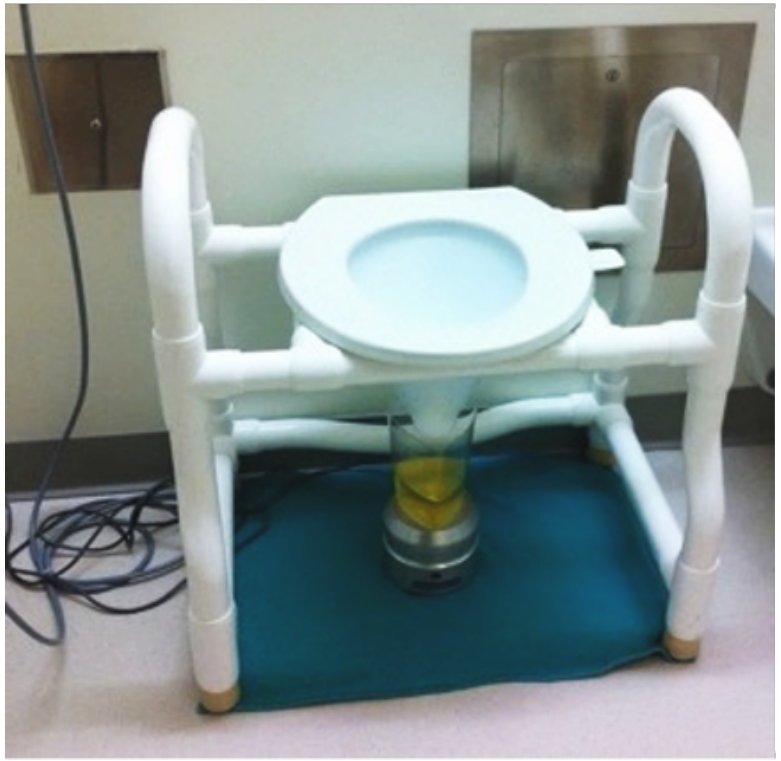


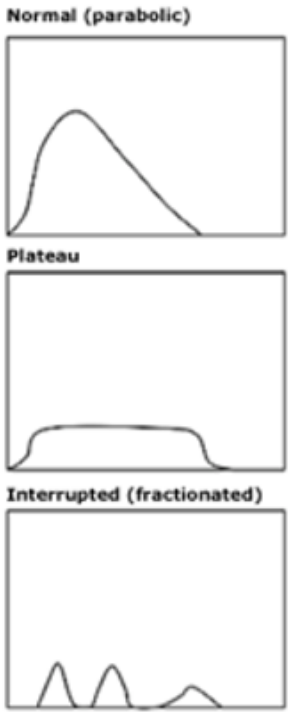
In-clinic uroflowmetry



Homeflow

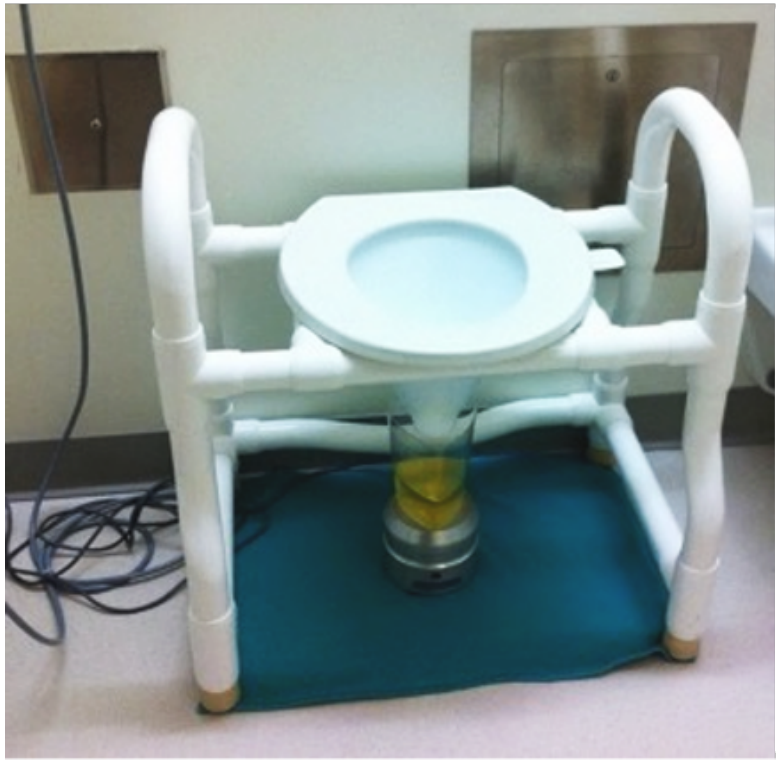
In-clinic uroflowmetry

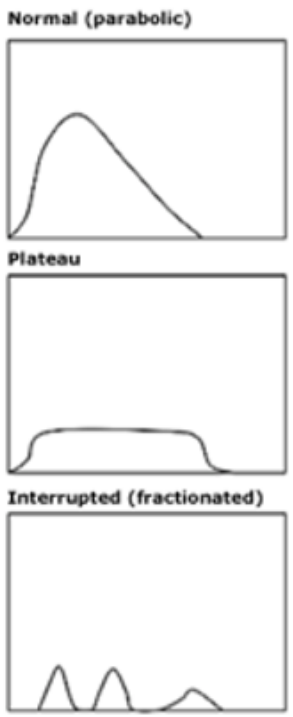




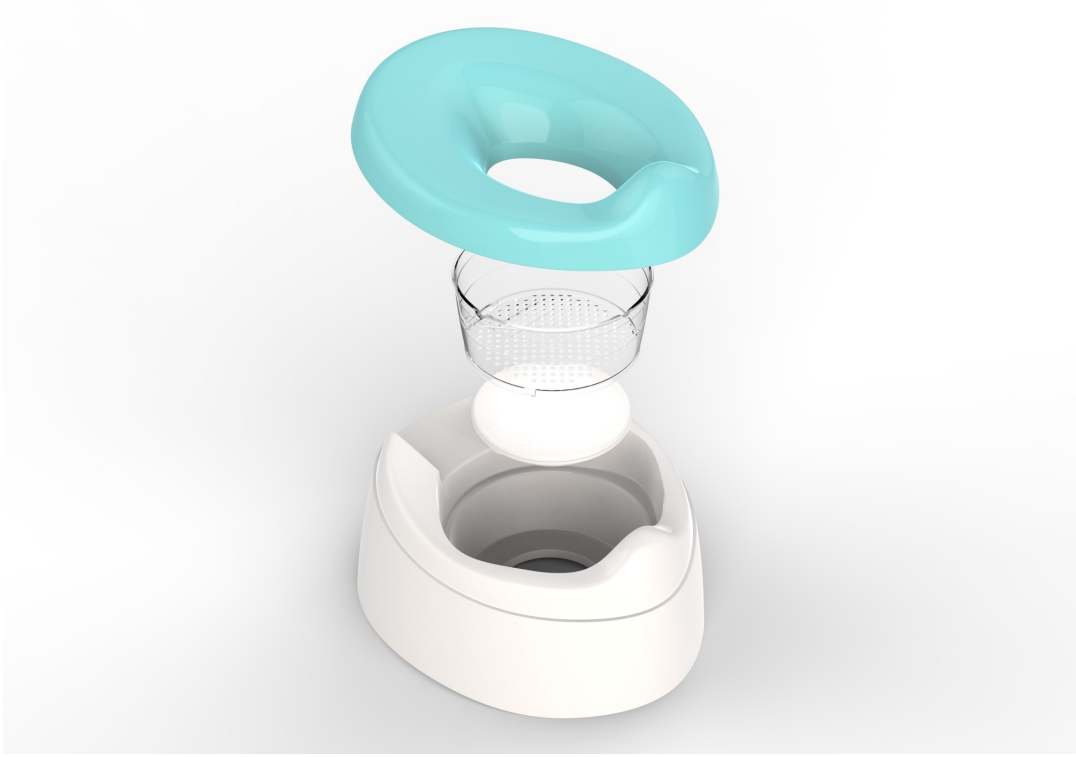
Homeflow

In-clinic uroflowmetry



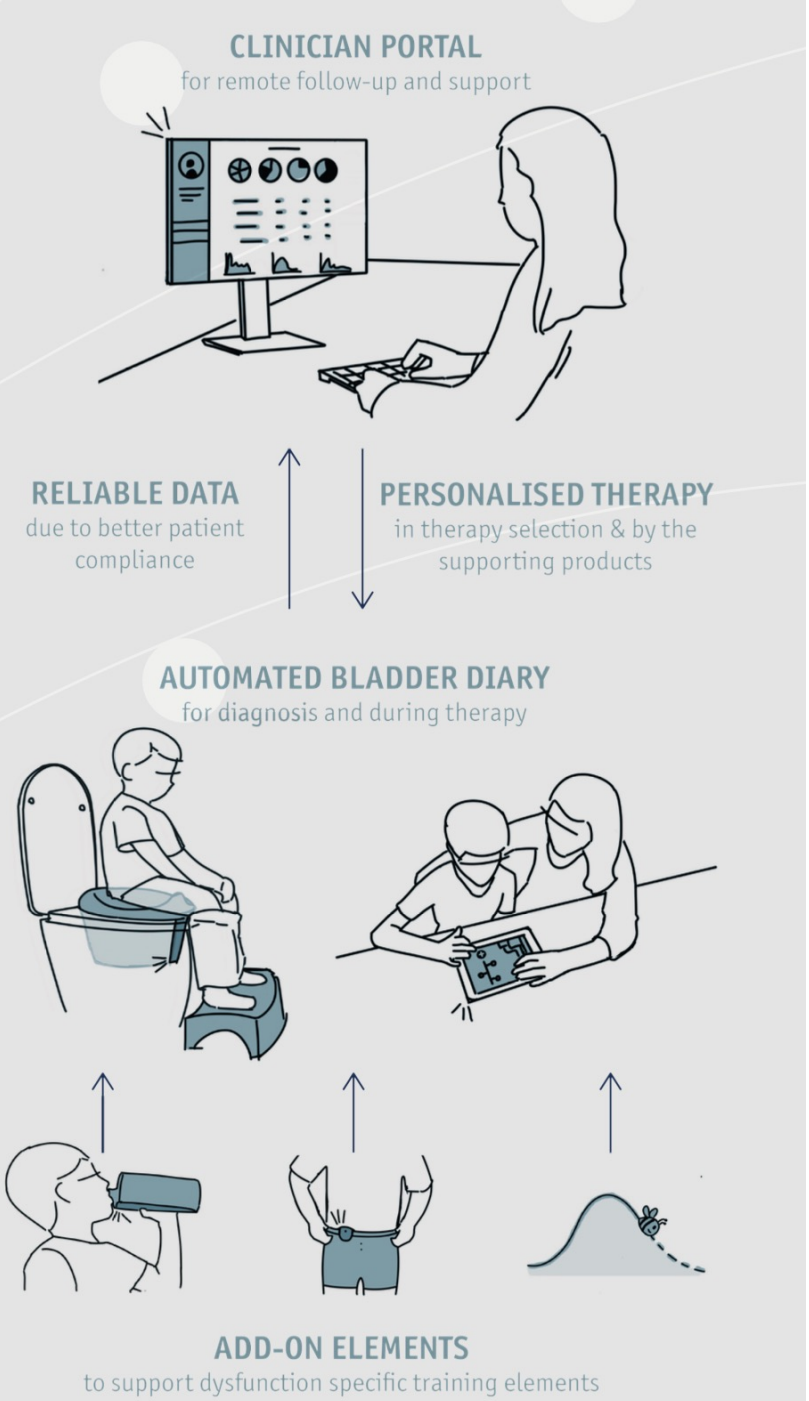


Homeflow



PhD project

Children with LUTS



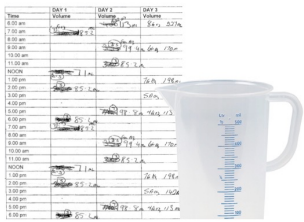
Personalized urotherapy at home to improve the care pathway of children with lower urinary tract dysfunctions

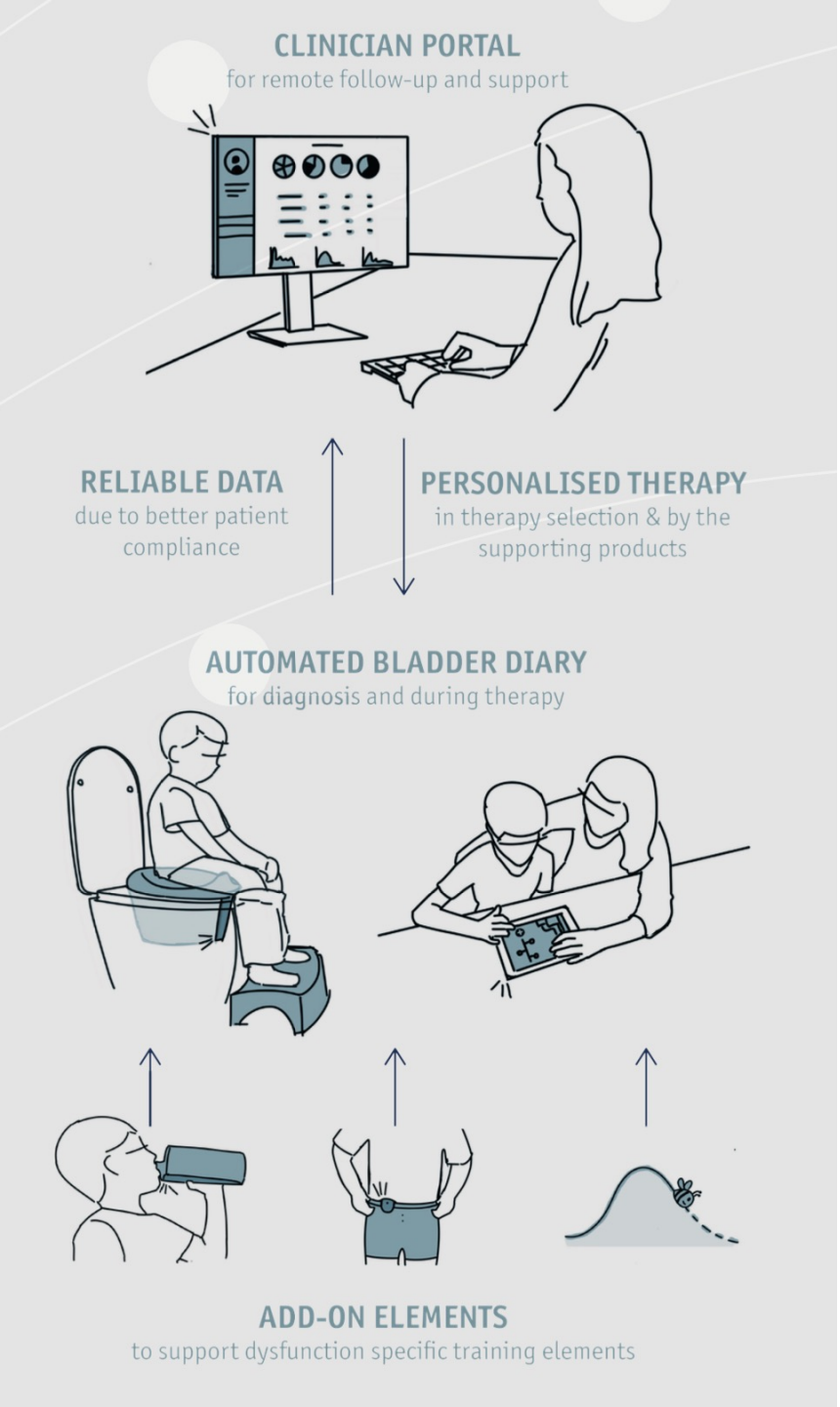
±10% Children (5-13y) with Lower Urinary Tract dysfunction

±50% Success rate of urotherapy due to lack of motivation

Supporting products play a key role in motivation.

- Paper diaries
- (Bed)wetting alarm
- Timer watch
- Uroflowmetry / EMG (bio)feedback



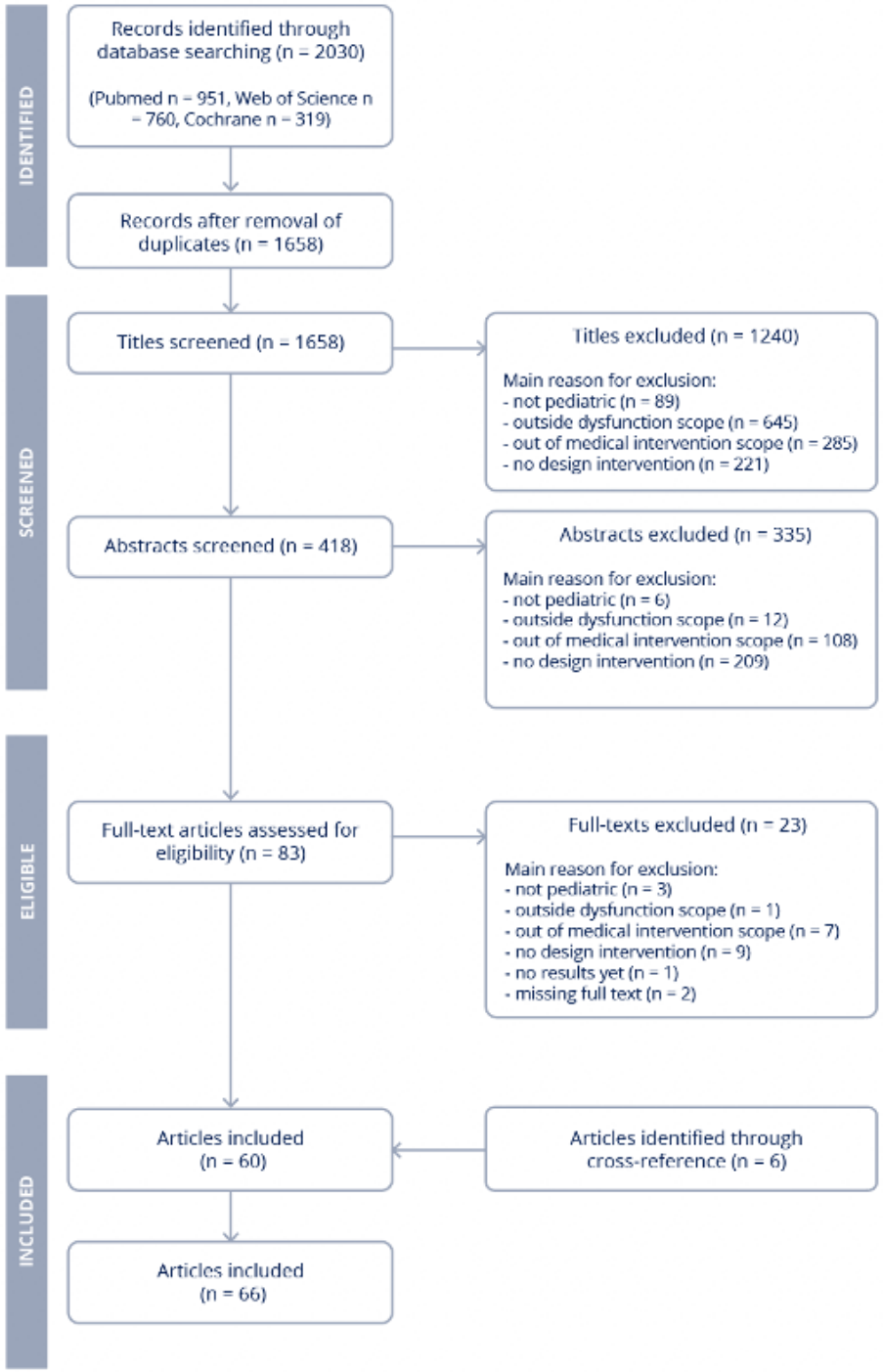


Personalized urotherapy at home to improve the care pathway of children with lower urinary tract dysfunctions

- Scoping literature review
- Focus group / co-creation
- Randomized control crosover trial

Scoping literature review

Design/innovation strategies



Scoping literature review

- **Goal:** Map the various design/innovation strategies aimed at improving the patient pathway of children with LUTD.
- **Search strategy:** 4 search concepts were used and combined
  - Dysfunction descriptors
  - Therapy descriptors
  - Innovation strategy descriptors
  - Pediatric population descriptors
- **Sources:** Web of Science, Pubmed and Cochrane Library
- **Articles:** 2030 retrieved → 66 included (after screening and eligibility assessment)

Scoping literature review

TYPE OF DYSFUNCTION	#	Patient experience as outcome
Nocturnal enuresis	19	8
Urinary incontinence	12	5
Dysfunctional voiding	9	2
Neurogenic LUTD	5	4
Functional LUTD	4	1
All types of LUTD	4	0
UTI	4	1
Pre-continent children with special needs	3	2
Bladder and bowel dysfunction	2	2
Overactive bladder / urge incontinence	2	0
Underactive bladder	1	0
Anatomical LUTD	1	0
Total	**66**	**25**

The majority of **innovation strategies targeted** children with nocturnal enuresis (N=19) and urinary incontinence generally (N=12).

Scoping literature review

TYPE OF STUDY DESIGN	#	Patient experience as outcome
RCT	14	5
Validation	13	3
Quasi-experiment	9	3
Experimental n.c.	8	6
Type of review	6	0
Mixed methods	5	4
Retrospective study	4	1
Qualitative	3	3
Modelling	2	0
Case study	1	0
Design-based research	1	0
Total	**66**	**25**

- Most studies were **randomized controlled trials (N=14)** and **validation studies (N=13)**
- 37.8% (N=25) of studies evaluated **outcomes related to patient experience**, such as satisfaction, motivation and usability.

Scoping literature review

Mobile applications digital
voiding diaries, self-management

Gamification
Voiding diary, urotherapy,...

Biogames
animated biofeedback

Reminder tools
Timer-watch (voiding & self-management), alarm, imitation tool

NE alarm
Different design implementations

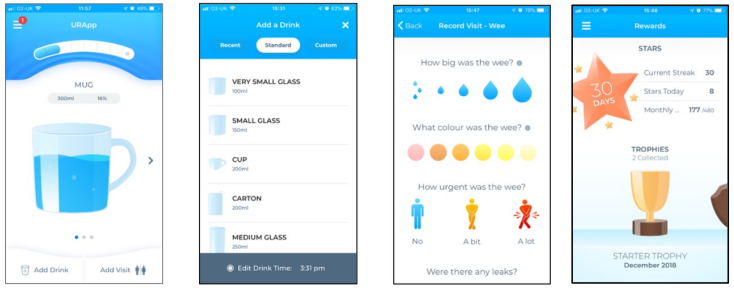
Pre-void NE alarm
US bladder monitoring and physiological signals

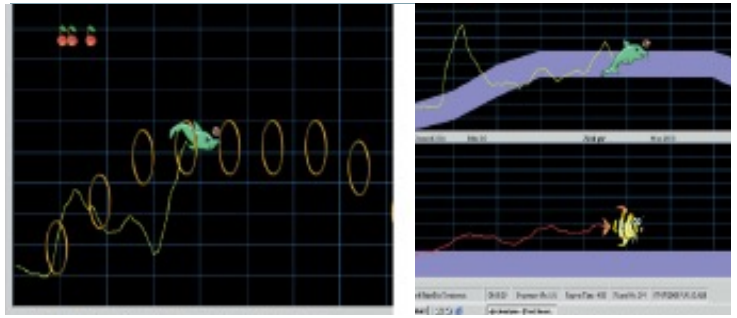
Home assessments
Uroflowmetry technologies, fluid intake, TENS, telehealth, AI

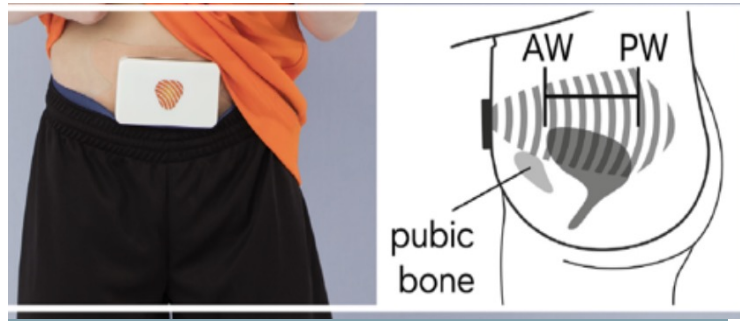
Video / multimedia
enuresis, bladder training, preoperative, embodied conversational agent

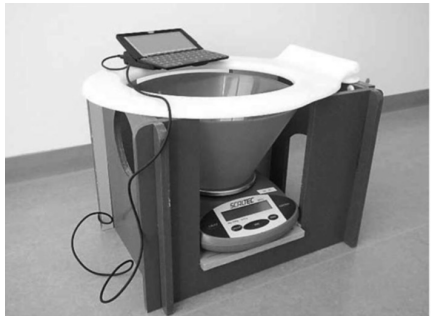
Educational tools
UTI clean-cath, daytime wetting workbook, new enuresis chart

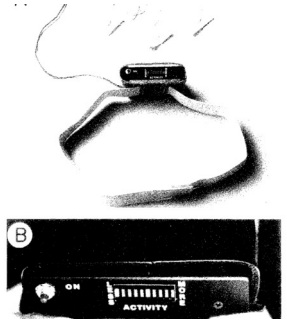
Scoping literature review

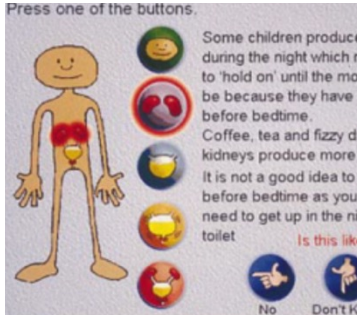


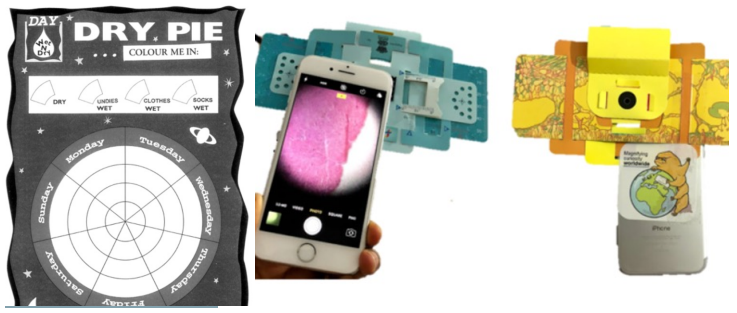












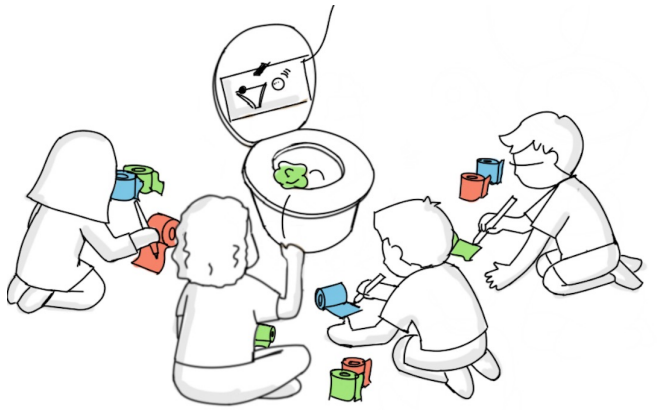
Focus group

Urotherapy supporting products

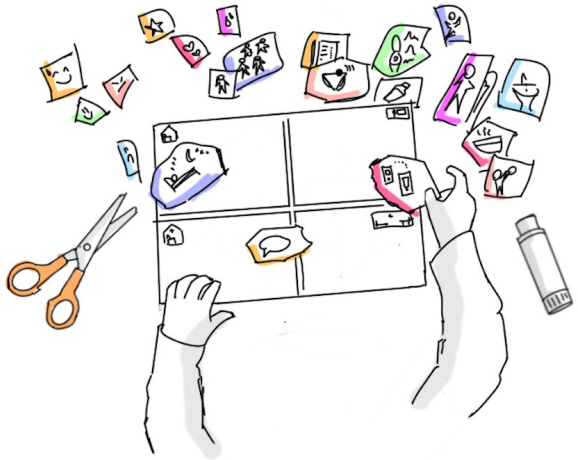
Focus group

1. Icebreaker & warm up

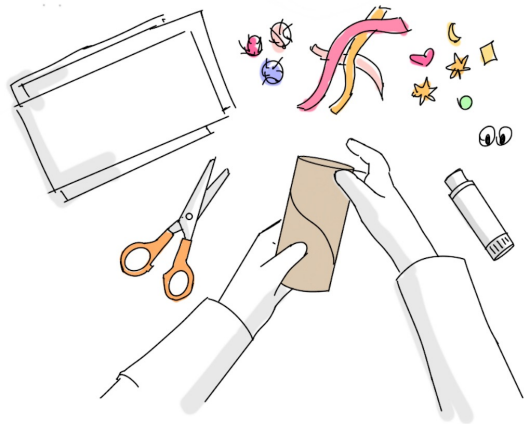
2. Anonymous pen and paper

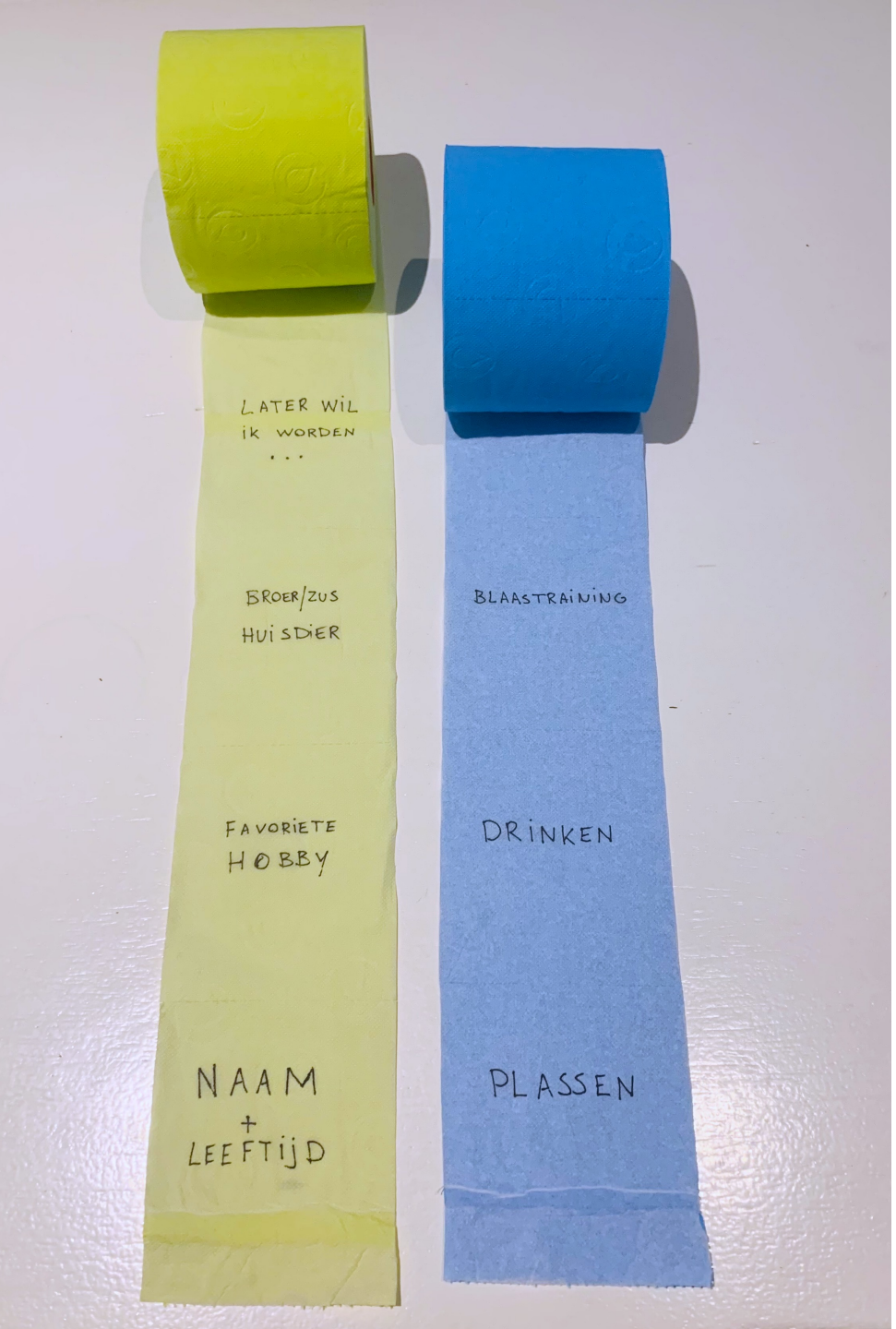


3. Collaging



4. Storyline character (hero)





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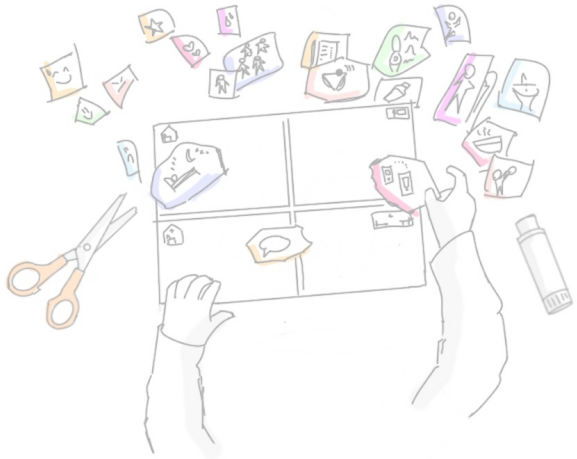

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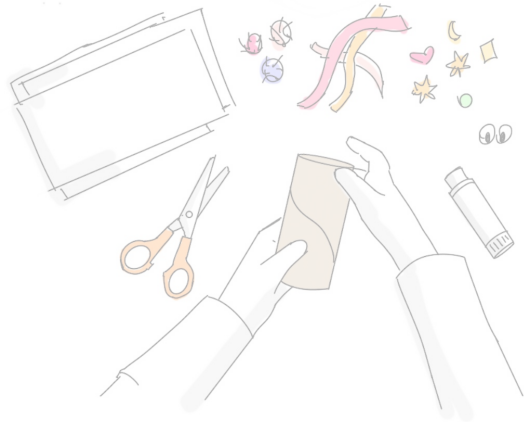

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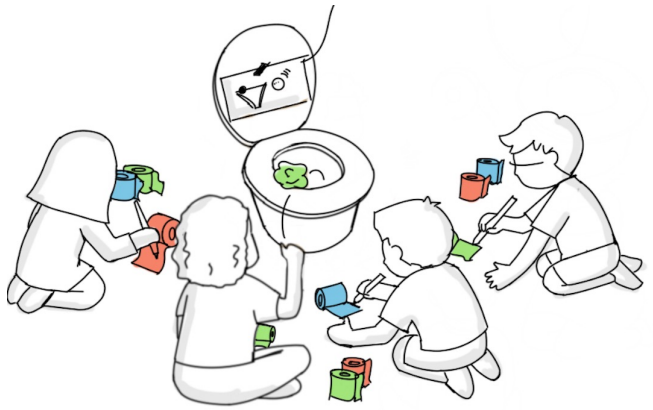

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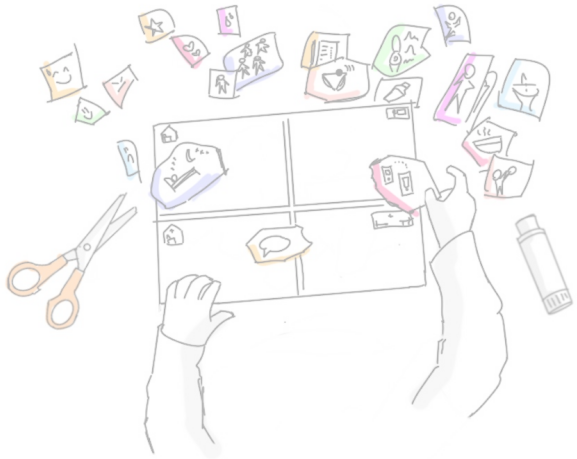

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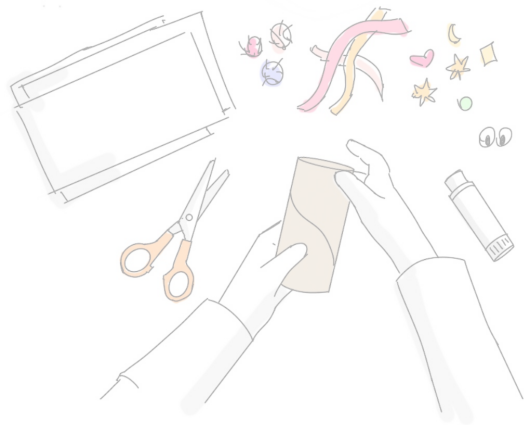

Focus group

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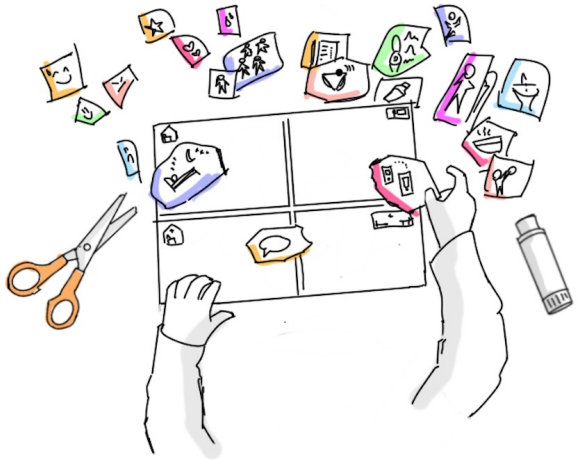

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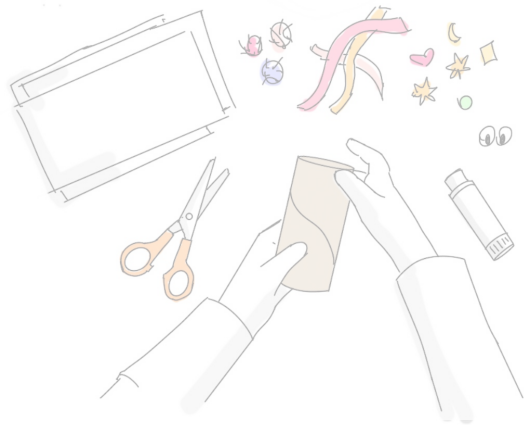
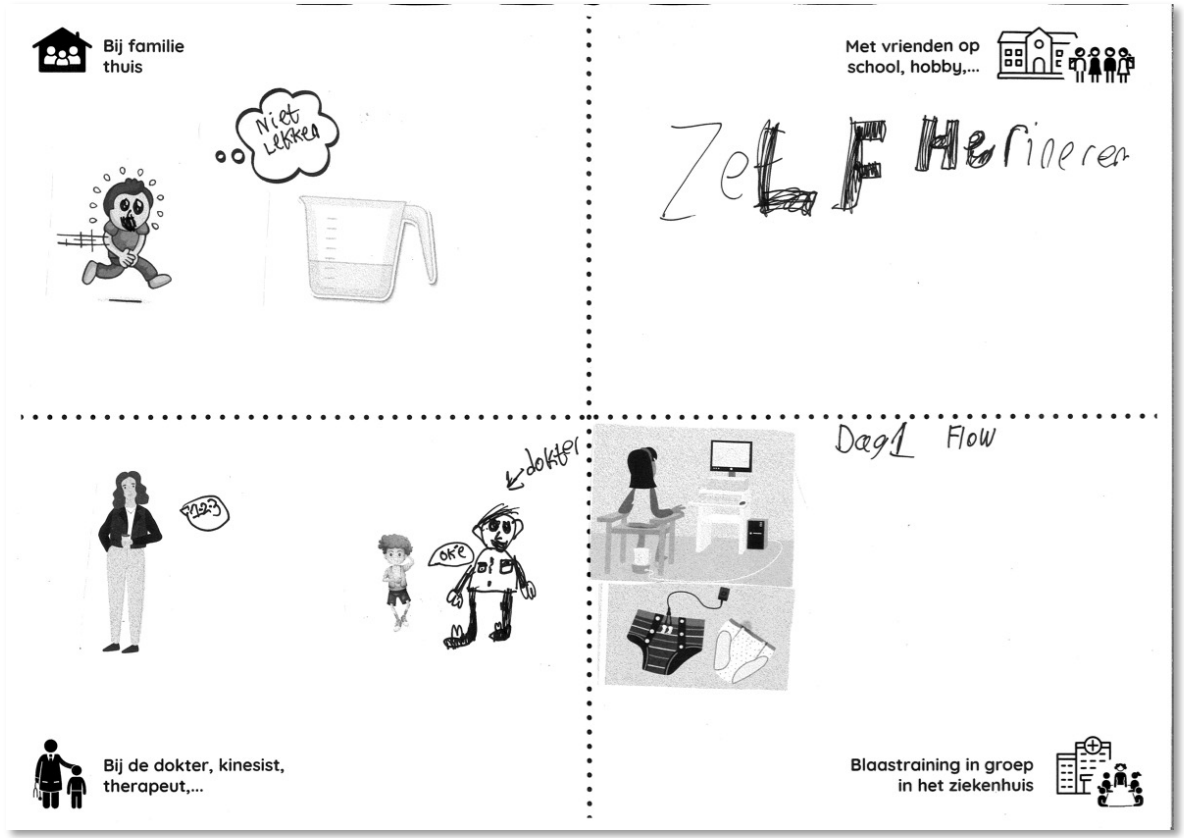


Focus group

Collaging



Focus group

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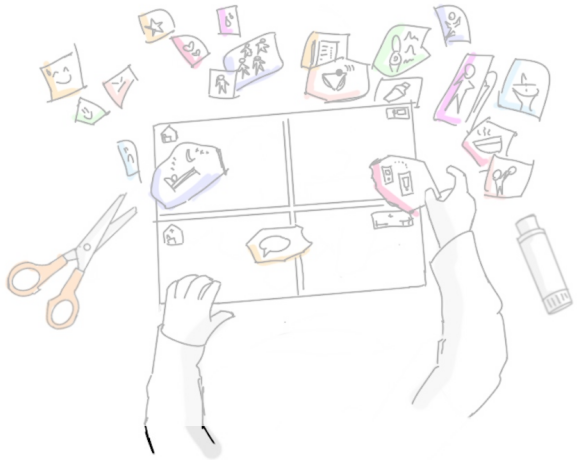

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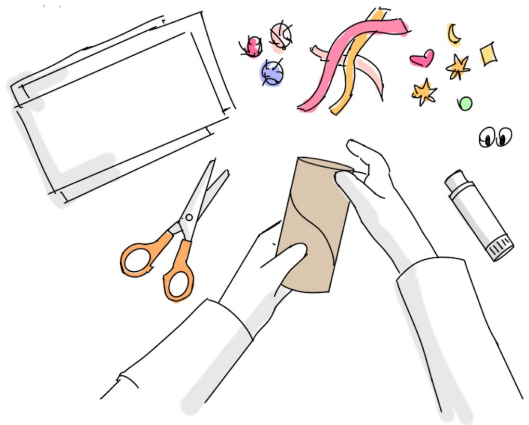
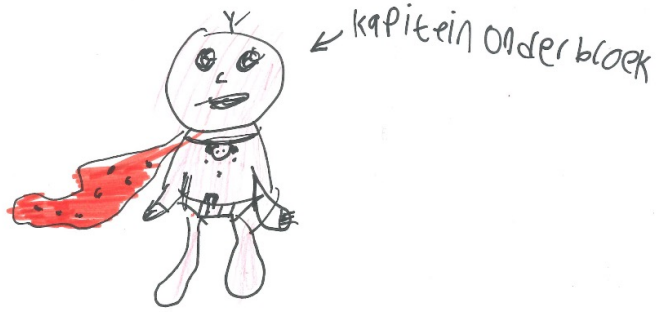


Focus group

Storyline character (hero)

Mijn superheld(in)



Mijn superheld(in)

Mijn superheld(in)

Focus group

Storyline character (app avatar)

RCT crossover

Bladder diary comparison

Table 1 Comparison studies between electronic bladder diaries (eBD) and paper bladder diaries (pBD)

Author(s)	Year	Title	Type	Length	Participants	Conclusion
Rabin et al. [20]	1996	'Compu-void II': The computerized voiding diary	Dedicated device	7 days	Women with incontinence and pelvic floor dysfunctions (>18y)	They found in all subjects, the number of entries in the eBD exceeded the number made with the pBD, suggesting *(according to them)* increased patient compliance with the eBD. Moreover, the eBD was preferred by 98% of patients.
Quinn et al. [27]	2003	Assessment of an electronic daily diary in patients with overactive bladder,	Dedicated device	7 days	Patients with overactive bladder symptoms (>18y)	The number of daily voids was slightly lower for the eBD than for the pBD, yet the amount of urgency episodes was again higher. They concluded the eBD may reflect more accurate data, as 94% of patients found the eBD easy to use, it reflects real-time data entry and had no data errors (according to their definitions of errors).
Mangera et al. [28]	2014	Development of two electronic bladder diaries: A patient and healthcare professionals pilot study	Dedicated device	3 days and 1 extra over-lapping day	Patients requiring a bladder diary (>8y)	They found a concordance of parameters on one overlapping day of only 50%. The number of daily voids and volumes was higher for the eBD than for the pBD, whereas the number of nocturnal voids and incontinence episodes were lower. They concluded that differences could be due to misunderstandings in completing either diary. However, the eBD was preferred by 81% of patients over the pBD.
Johnson et al. [29]	2014	Evaluation of a Mobile Voiding Diary for Pediatric Patients with Voiding Dysfunction: A Prospective Comparative Study	App	5 days	Pediatric patients with voiding dysfunctions (4-17y)	They found somewhat lower completion rates with the eBD than with the pBD. Data quality on the other hand was not clearly better for either version. Furthermore, they did not find differences between both diary formats on ease of use, both were found not difficult to complete; and on child participation, in slightly more than half of the cases the child participated in filling in the diary.
Abrams et al. [30]	2015	Electronic bladder diaries of differing duration versus a paper diary for data collection in overactive bladder	Dedicated device	3 days, 7 days and continuous	Patients with overactive bladder on a stable therapy (>18y)	They found compliance was generally high across all diary groups. However, they did find 7-day or continuous eBDs to be more reliable, in terms of consistency, for voids and incontinence frequency compared with shorter collection periods and pBDs.
Sussman et al. [31]	2016	Utilizing Technology in Assessment of Lower Urinary Tract Symptoms: A Randomized Trial of Electronic Versus Paper Voiding Diaries	App	3 days	Women with lower urinary tract symptoms (>18y)	They found a good degree of association between the two methods. However, the number of voids and incontinence episodes recorded with the eBD was lower compared to the pBD. Patients indicated the app to be difficult to use, potentially explaining the observed differences. Consequently, only approximately half of the patients preferred the eBD over the pBD, which is noticeably less than in other studies. Though 78% of patients reported they would prefer an electronic format if the app were improved.
Arrom et al. [33]	2018	Validation of a 3 day electronic bladder diary as an app for smartphone	App	3 days	Patients with overactive bladder or nocturia symptoms (>18y)	They found the eBD to be of high reliability (test-retest). Their results showed good agreement regarding the presence or absence of symptoms between both formats. Symptoms which showed lower agreements were the presence of nocturia or nocturnal polyuria. A possible explanation was that patients might find some difficulties in recording voids at night with an eBD as this could require a degree of wakefulness which could interfere with the sleep cycle. This is endorsed by the desire expressed by patients to support the possibility of backfilling. Nevertheless, 88% of patients would choose the eBD over the pBD if they had to repeat a bladder diary.

eBD: electronic bladder diaries; pBD: paper bladder diaries

Randomized control crossover trial

Bladder diary comparison in pediatric patients (6-12y)

Research aim To compare an **automated bladder diary (autoBD)** to a **paper bladder diary (pBD)** on their:

Level of agreement (Bland Altman)

What are the mean differences and the limits of agreement between the pBD and autoBD for key diary parameters.

Compliance (survey & interviews)

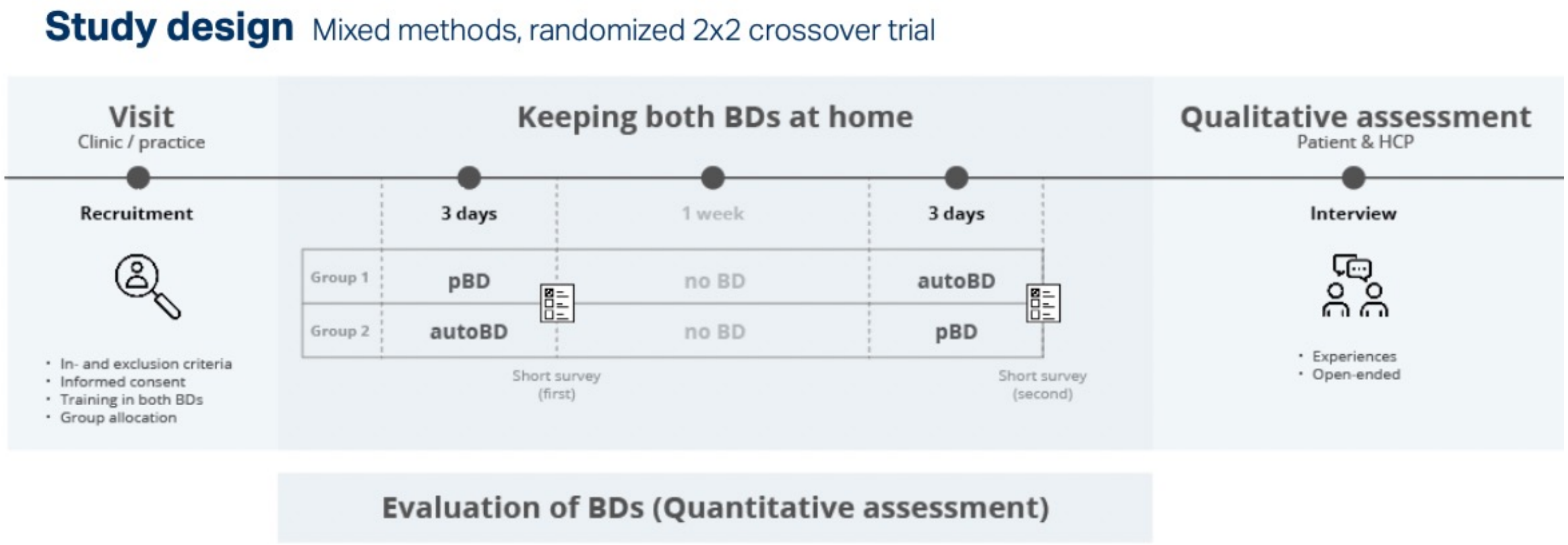
Subjective compliance will be assessed using topics such as completeness, reliability, usefulness and child/parents' motivation.

Satisfaction (survey & interviews)

Preference, patient satisfaction (usability & ergonomics) and healthcare professional satisfaction (set-up & interpretations)

Randomized control crossover trial

Bladder diary comparison in pediatric patients (6-12y)



Thank you!

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