Stride velocity 95th centile (SV95C): From EMA qualification in Duchenne to the application in 26 other conditions

****

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Muscular Dystrophy UK
Fighting muscle-wasting conditions
MDUK Oxford Neuromuscular Centre

UNIVERSITY OF OXFORD

LIÈGE université

CHU de Liège

Disclosure

In the context of digital technology, I have given consultancy to Dyne, Aparito, Sanofi, Wave, Roche and Sysnav

Background

Clinical Gold Standard → New Biomarker Qualification

Major challenges of current state (1)

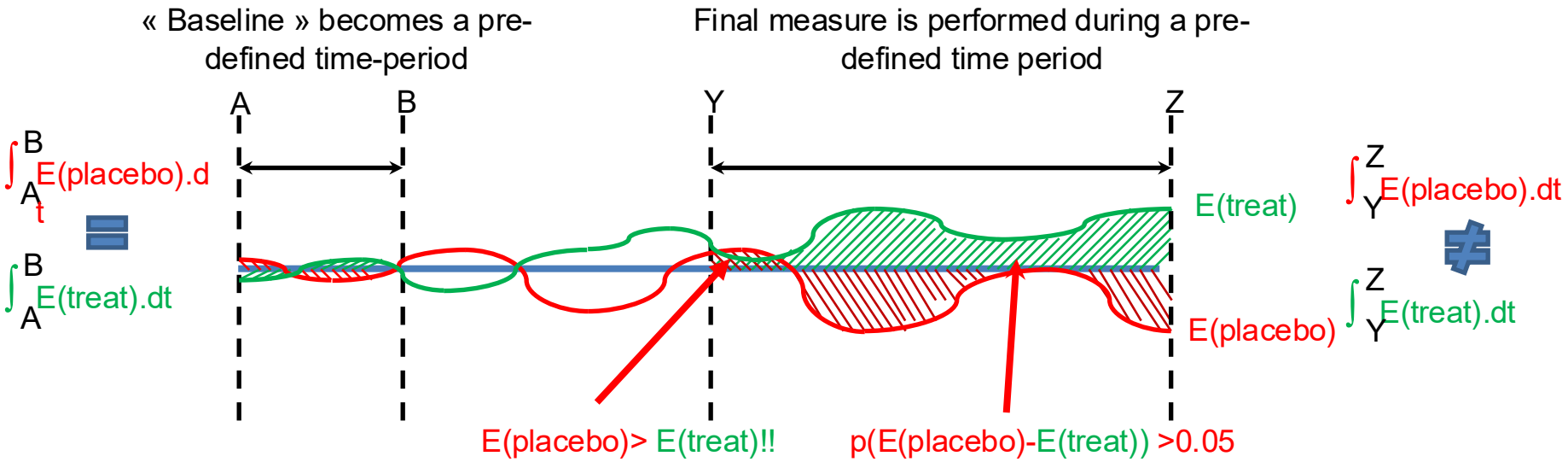
Patients with rare disease may travel a lot to access the research center

Background

Clinical Gold Standard → New Biomarker Qualification

Major challenges of current state (2)

All measures performed in the hospital, it remains a single point assessment, and highly dependant on patient's form and motivation

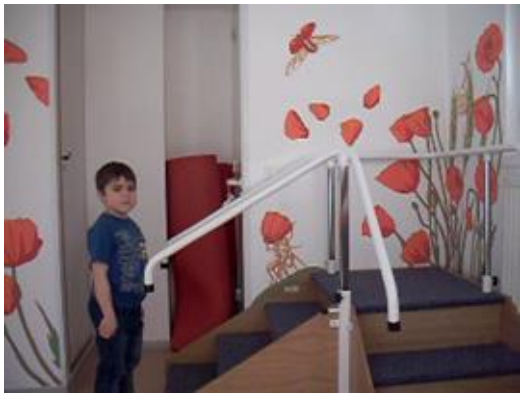


Background

Clinical Gold Standard → New Biomarker Qualification

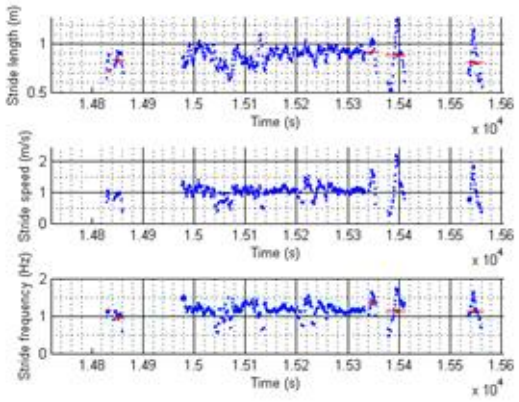
Major challenges of current state (3)

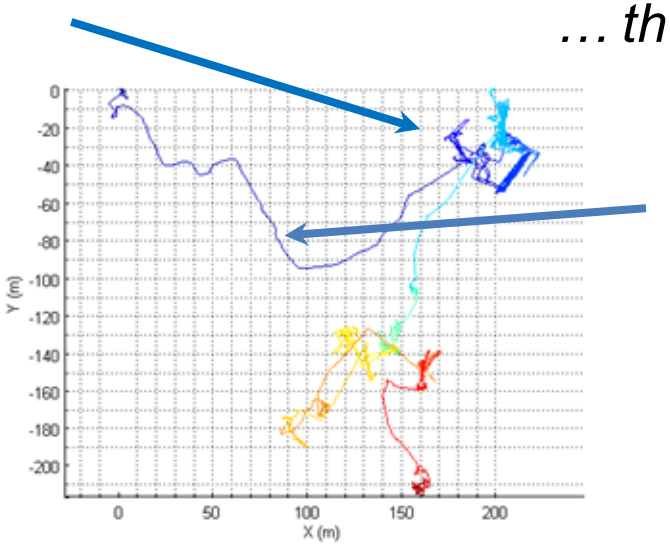
Short duration tests are deeply influenced by patients reflexes, longer tests by motivation

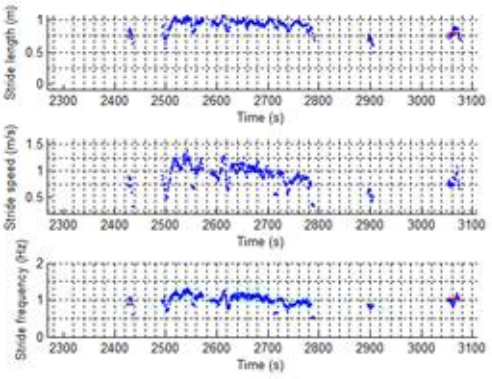


Patient performs the 6MWT...

… then flies away after







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digital outcome

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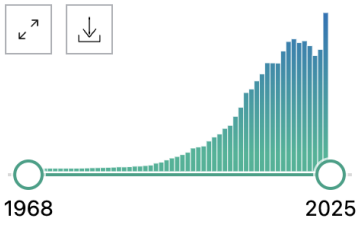
132,063 results

RESULTS BY YEAR



1 Cite Share

TransCatheter aortic
percutaneous corona
replacement and cor
valve stenosis and c
international, multice
controlled trial.

Kedhi E, Hermanides RS, Amat-Santos IJ, Andreas

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outcome measures wearable device

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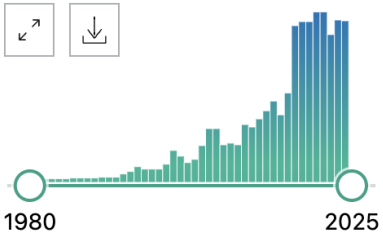
2,335 results

RESULTS BY YEAR



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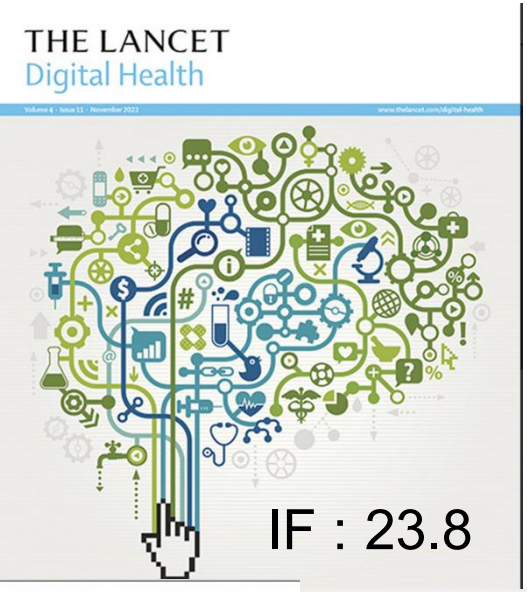
Patient Preferences in Cochle

Freeman MH, Patro A, Lindquist NR, Moberly AC, Haynes DS, Bennett MI

Otol Neurotol. 2025 Jan 1;46(1):54-

PMID: 39627903

INTERVENTIONS: Survey administer
Sources of information regarding CI
deciding on a manufacturer, and ma



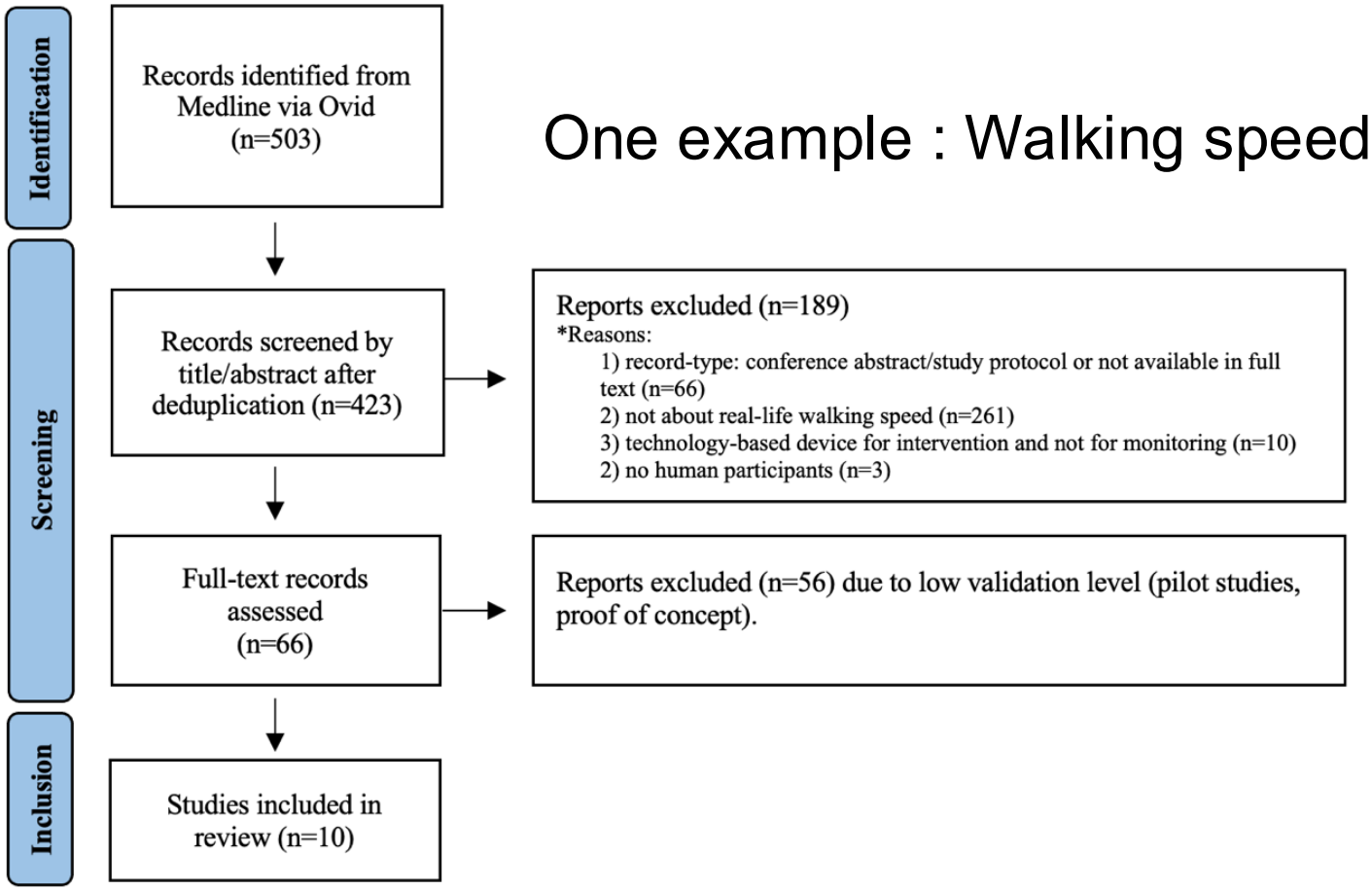
IF : 23.8

npj | Digital Medicine

IF : 15.35

PLOS Digital Health

IF : 2.9



One example : Walking speed

TYPE Systematic Review
PUBLISHED 17 February 2026
DOI 10.3389/fdgth.2026.1726549

Check for updates

OPEN ACCESS

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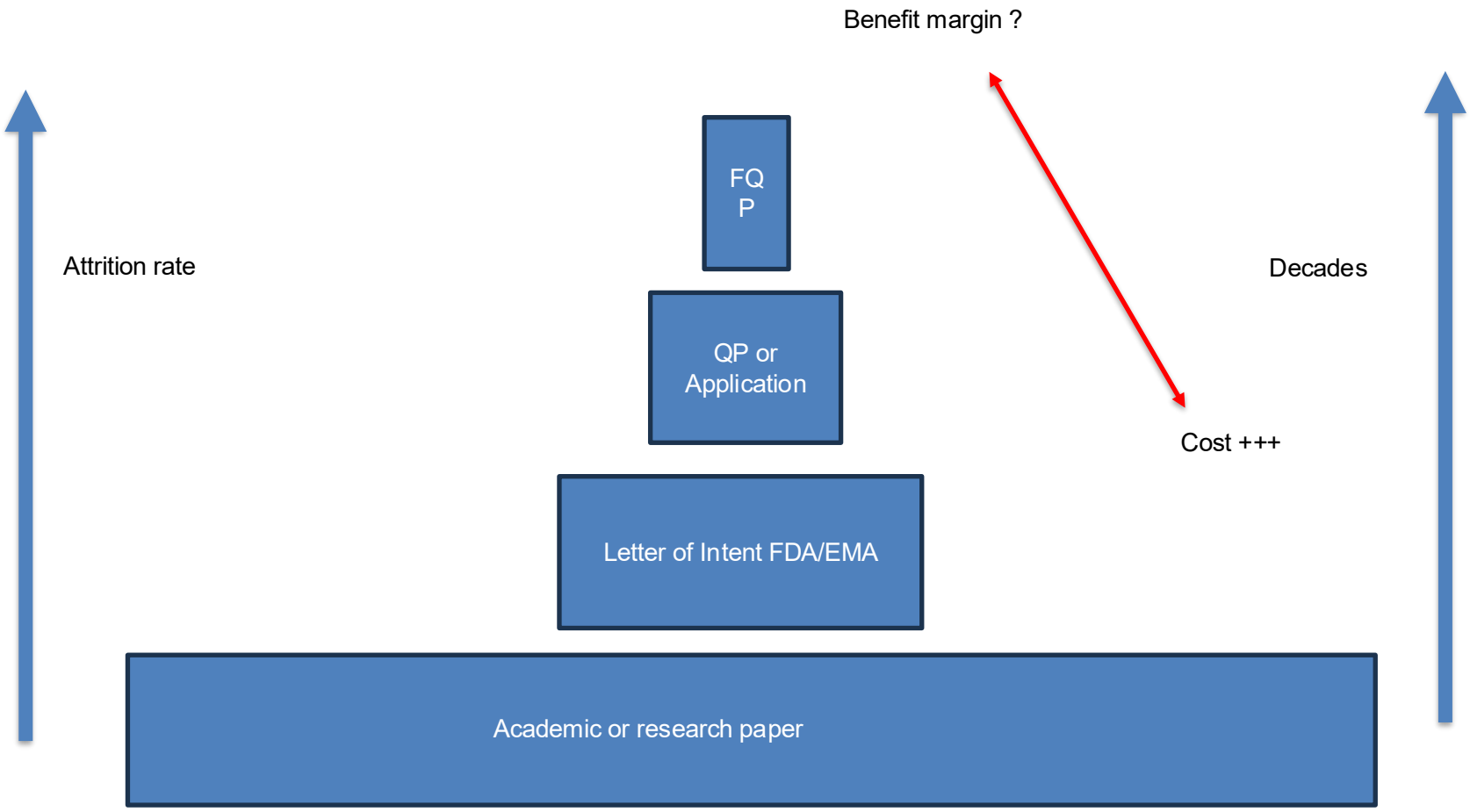
Real-world walking speed as a digital biomarker and outcome measure for clinical trials—a systematic review, regulatory status and future directions

Margaux Poleur[1]*, Cyril Tychon[2], Stephen Gilbert[3,4], Martin Daumer[5†] and Laurent Servais[6†]

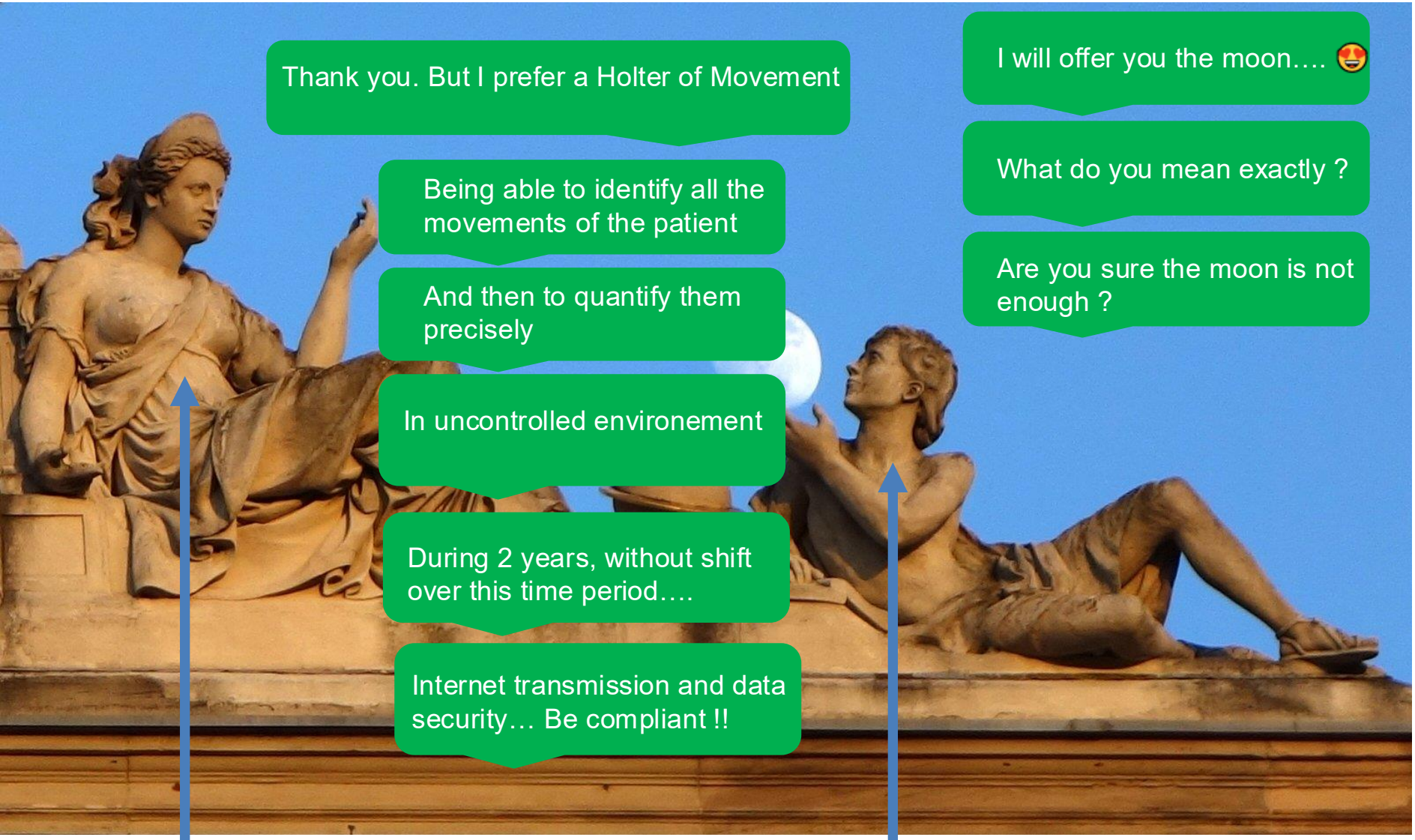
[1]University Department of Neurology, Citadelle Hospital, Liège, Belgium, [2]Department of Pediatrics, University of Liège, Liège, Belgium, [3]Else Kröner Fresenius Center for Digital Health, TUD Dresden University of Technology, Dresden, Germany, [4]Faculty of Business and Economics, TUD Dresden University of Technology, Dresden, Germany, [5]SLCMSR E.V. - The Human Motion Institute, Munich, Germany, [6]Department of Paediatrics, MDUK Oxford Neuromuscular Centre, University of Oxford, Oxford, United Kingdom


Benefit margin ?
Attrition rate
FQ
P
QP or
Application
Letter of Intent FDA/EMA
Academic or research paper
Decades
Cost +++

So why are wearable devices not more used as primary outcome ??

What can I do with that ??

Clinical trial



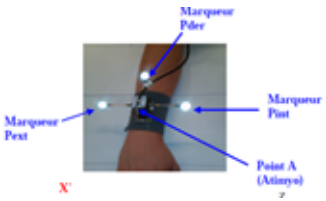
The doctor

The engineer

The long and winding road of SV95C

Technical development timeline

Controlled environment —> unsupervised usage



2010

Identification of the variables

Prototype

V2.0

2011

Validation during NHS

V3.0

2012

Clinical trial

2017

Medical device

What do we need??

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nature medicine

Correspondence | Published: 09 October 2023

First regulatory qualification of a digital primary endpoint to measure treatment efficacy in DMD

Laurent Servais ✉, Damien Eggenspieler, Margaux Poleur, Marc Grelet, Francesco Muntoni, Paul Strijbos & Mélanie Annoussamy

Nature Medicine **29**, 2391–2392 (2023) | Cite this article

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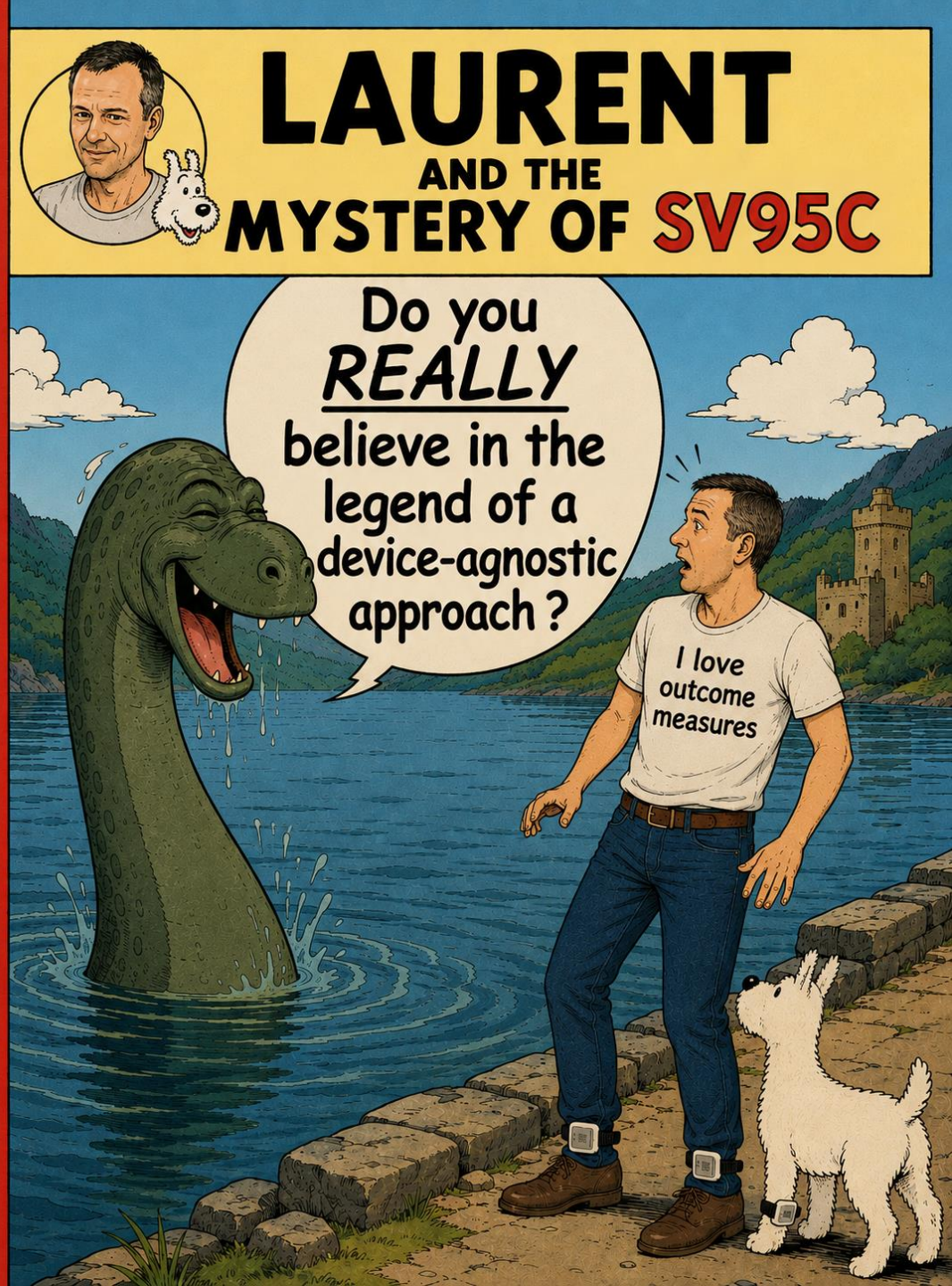
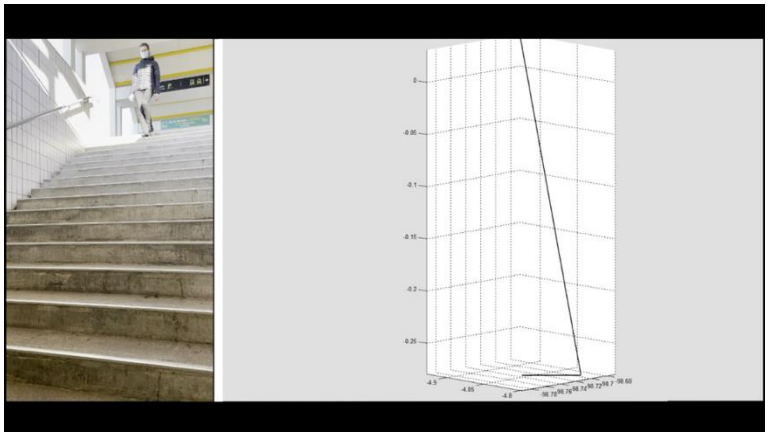
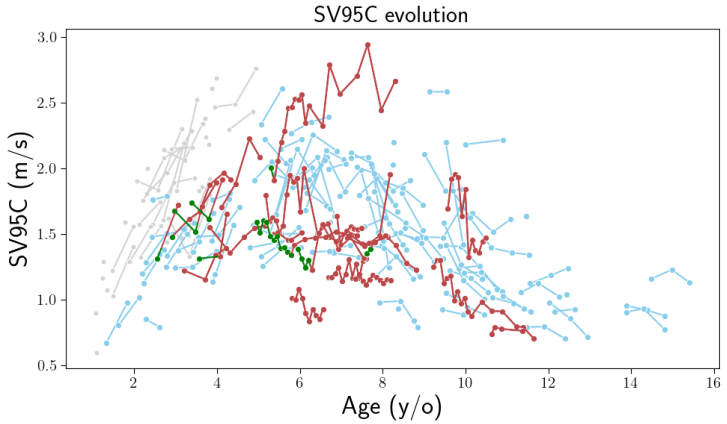


These sensors can collect stride-level data in daily life

1. Strides can be identified and trajectories reconstructed from raw sensor data



2. Several digital variables can be derived from these data, including SV95C, a measure of the top ambulation speed



SV95C=stride velocity 95th centile.

2019

EUROPEAN MEDICINES AGENCY
SCIENCE MEDICINES HEALTH

26 April 2019
EMA/CHMP/SAWP/178058/2019
Committee for Medicinal Products for Human Use (CHMP)

Qualification opinion on stride velocity 95th centile as a secondary endpoint in Duchenne Muscular Dystrophy measured by a valid and suitable wearable device*

Draft agreed by Scientific Advice Working Party	12 April 2018
Adopted by CHMP for release for consultation	26 April 2018
Start of public consultation	21 September 2018
End of consultation (deadline for comments)	30 November 2018
Adopted by CHMP	26 April 2019

Keywords	Activity monitor, Duchenne Muscular Dystrophy (DMD), Real World Data, Stride Velocity, Ambulati

2023

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SCIENCE MEDICINES HEALTH

28 July 2023
EMADOC-1700519818-1127132
Committee for Medicinal Products for Human Use (CHMP)

Qualification Opinion for Stride velocity 95th centile as primary endpoint in studies in ambulatory Duchenne Muscular Dystrophy studies

Draft agreed by Scientific Advice Working Party (SAWP)	01 September 2022
Adopted by CHMP for release for consultation	15 September 2022[1]
Start of public consultation	27 February 2023[2]
End of consultation (deadline for comments)	09 April 2023
Adopted by CHMP	20 July 2023

Keywords	Qualification of Novel Methodology, Duchenne Muscular Dystrophy studies,

nature medicine

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First regulatory qualification of a digital primary endpoint to measure treatment efficacy in DMD

Laurent Servais ✉, Damien Eggenspieler, Margaux Poleur, Marc Grelet, Francesco Muntoni, Paul Strijbos & Mélanie Annoussamy

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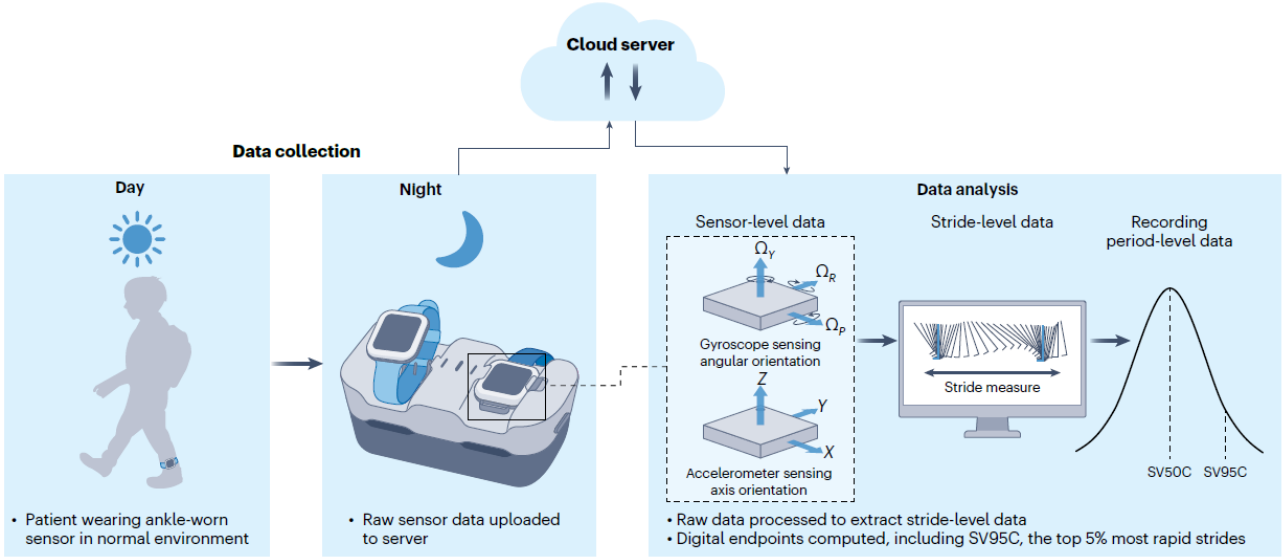


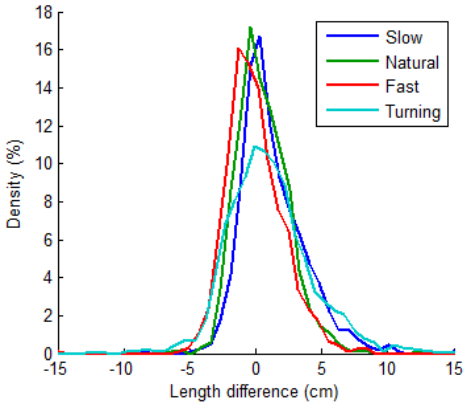
Validation in Optical motion capture room

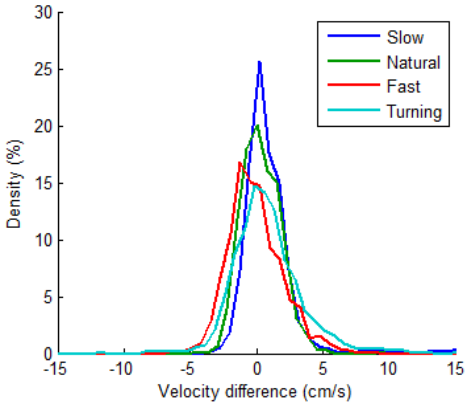
Gait measurement

- Tests done by 8 healthy controls in an optical motion capture room
  - Walking at various paces

Distribution of measurement errors

- Evaluate the measurements accuracy
  - The error is under 2.5% at 1σ





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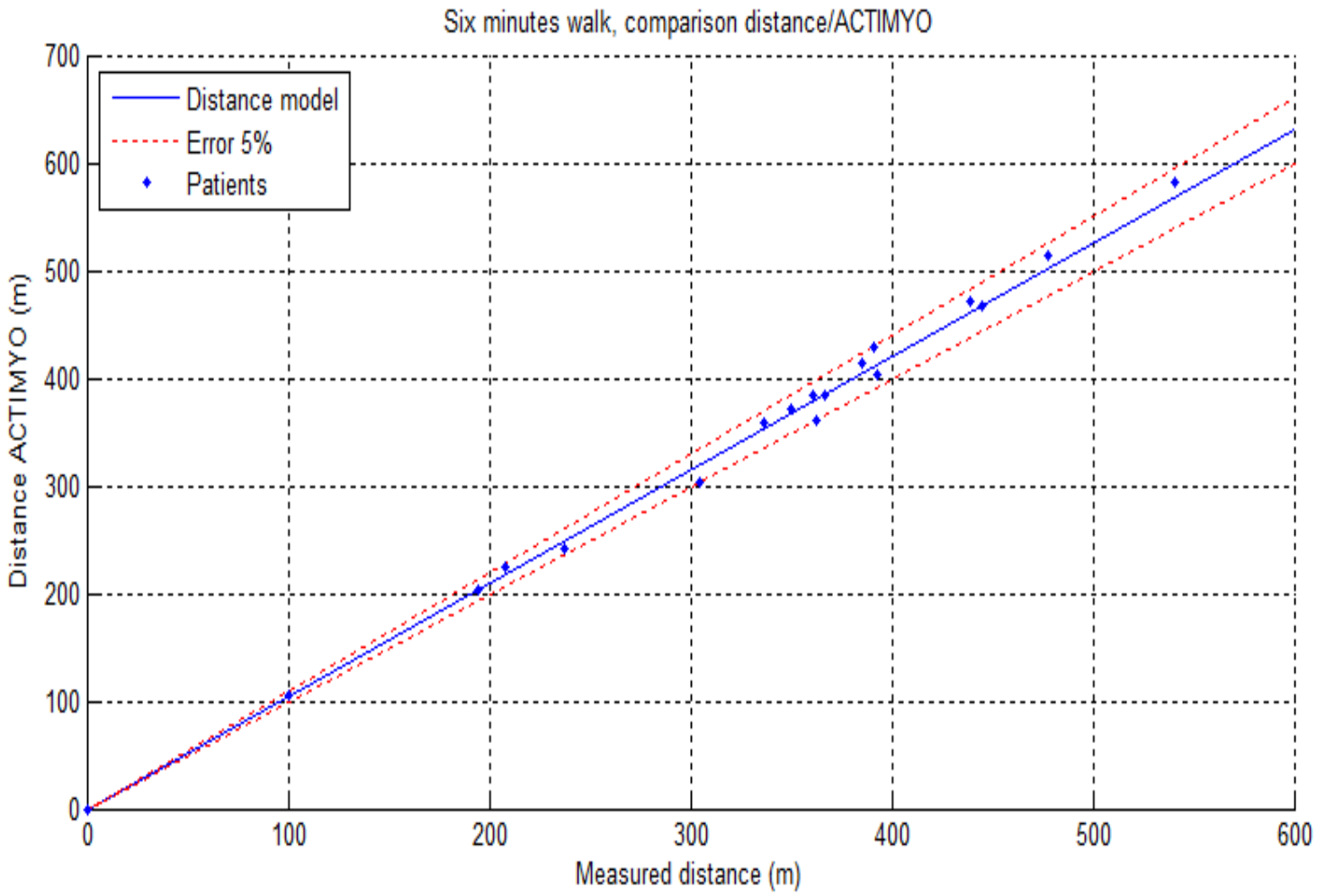
MEASURING WALK WITH ACTIMYO

COMPARAISON ACTIMYO/DISTANCE MESURÉE

- Dista

MEASURING WALK WITH ACTIMYO



Variability of actimetry....

When it pours, Brittish people walk less.
When it simply rains, they walk more

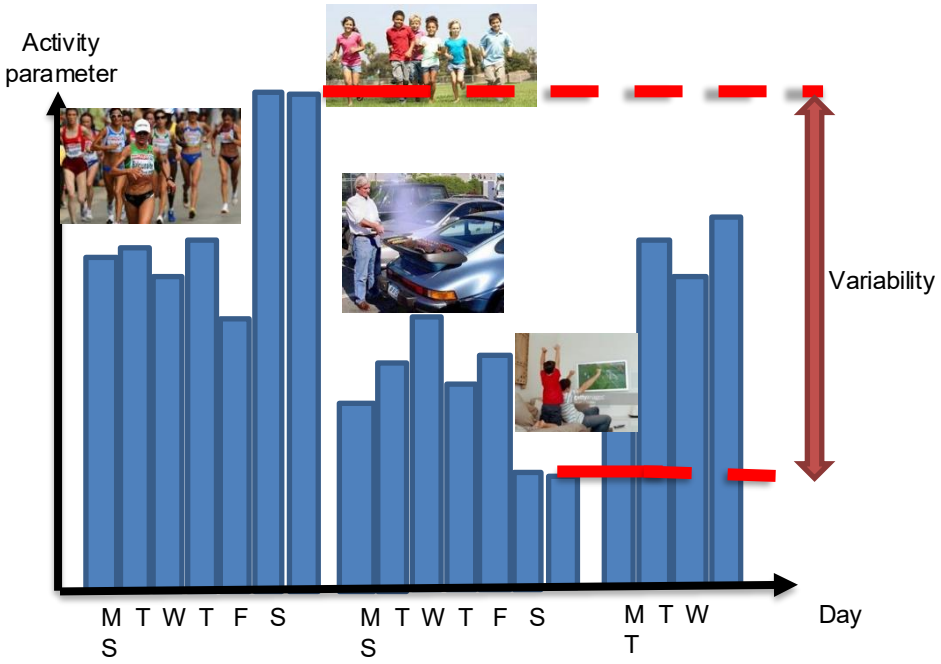
Theorem of Servais (Oxford 2021)

… But do they walk a different way ?

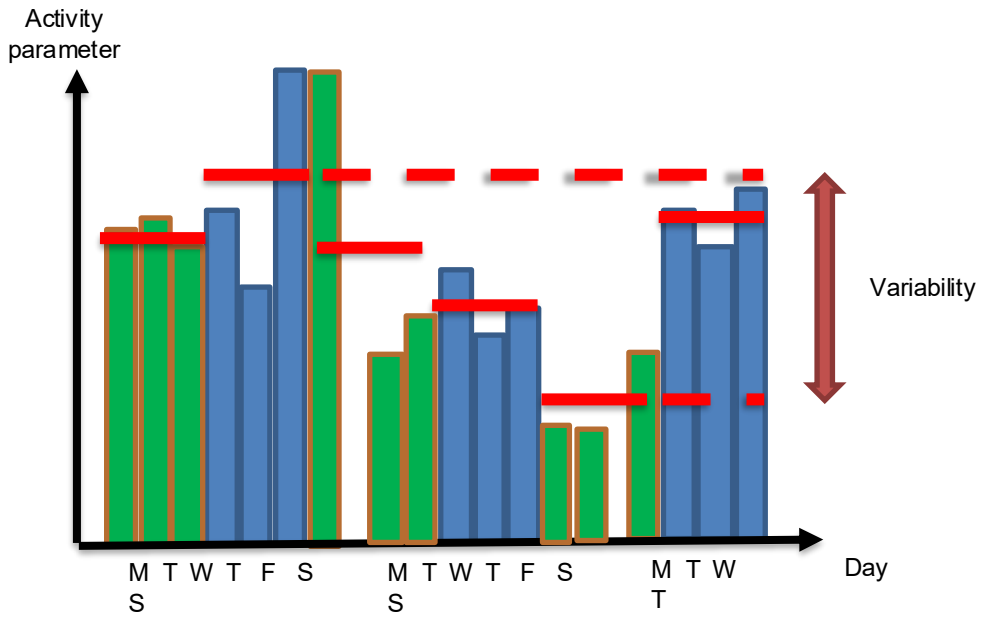
Theorem of Servais (Paris 2014)

When the French are on strike, they walk more

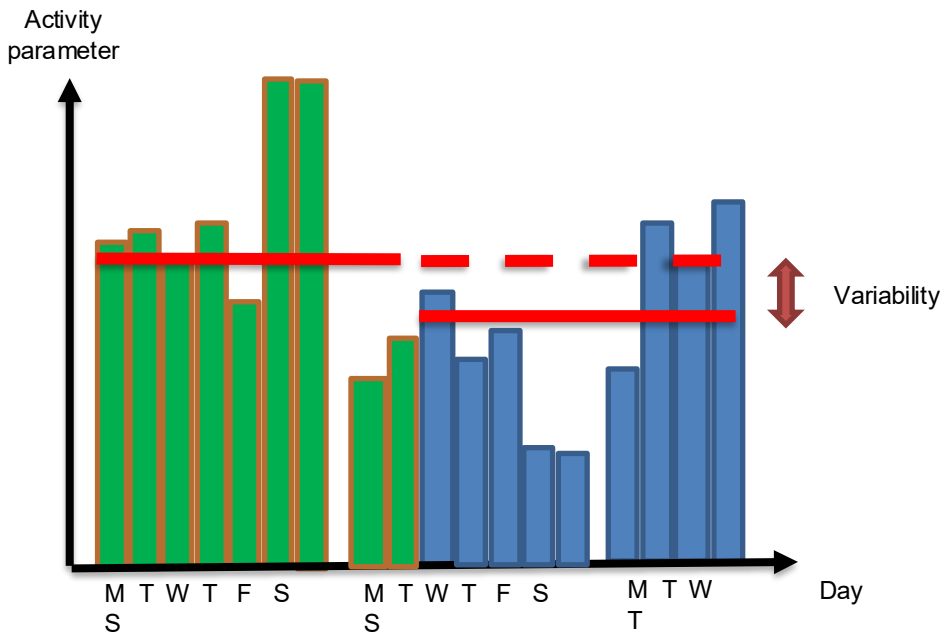
Variability measurements



Variability measurements

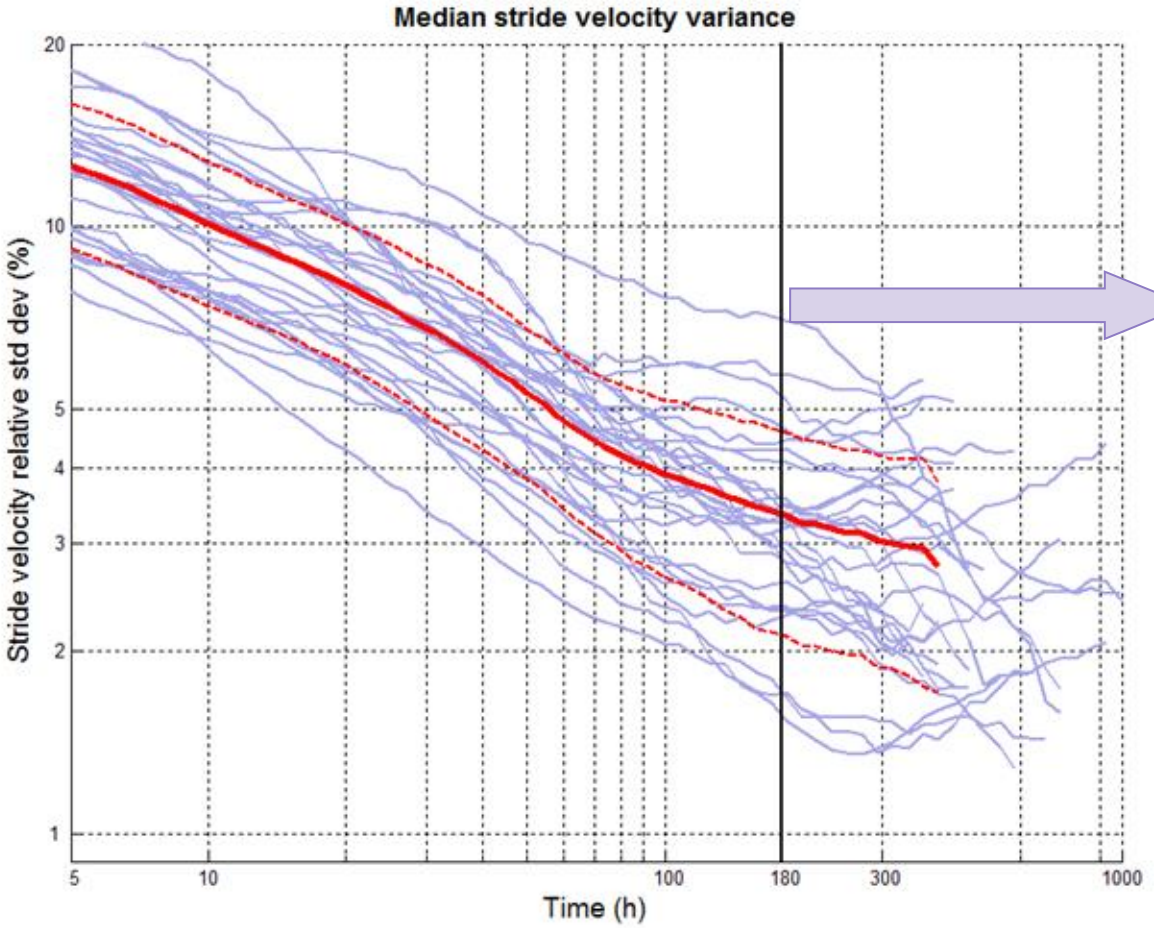


Variability measurements



Variability decreases with increasing length of monitoring

ACTIMYO
HOME MONITORING



- Averaged variation stabilises at 3.3% after 180 hours (15 days) monitoring
- 15% variability currently "acceptable" for 6MWT

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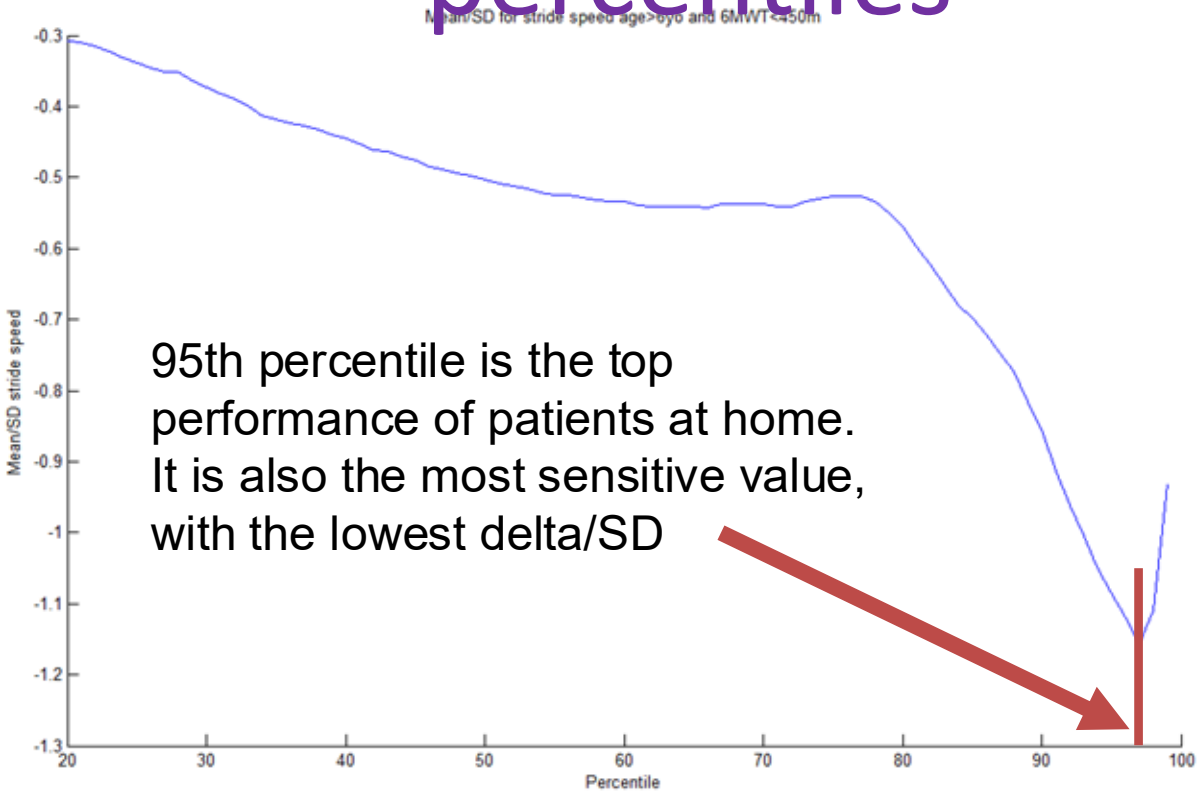
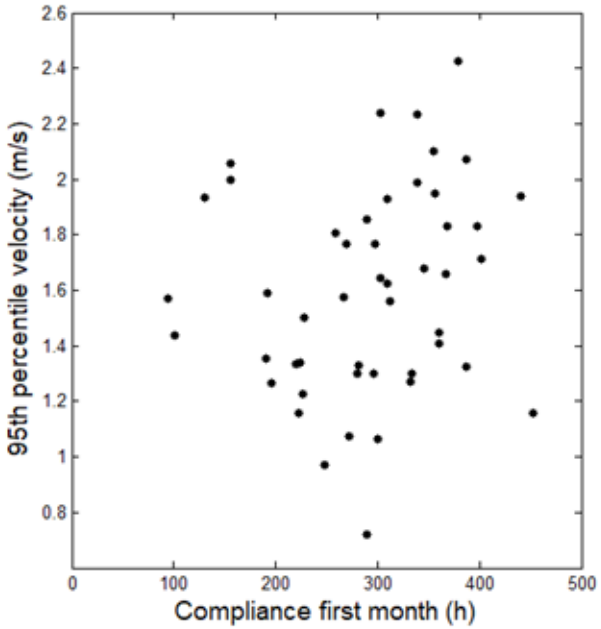
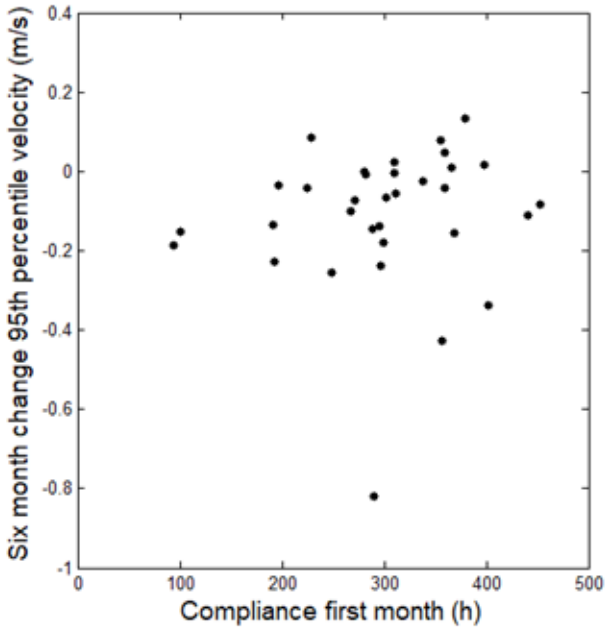
Stride speed as a function of percentiles



Influence of compliance on SV95C

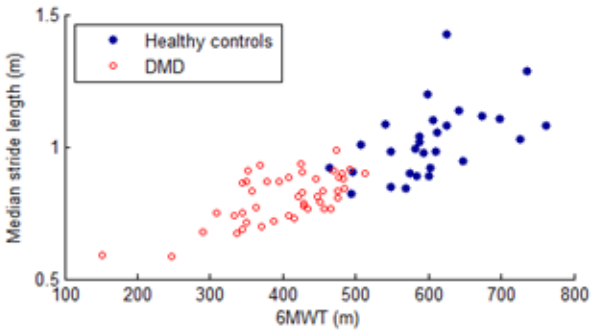


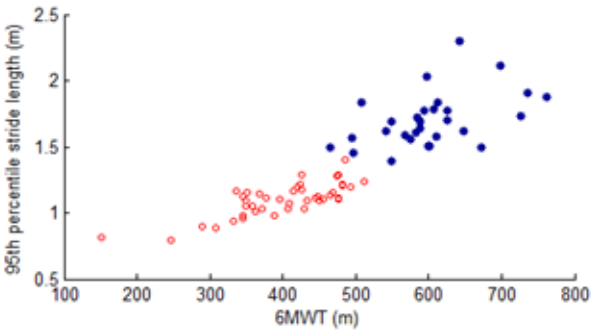


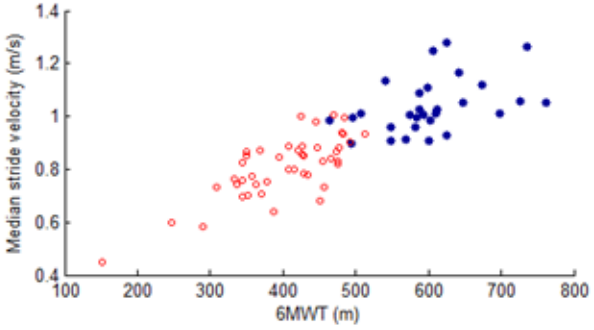
Absence of correlation between compliance and performance

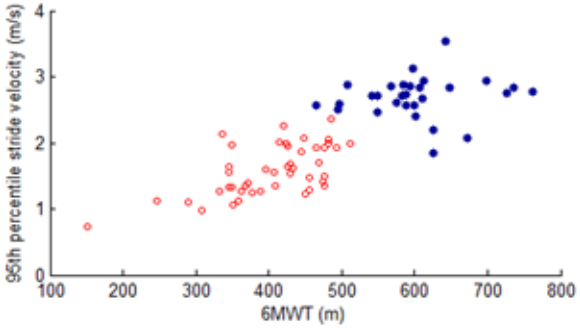
Normative data in healthy age-matched controls

- DMD and healthy controls correlated with 6MWT









Poleur et al. Orphanet J Rare Dis (2021) 16:318
https://doi.org/10.1186/s13023-021-01956-5

Orphanet Journal of Rare Diseases

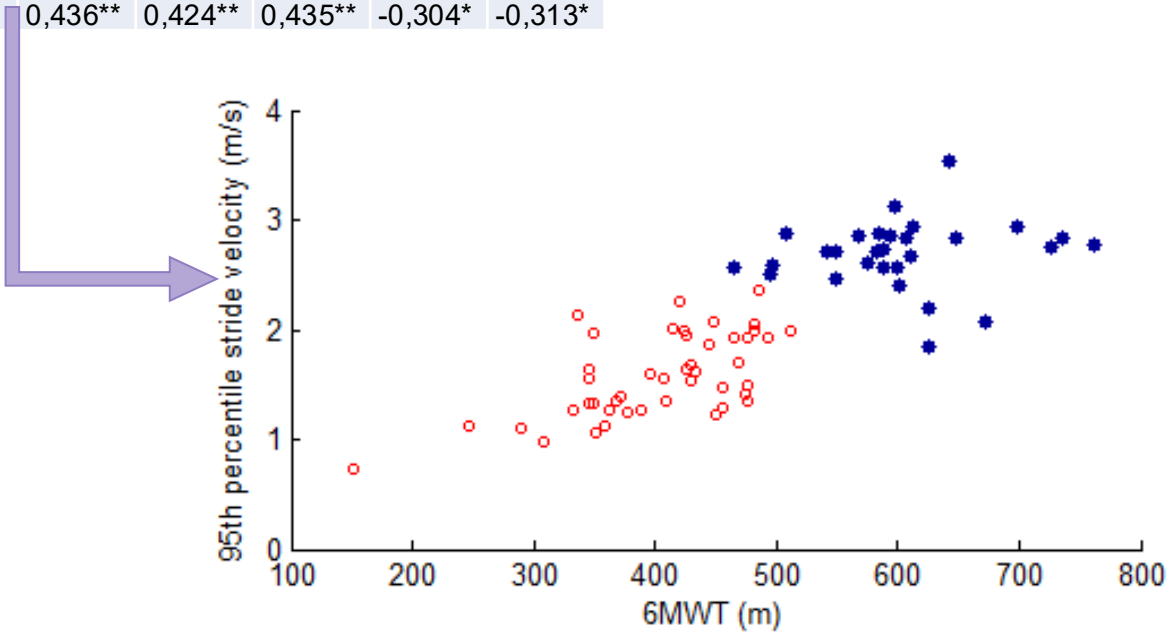
RESEARCH Open Access

Normative data on spontaneous stride velocity, stride length, and walking activity in a non-controlled environment

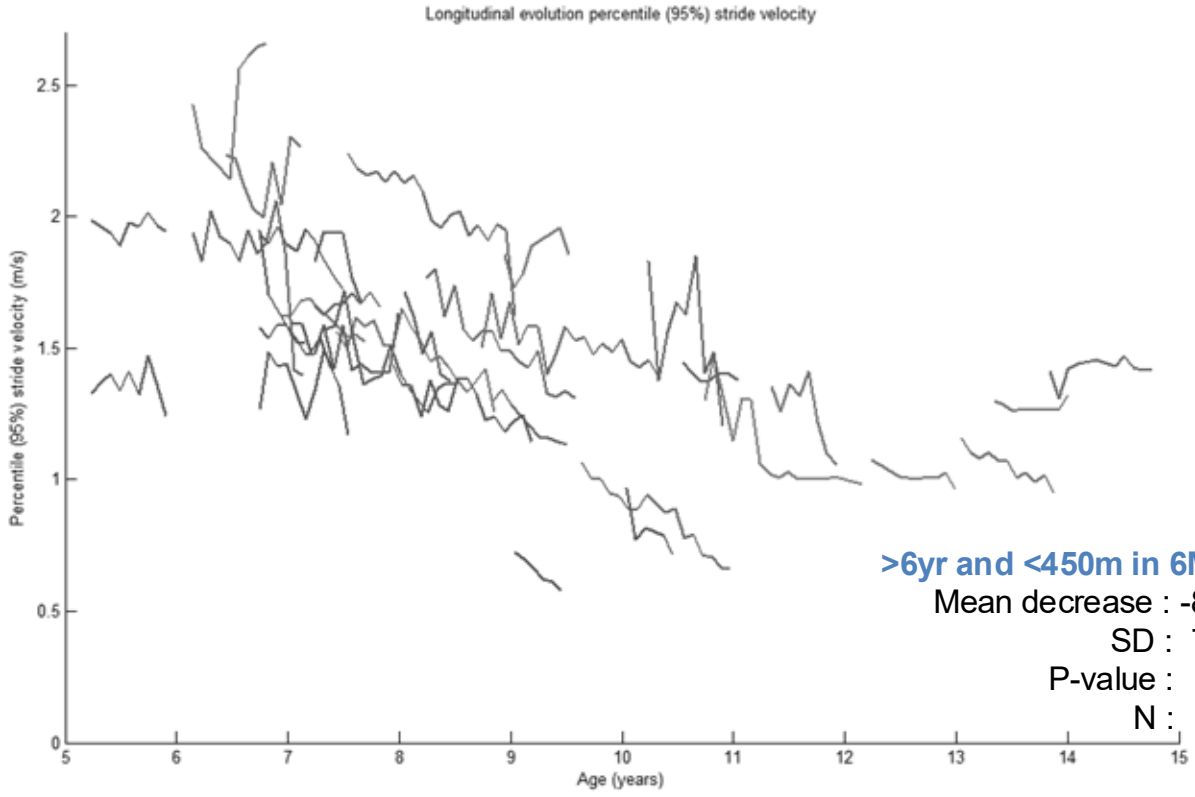
Margaux Poleur[1], Ana Ulinici[1], Aurore Daron[1], Olivier Schneider[1], Fabian Dal Farra[1], Marie Demonceau[1], Mélanie Annoussamy[2], David Vissière[2], Damien Eggenspieler[2] and Laurent Servais[1,3*]

Correlation with different outcomes

		6MWT		NSAA		4SC	
ActiMyo® Variables	N	ρ	r	ρ	R	ρ	r
50th Percentile (median) stride length (m)	45	0,552**	0,649**	0,554**	0,607**	0,126	0,066
95th Percentile stride length (m)	45	0,679**	0,772**	0,779**	0,816**	-0,301*	-0,251
50th Percentile (median) stride velocity (m/s)	45	0,652**	0,758**	0,712**	0,724**	-0,161	-0,195
95th Percentile stride velocity (m/s)	**45**	**0,542****	**0,616****	**0,645****	**0,689****	**-0,547****	**-0,484****
Distance walked/hour	45	0,371*	0,436**	0,424**	0,435**	-0,304*	-0,313*



Stride velocity 95th percentile



>6yr and <450m in 6MWT

Mean decrease : -8.5%

SD : 7.9%

P-value : 0.00

N : 20

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Minimally clinically important difference

	Mean	SD	Intra-correlation	MCID	Relative MCID
50th Percentile (median) stride length	0.825 m	0.087 m	0.957	0.0179 m	2.17%
95th Percentile stride length	1.101 m	0.129 m	0.951	0.0284 m	2.58%
50th Percentile (median) stride velocity	0.836 m/s	0.116 m/s	0.942	0.0278 m/s	3.33%
95th Percentile stride velocity	**1.578 m/s**	**0.391 m/s**	**0.937**	**0.0985 m/s**	**6.24%**
Distance walked/hour	162.6 m/h	87.9 m/h	0.839	35.3 m/h	21.7%

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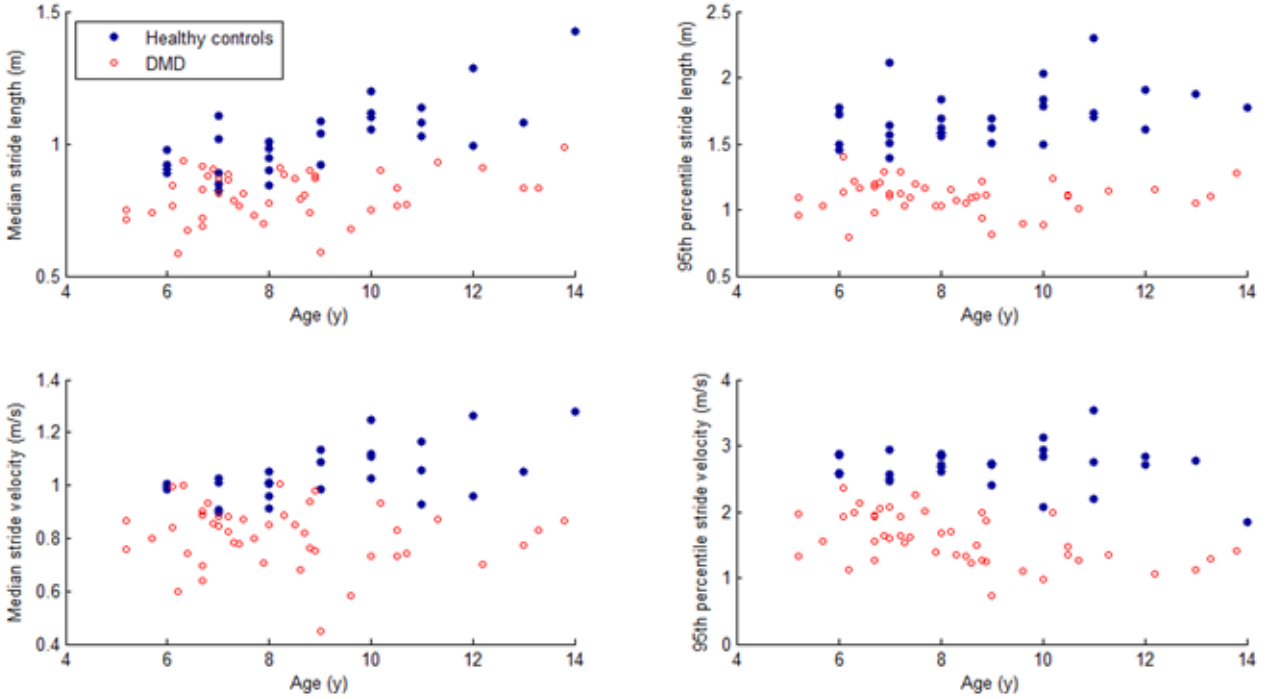
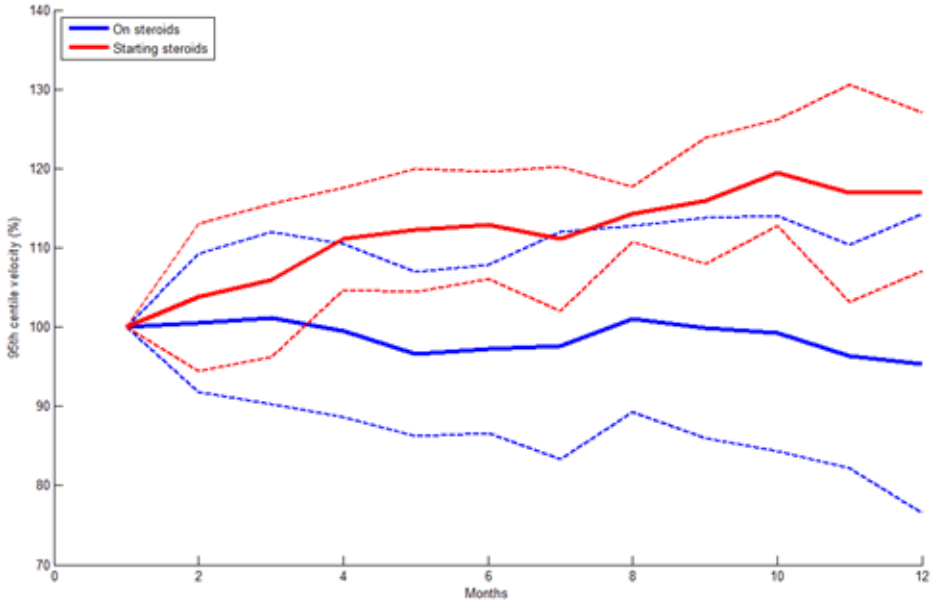
Normative data in healthy age-matched controls

- Clear separation between healthy controls and DMD groups



Sensitivity to positive Change : Patient starting steroid treatment



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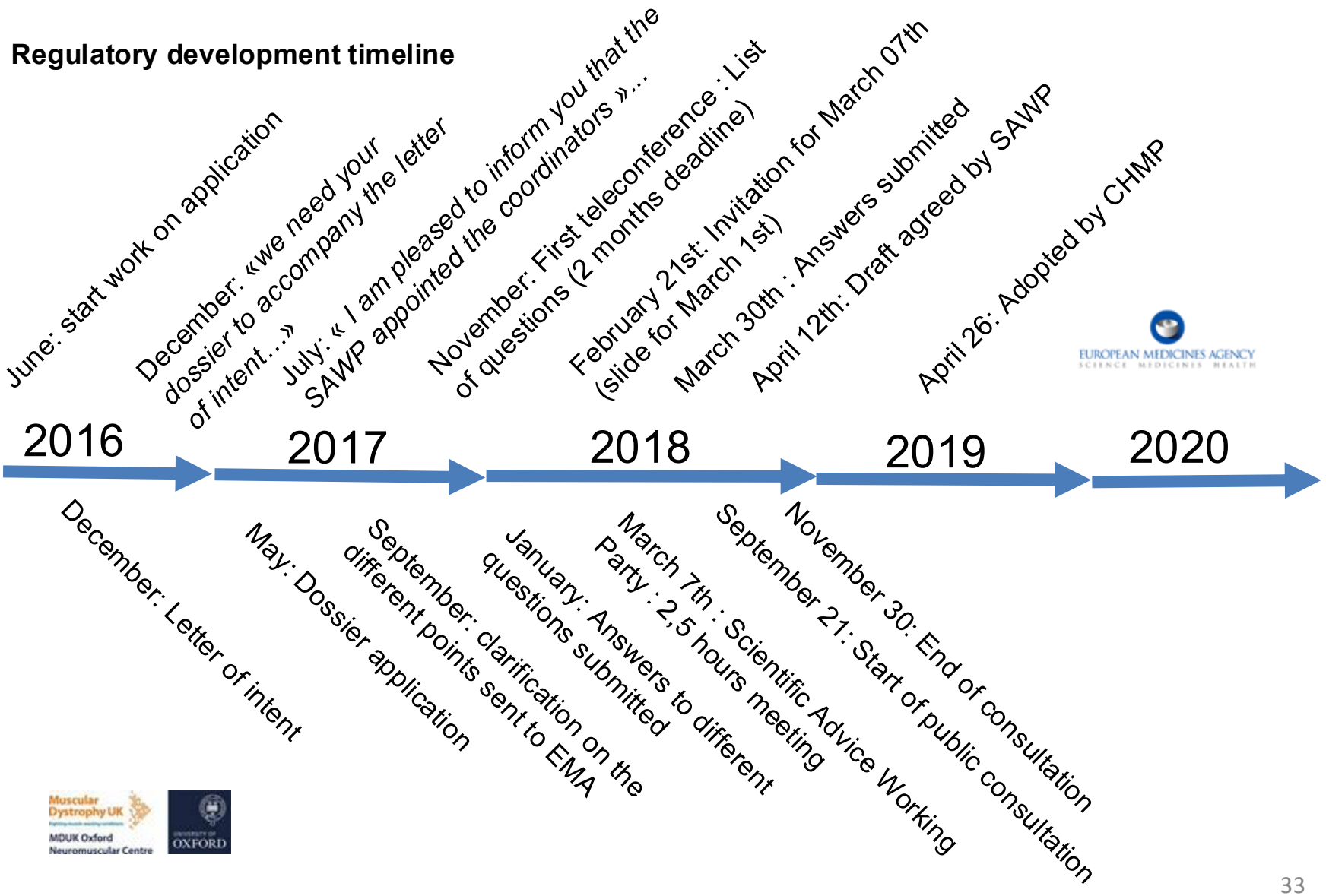
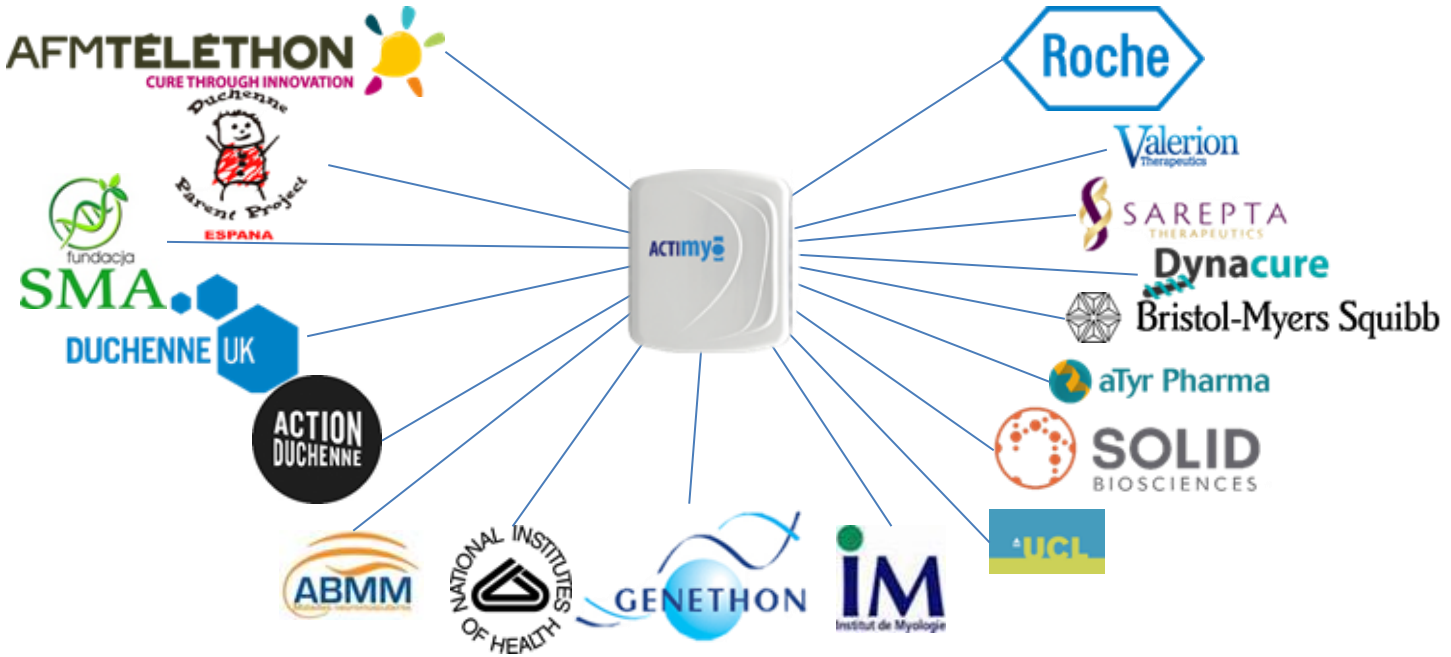
The long and winding road of SV95C



CHMP qualification has been achieved thanks to the support of a broad community



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Key opportunities for clinical development

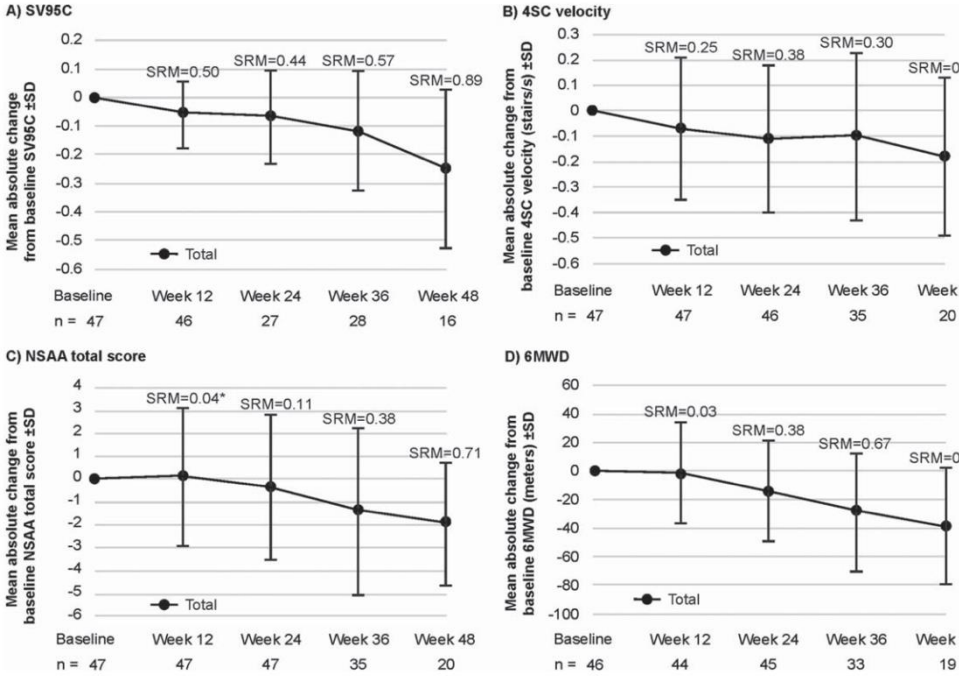
1. Early detection of decline

Journal of Neuromuscular Diseases 11 (2024) 701–714
DOI 10.3233/JND-230188
IOS Press

Research Report

Stride Velocity 95th Centile Detects Declin in Ambulatory Function Over Shorter Intervals than the 6-Minute Walk Test or North Star Ambulatory Assessment in Duchenne Muscular Dystrophy

Michael Rabbia[a], Maitea Guridi Ormazabal[b], Hannah Staunton[c], Klaas Veenstra[b], Damien Eggenspieler[d], Mélanie Annoussamy[d], Laurent Servais[e,f] and Paul Strijbos[b,*]



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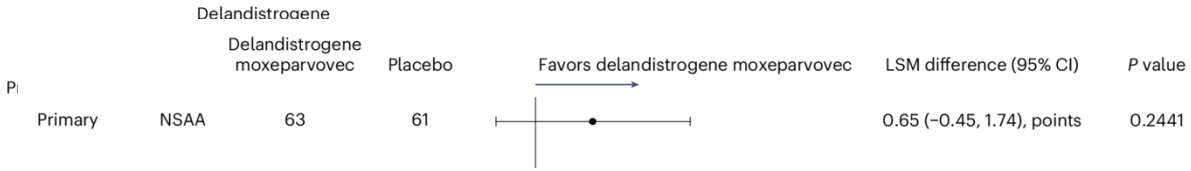
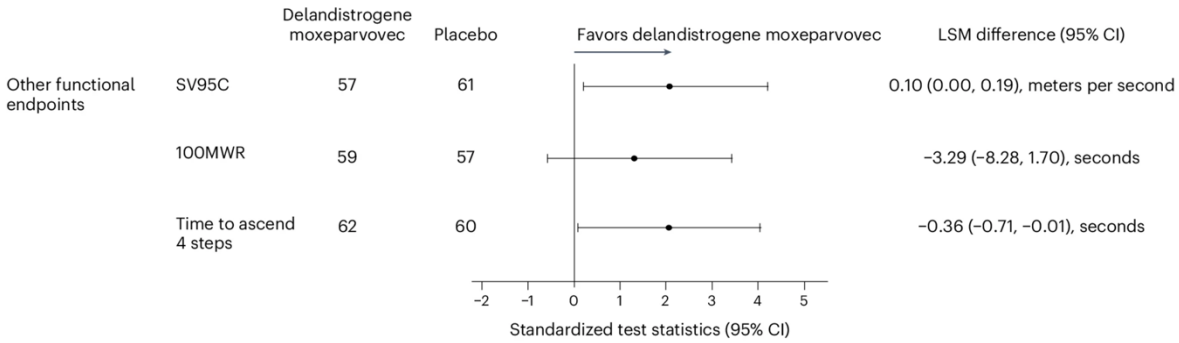
AAV gene therapy for Duchenne muscular dystrophy: the EMBARK phase 3 randomized trial

Jerry R. Mendell, Francesco Muntoni, Craig M. McDonald, Eugenio M. Mercuri, Emma Ciafaloni, Hirofumi Komaki, Carmen Leon-Astudillo, Andrés Nascimento, Crystal Proud, Ulrike Schara-Schmidt, Aravindhan Veerapandiyan, Craig M. Zaidman, Maitea Guridi, Alexander P. Murphy, Carol Reid, Christoph Wandel, Damon R. Asher, Eddie Darton, Stefanie Mason, Rachael A. Potter, Teji Singh, Wenfei Zhang, Paulo Fontoura, Jacob S. Elkins & Louise R. Rodino-Klapac

Nature Medicine (2024) | Cite this article

2. Avoid the risk of false negative





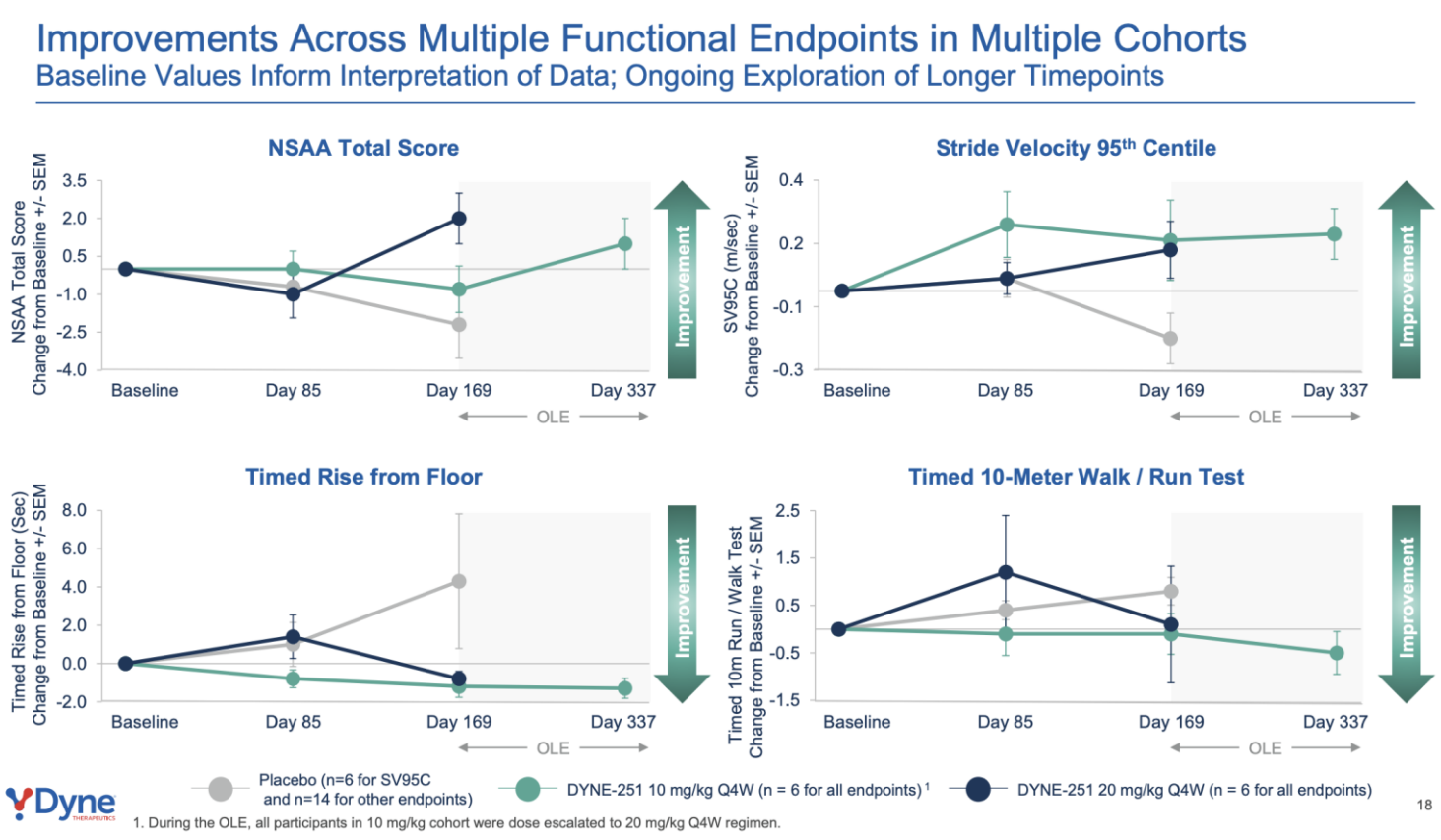
Wearable devices and the future of rare disease clinical trials: Landry's story

Landry Wardlow is a playful 10-year-old from Iowa. He takes swimming lessons, likes outings to the zoo, spends cold winter nights doing art projects and hot summer days killing time at his brothers' baseball tournaments. Typical kid stuff.

But Landry lives with Duchenne muscular dystrophy and his journey is far from ordinary. In addition to navigating life with a rare genetic disease, he is a pioneer in the new era of drug development. That's because Landry recently participated in a groundbreaking clinical trial that incorporated a wearable device.

After he was diagnosed with Duchenne at age 4, Landry's mom, Holly, dedicated herself to researching treatment options and finding a clinical trial that might help stop the disease progression. In late 2021, Landry enrolled in a Phase 3 trial for Sarepta's investigational gene therapy for Duchenne. According to topline results from that trial, participants saw meaningful improvements in something called stride velocity 95th centile, or SV95C.[1] SV95C is a measure of how fast someone walks, and it is captured via small wearable devices on each ankle.

3. Early detection of clinical benefit



The Toddler…

Ask him to do something and hope that he does exactly what you want…

It would be best to not ask him anything and let him do what HE wants…

ActiLiège-Next: a multicentric natural history study

Study objectives:

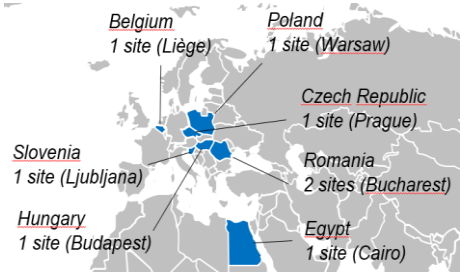
1. Gather 3-year functional data for SV95C to broaden our understanding of this measure

2. Provide longitudinal data to support FDA qualification dossier

3. Investigate feasibility, robustness and sensitivity of SV95C in DMD patients below the age of 4 years old

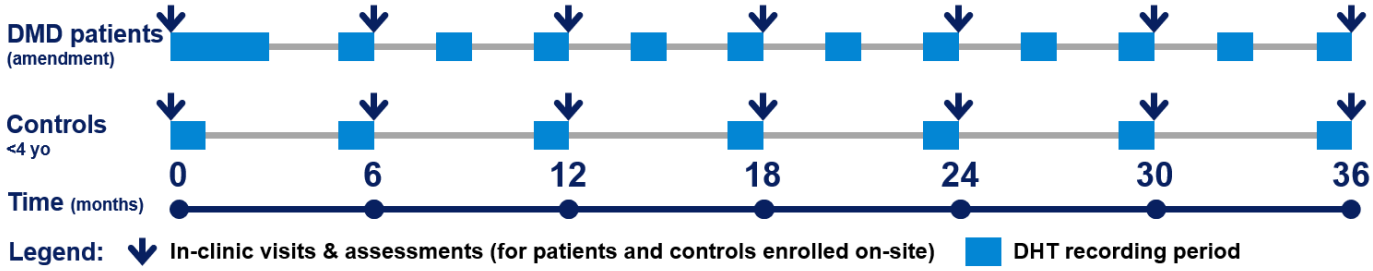
ActiLiège-Next: a multicentric natural history study

8 clinical sites



- Ambulant DMD patients
- Healthy subjects
- 1 to 15 years old

Schedule of assessments for 1-4 y/o



- 3-year follow-up with visits every 6 months for DMD patients and controls enrolled on-site
  - NSAA, 6MWT, 4SC, TRF… when possible
- 3-month baseline DHT wear period, and every 3-6 months afterwards
  - Variables including SV95C

4SC=4-stair climbing test; 6MWT=6-minute walk test; DHT=digital health technology; NSAA=North star ambulatory assessment; TFR=Time to rise from floor; y/o=years old.

Baseline characteristics of all subjects

Mean (SD) [min; max]	DMD (N=29)*		Controls (N=26)	
Age (months)	34.3 (9.2) [16.1; 47.4]	N=29	31.8 (10.6) [12.8; 47.7]	N=26
NSAA	17.9 (5.7) [6.0; 30.0]	N=22	Not applicable	
6MWT (m)	294 (61) [151; 384]	N=12	404 (104) [300; 508]	N=2†
4SC (s)	6.4 (3.3) [2.8; 14.9]	N=26	4.1 (1.7) [1.4; 6.6]	N=6†
TTR (s)	5.8 (2.4) [0.4; 11.2]	N=28	2.9 (0.7) [1.7; 3.8]	N=6†
SV95C (m/s)	1.3 (0.3) [0.6; 1.7]	N=28	1.8 (0.5) [0.9; 2.7]	N=26

sd=standard deviation; y/o=years old.

Excellent compliance with DHT wear

Visit	Subjects	< 50 h of data	≥ 50 h of data
Baseline (first month)	DMD (N=29)	1 (3%)	28 (97%)
	Controls (N=26)	0 (0%)	26 (100%)
Month 6	DMD (N=28)*	2 (7%)	26 (93%)
	Controls (N=25)†	0 (0%)	25 (100%)
Month 12	DMD (N=25)*	3 (12%)	22 (88%)
	Controls (N=25)†	3 (12%)	22 (88%)
Month 18	DMD (N=21)*	0 (0%)	21 (100%)
	Controls (N=15)†	0 (0%)	15 (100%)

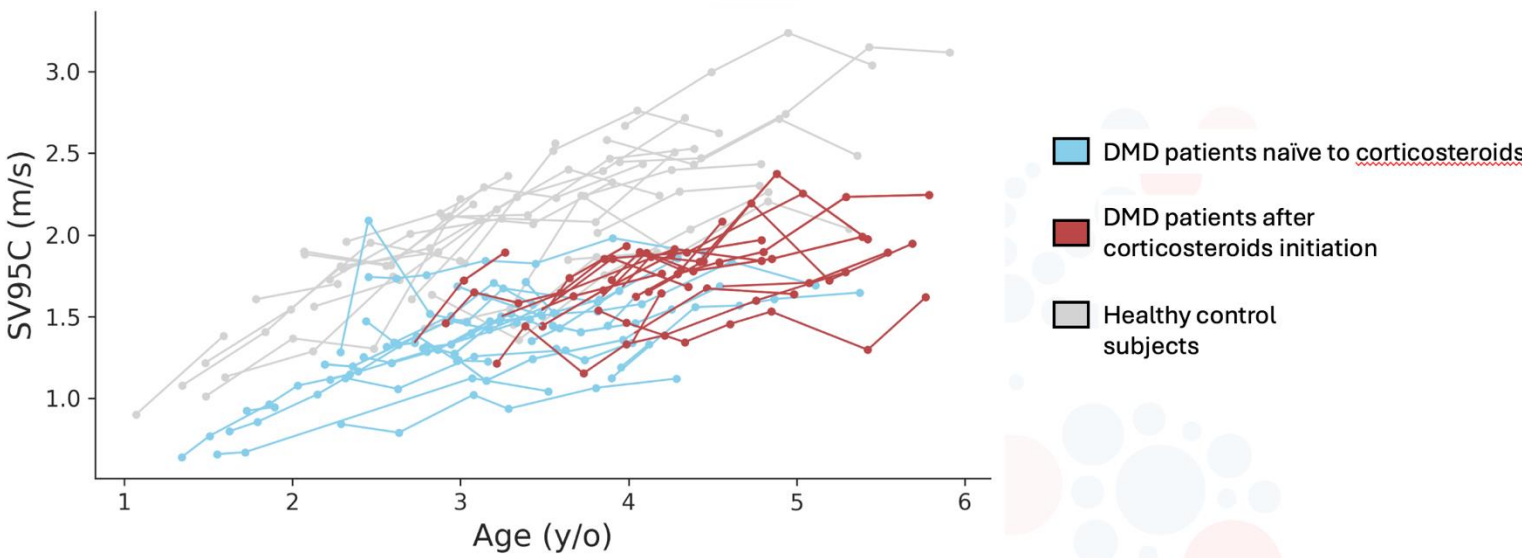
DHT = digital health technology.

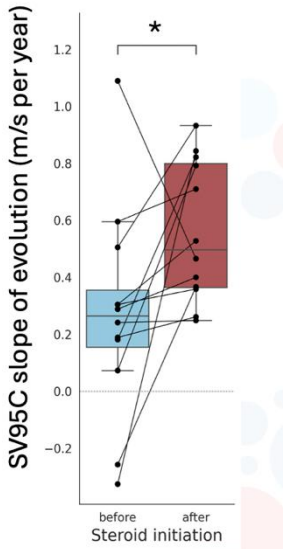
Excellent SV95C reliability for young subjects

	ICC2k† [95% confidence interval]			
Subjects	**Baseline**	**Month 6**	**Month 12**	**Month 18**
DMD	0.99 [0.97; 0.99] (N=24)	0.96 [0.91; 0.98] (N=25)	0.96 [0.9; 0.98] (N=20)	0.98 [0.94; 0.99] (N=19)
Controls	0.99 [0.97; 1.0] (N=23)	0.92 [0.8; 0.96] (N=23)	0.98 [0.94; 0.99] (N=21)	0.91 [0.69; 0.98] (N=11)

LONGITUDINAL EVOLUTION

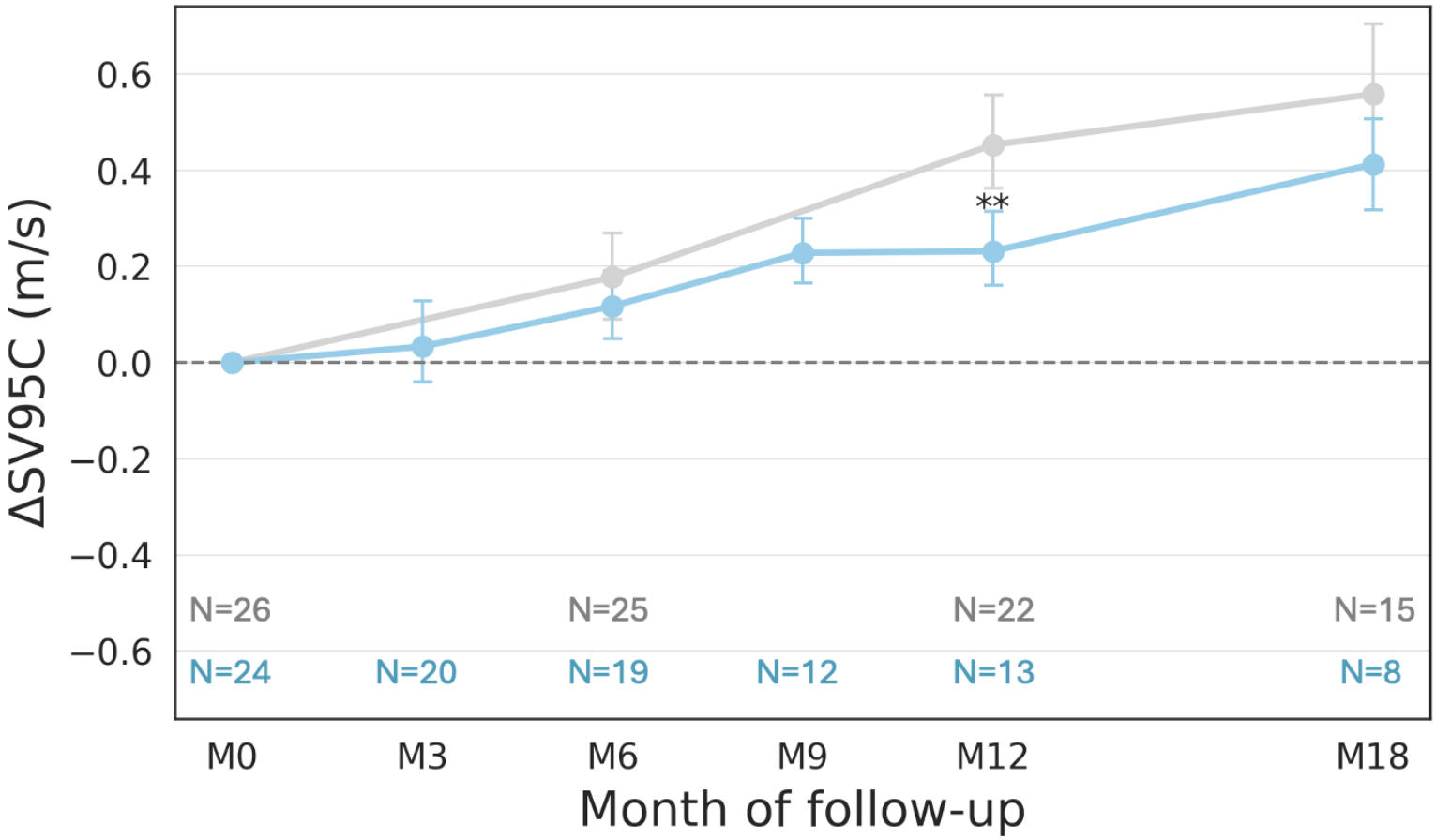
SV95C VS AGE, & STEROID HIGHLIGHTS

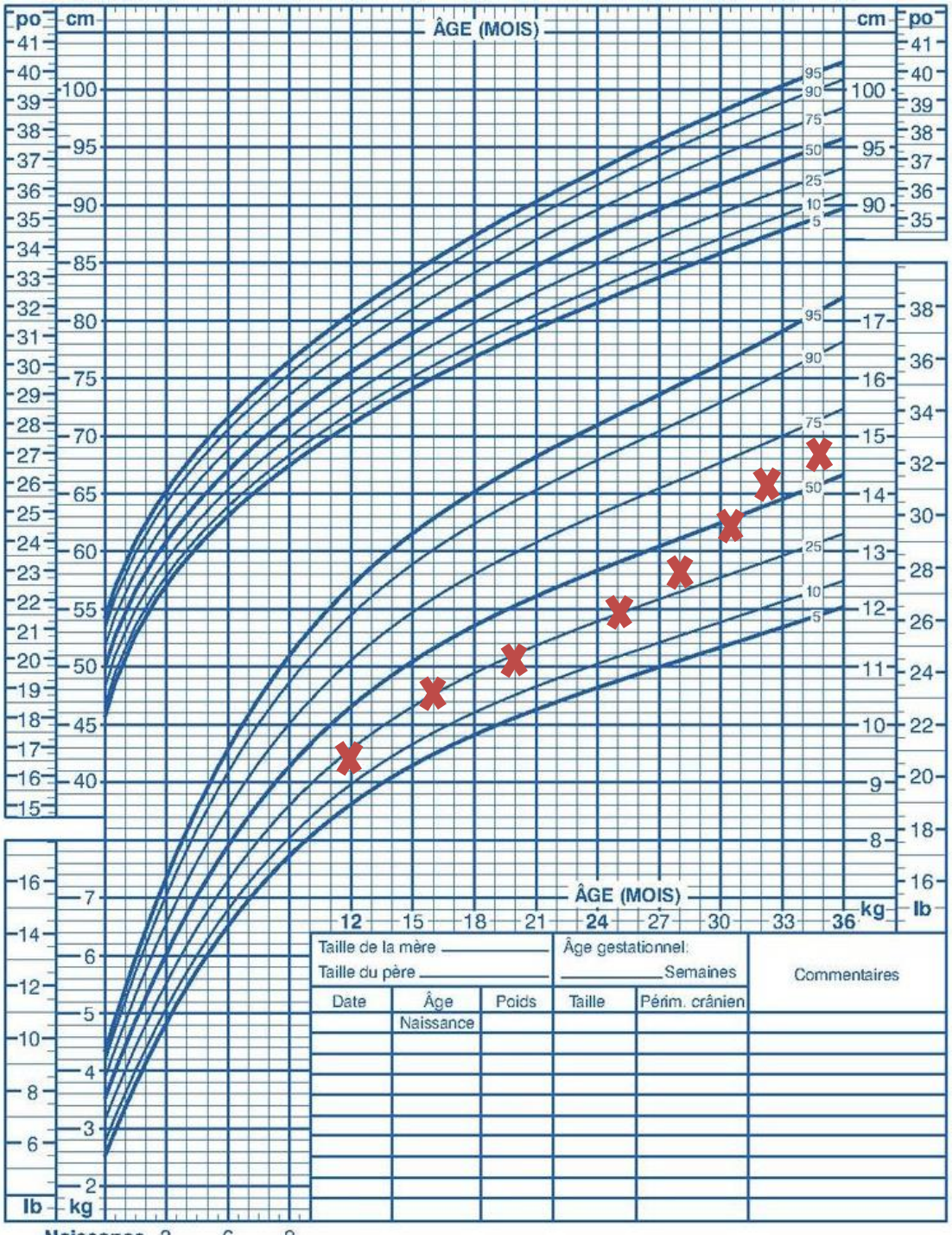




LONGITUDINAL EVOLUTION

ALL AGES (1-15y/o), SV95C & Nb strides/h

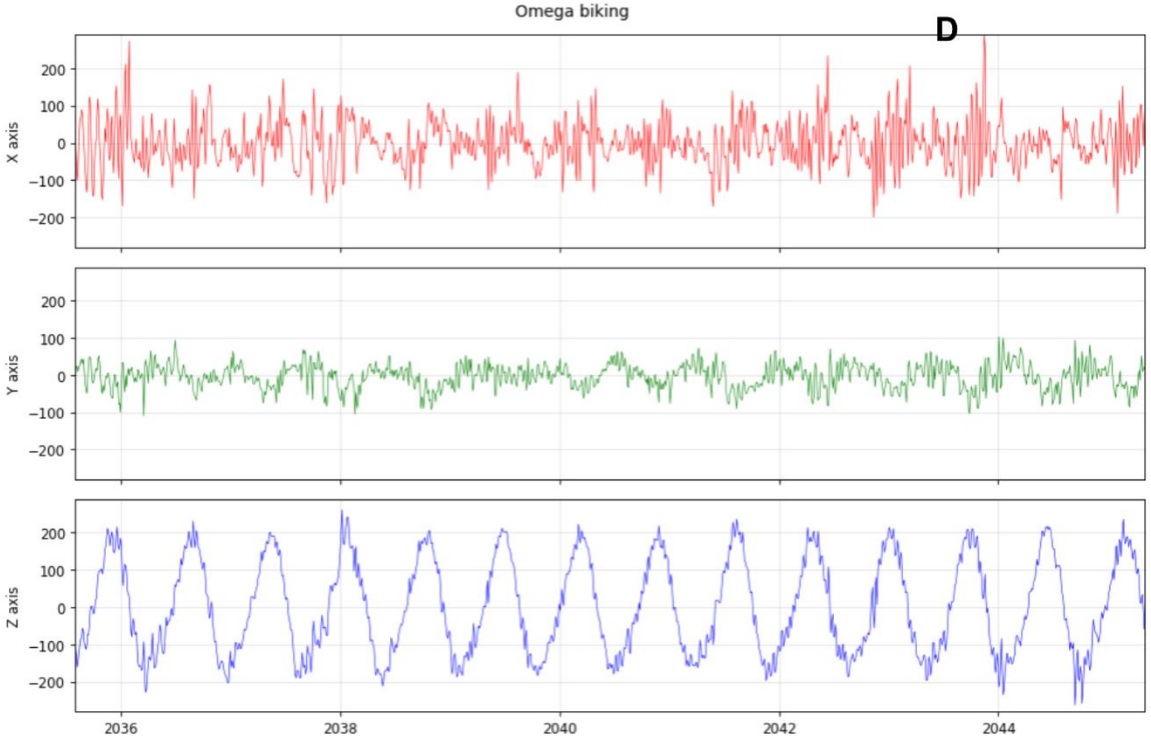


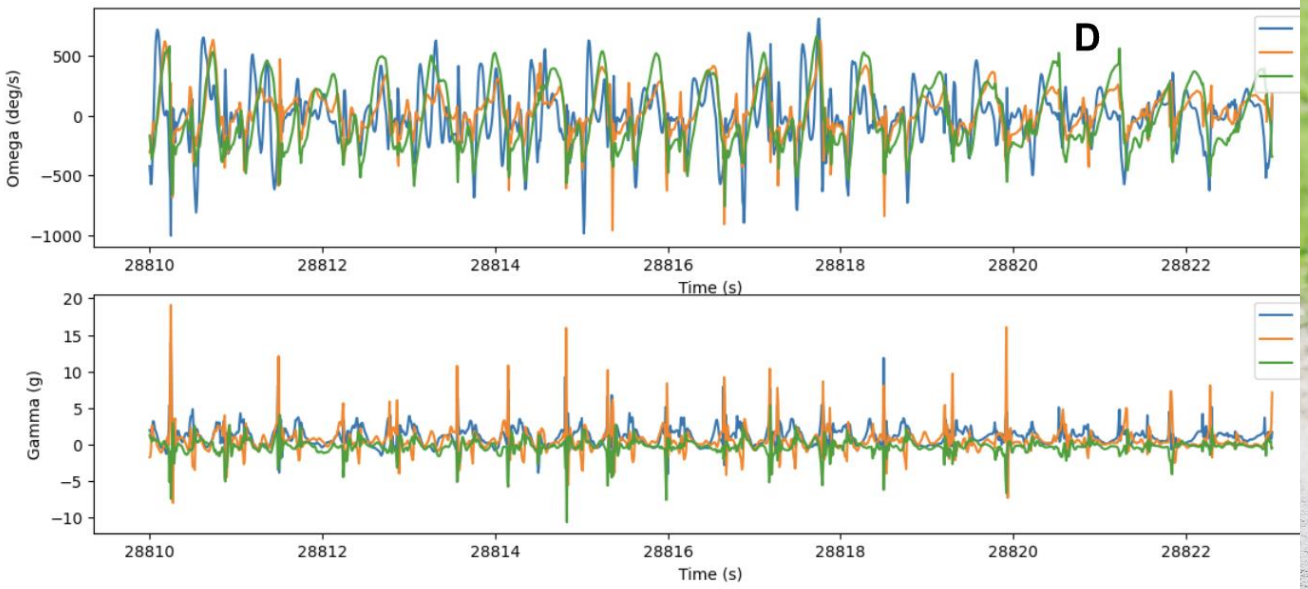


My dream…

Let’s prescribe drug A


BERG
BERG
10


Omega biking
D
X axis
Y axis
Z axis
200
100
0
−100
−200
2036
2038
2040
2042
2044


D
Omega (deg/s)
500
0
−500
−1000
28810
28812
28814
28816
28818
28820
28822
Time (s)
Gamma (g)
20
15
10
5
0
−5
−10
Time (s)

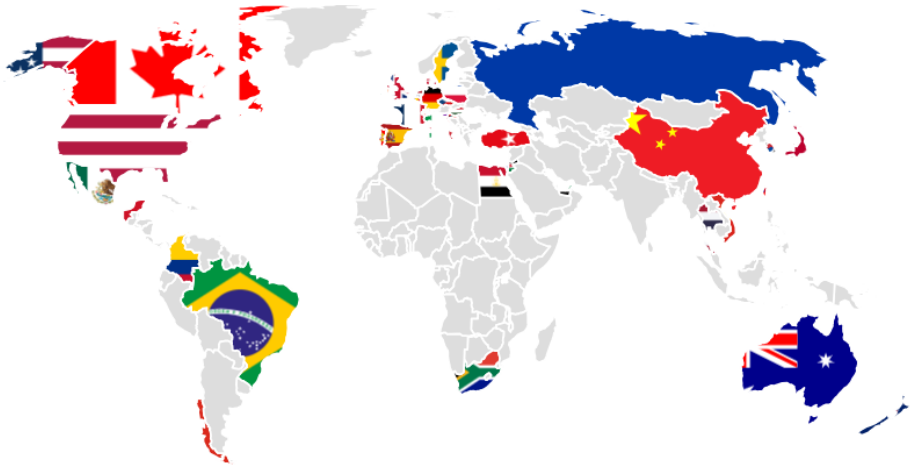
SYDE® - A few figures on global footprint

Sub-therapeutic area	Pathologies with active Syde studies	Number of patients currently in active studies
Neuromuscular	DMD	N = 1000+
	SMA BMD LGMD FSHD DM1 & DM2 Nemaline CMT ALS	N = 700+
Neurology	Multiple sclerosis Spinocerebellar Ataxia Friedrich Ataxia Parkinson	N = 500+
Neurodevelop mental	Angelman Syndrome Dup15Q	N = 150+
Short stature	ACH & HCH	N=200+
other rare diseases	CTNNB1 RYR1-RM HSP	N = 30+
Healthy controls	Across all age ranges	N = 300+
Total		N = 3 000+

150+ Ongoing clinical trials with Syde®

25+ Indications explored with Syde®

95+ Languages available for Syde® patient materials



Current geographic footprint of Syde® as of 2026

In which conditions has digital outcome demonstrate a better sensitivity to change than traditional scales ?

DMD
Multiple Sclerosis
ALS
FSHD

Reliability, Compliance and analytical validation

SMA
LGMD
BMD
X-MTM
DM1
CMT

Parkinson
Achondroplasia
Knee Osteorthritis
Angelman
Dup 15q
CTNNB1

SMA

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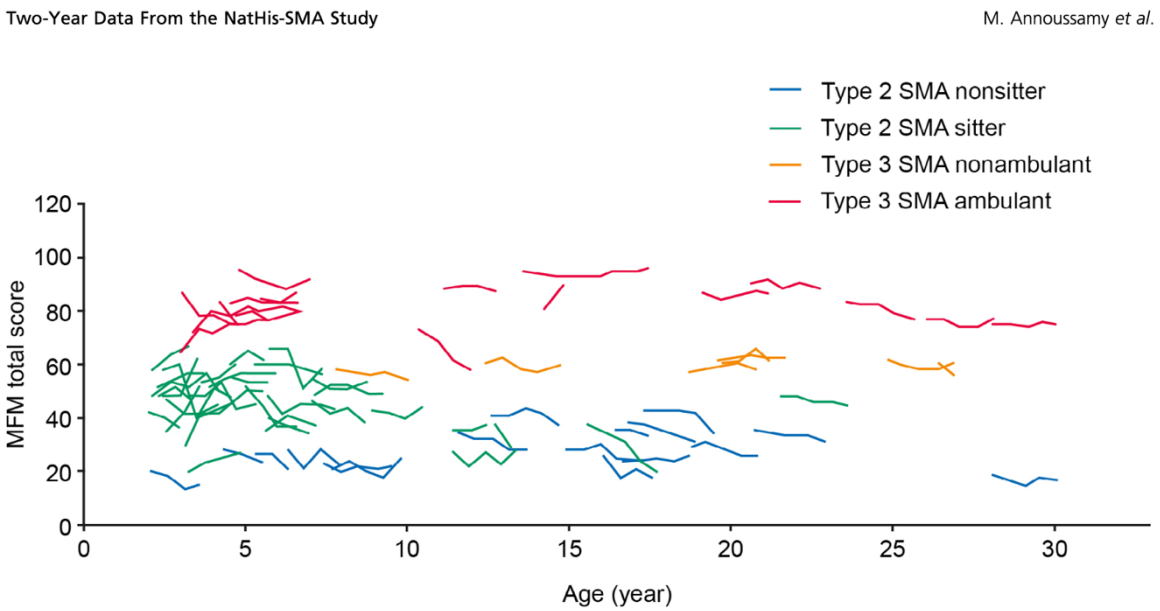
RESEARCH ARTICLE

Natural history of Type 2 and 3 spinal muscular atrophy: 2-year NatHis-SMA study

Mélanie Annoussamy[1,2], Andreea M. Seferian[1], Aurore Daron[3], Yann Péréon[4], Claude Cances[5,6], Carole Vuillerot[7,8], Liesbeth De Waele[9,10], Vincent Laugel[11], Ulrike Schara[12], Teresa Gidaro[1], Charlotte Lilien[1,13], Jean-Yves Hogrel[1], Pierre Carlier[1], Emmanuel Fournier[1], Linda Lowes[14], Ksenija Gorni[15], Myriam Ly-Le Moal[16], Nicole Hellbach[17], Timothy Seabrook[17,a], Christian Czech[17,18,a], Ricardo Hermosilla[17,a], Laurent Servais[1,13,19] & the NatHis-SMA study group[b]



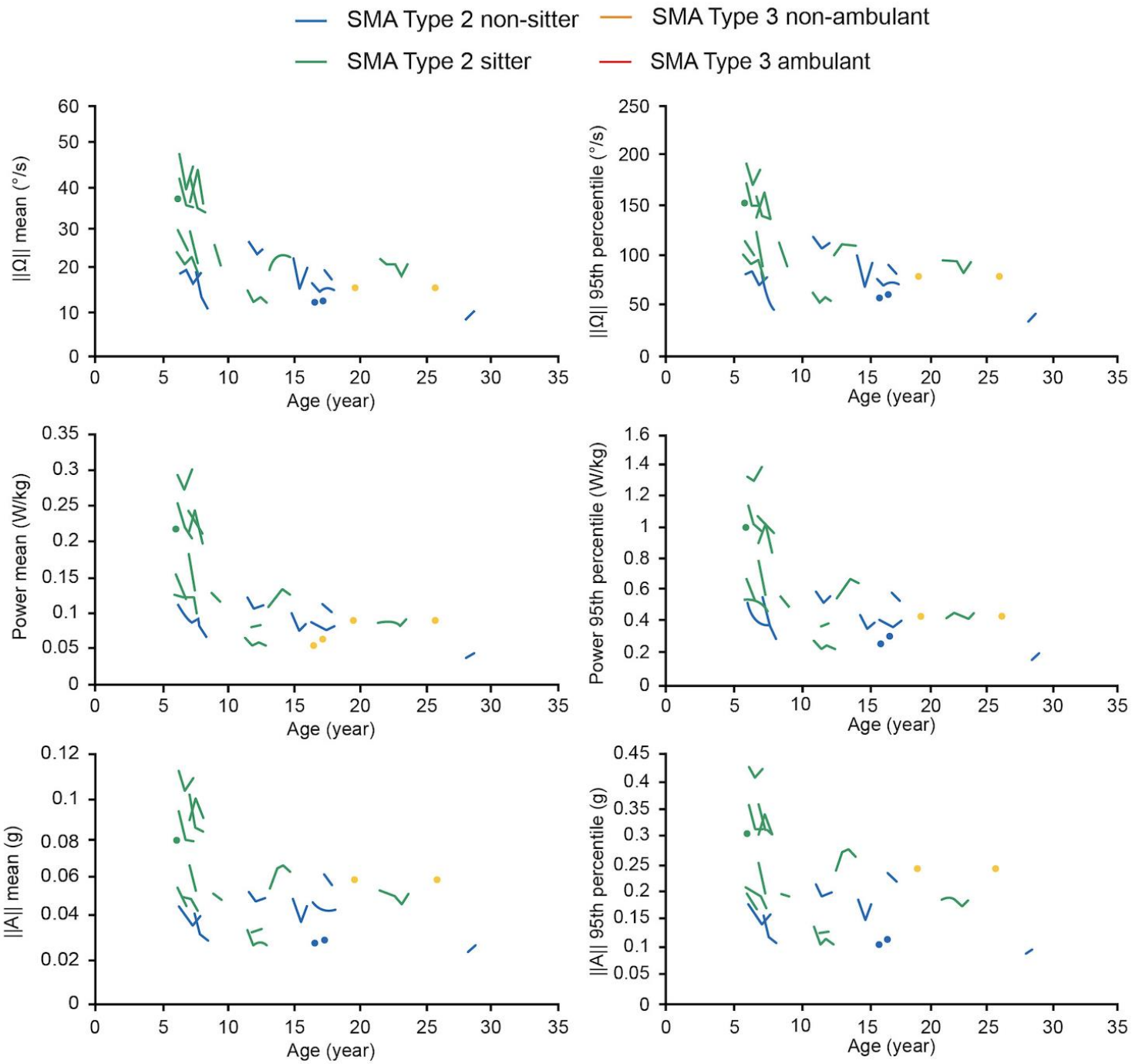
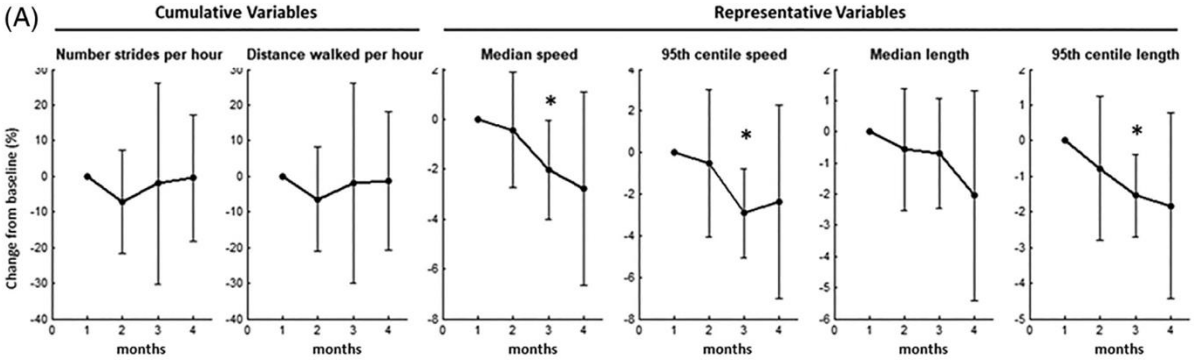

SMA Type 2 non-sitter
SMA Type 2 sitter
SMA Type 3 non-ambulant
SMA Type 3 ambulant
||Ω|| mean (°/s)
||Ω|| 95th percentile (°/s)
Power mean (W/kg)
Power 95th percentile (W/kg)
||A|| mean (g)
||A|| 95th percentile (g)
Age (year)

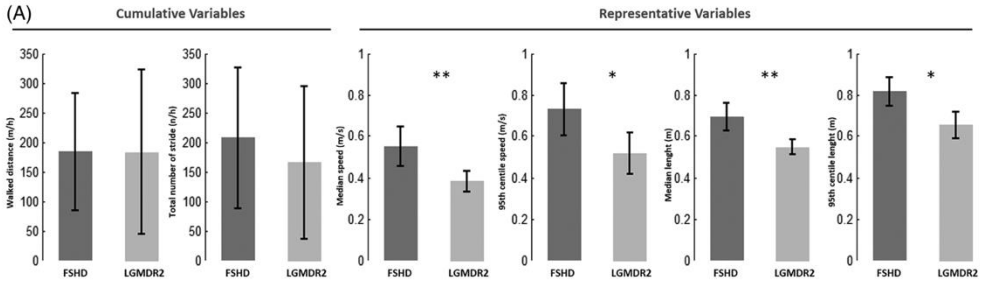
Table 1. Changes in ActiMyo® upper limb activity over 6 and 12 months.

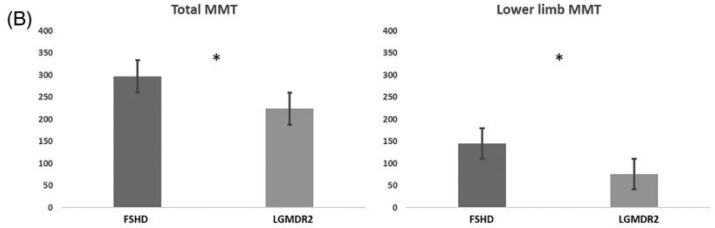
	‖Ω‖ mean (°/s)	‖Ω‖ 95th percentile (°/s)	‖A‖ mean (m/s^2)	‖A‖ 95th percentile (m/s^2)	vA mean (m/s^2)	vA 95th percentile (m/s^2)	Power mean (W/kg)	Power 95th percentile (W/kg)
Changes from baseline at Month 6								
N	19	19	19	19	19	19	19	19
Mean	−2.66	−9.62	−0.01	−0.02	0.01	0.00	−0.01	−0.05
SD	4.33	15.11	−0.01	0.02	0.02	0.01	0.02	0.08
Median	−2.68	−9.12	−0.01	−0.02	0.01	0.00	−0.01	−0.04
Min	−8.18	−32.49	−0.02	−0.05	−0.03	0.00	−0.05	−0.22
Max	8.04	24.71	0.01	0.04	0.03	0.02	0.03	0.12
P-value*	0.02	0.02	0.01	0.01	0.07	0.04	0.01	0.03
SRM	0.61	0.64	0.71	0.63	0.47	0.60	0.63	0.55
Changes from baseline at Month 12								
N	13	13	13	13	13	13	13	13
Mean	−2.63	−9.12	−0.01	−0.02	0.02	0.00	−0.01	−0.05
SD	3.51	12.40	0.01	0.02	0.03	0.01	0.02	0.10
Median	−1.37	−5.28	0.00	−0.02	0.01	0.00	−0.01	−0.05
Min	−9.53	−38.59	−0.02	−0.05	−0.02	−0.01	−0.06	−0.26
Max	3.55	11.21	0.01	0.04	0.10	0.03	0.02	0.12
P-value*	0.01	0.01	0.02	0.02	0.13	0.35	0.02	0.06
SRM	0.75	0.74	0.71	0.75	0.50	0.40	0.67	0.55

Home-based gait analysis as an exploratory endpoint during a multicenter phase 1 trial in limb girdle muscular dystrophy type R2 and facioscapulohumeral muscular dystrophy

Teresa Gidaro MD, PhD[1] | Erwan Gasnier PhD[1] | Melanie Annoussamy PhD[1,2] | John Vissing MD, PhD[3] | Shahram Attarian MD, PhD[4] | Tahseen Mozaffar MD[5] | Stanley Iyadurai MD, PhD[6] | Kathryn R. Wagner MD, PhD[7] | David Vissière PhD[2] | Gennyne Walker PhD[8] | Sanjay S. Shukla MD, MS[8] | Laurent Servais MD, PhD[1,9,10]







The analytical validation of Syde has been confirmed (97% detection, accuracy 0.5cm/s +- 3.6cm/s) across disease severity, including patients using assistive devices for walking

UNIVERSITY OF COPENHAGEN

CHARACTERISTICS OF PATIENTS

17

FSHD patients with confirmed genetic diagnosis

including

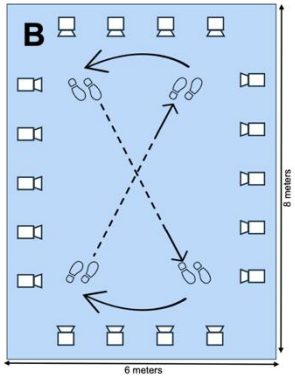
4 patients using walking aids during data collection (foot braces, cane, stroller)

Age: min 20 — median 52 — max 69

♀ 53%

9 females

Ricci score



VALIDATION OF STRIDE DETECTION

Table 1. Results of the stride detection validation (both ankles)

	All patients (N=17)	By disease severity (Ricci)		By ambulatory level	
		Ricci [2.5; 3] (N=11)	Ricci [3.5; 4] (N=6)	Using walking aids (N=4)	Not using walking aids (N=13)
True positive (TP) strides	11128	6730	4398	2794	8334
False positive (FP) strides	75	27	48	5	70
False negative (FN) strides	190	135	55	59	131
Precision [TP/(TP+FP)]	**99.3%**	**99.6%**	**98.9%**	**99.8%**	**99.2%**
Recall [TP/(TP+FN)]	**98.3%**	**98.0%**	**98.7%**	**97.9%**	**98.5%**

More than 97% of accurate stride detection overall (both ankles), with similar performance at all severity of symptoms and for patients using walking aids.

ACCURACY OF STRIDE VELOCITY MEASUREMENT

Table 3. Accuracy of DHT measurement of stride velocity (SV) (both ankles)

	All patients (N=17)	By disease severity (Ricci)		By ambulatory level	
		Ricci [2.5; 3] (N=11)	Ricci [3.5; 4] (N=6)	Using walking aids (N=4)	Not using walking aids (N=13)
Stride count	10272	6292	3980	2503	7769
Mean MoCap SV (m/s)	0.991	1.084	0.843	0.793	1.054
Mean SV error (Mocap – DHT) (m/s)	**0.005**	**0.011**	**-0.004**	**-0.001**	**0.007**
SV error standard deviation (m/s)	**0.036**	**0.040**	**0.028**	**0.018**	**0.040**
95th centile of SV error (m/s)	**0.054**	**0.055**	**0.051**	**0.034**	**0.060**

Measuring gait with Syde® in patients with Facioscapulohumeral muscular dystrophy (FSHD): Analytical validation in a controlled environment, FSHD IRC, 2025

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Evaluation of Ambulatory Function in Daily Life with an Ankle Wearable Sensor in Ambulant Patients with FSHD

RESULTS

Characteristics of patients

Baseline demographics of FSHD cohort (N=13)	
Sex (N female, %)	4 (31%)
Age (years): Mean [min - max] (std)	55 [30 - 70] (13)
Ricci score: Mean [min - max] (std)	3.2 [2.5 - 4.0] (0.5)

Digital outcome identification

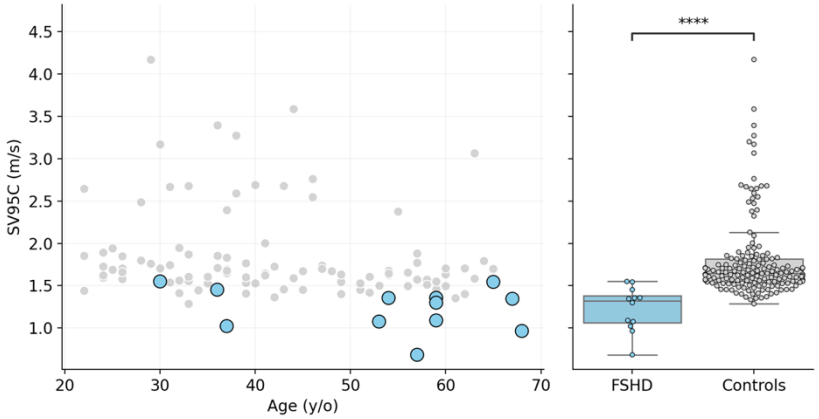
SV95C discriminated patients from controls ($p<0.0001$) and correlated well with gold standard endpoints (Spearman $p<0.05$).

Spearman's correlation coefficients (FSHD cohort).

	Ricci score	6MWT	FSHD-COM	FSHD-COM Leg Function
SV95C	-0.60 (p<0.05)	0.85 (p<0.001)	-0.78 (p<0.01)	-0.90 (p<0.0001)

Digital outcome identification

Comparison of SV95C: FSHD vs healthy volunteers.

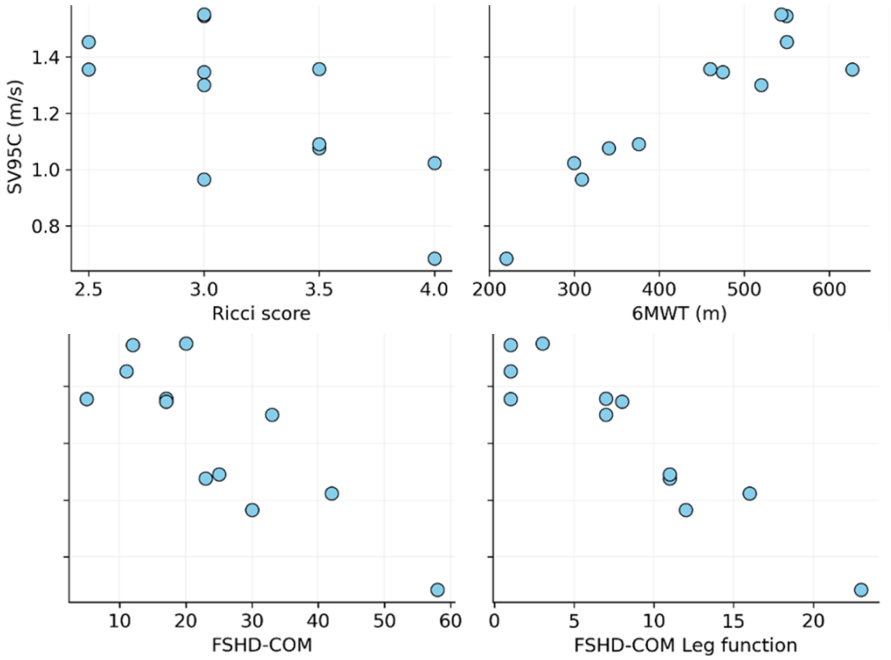


Evaluation of Ambulatory Function in Daily Life with an Ankle Wearable Sensor in Ambulant Patients with FSHD

RESULTS

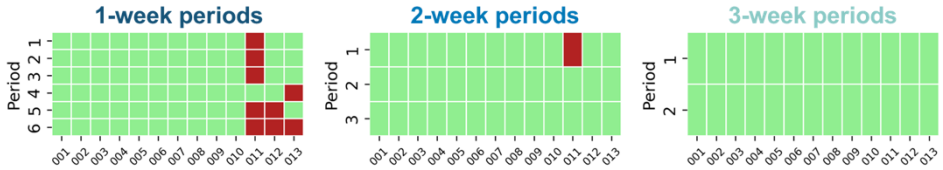
Digital outcome identification

Correlation between SV95C and clinical outcomes.



Impact of recording period duration on data availability and outcome reliability

Individual data availability for different recording period lengths.
Red and green colors figure less and more than 50h of recordings, respectively.

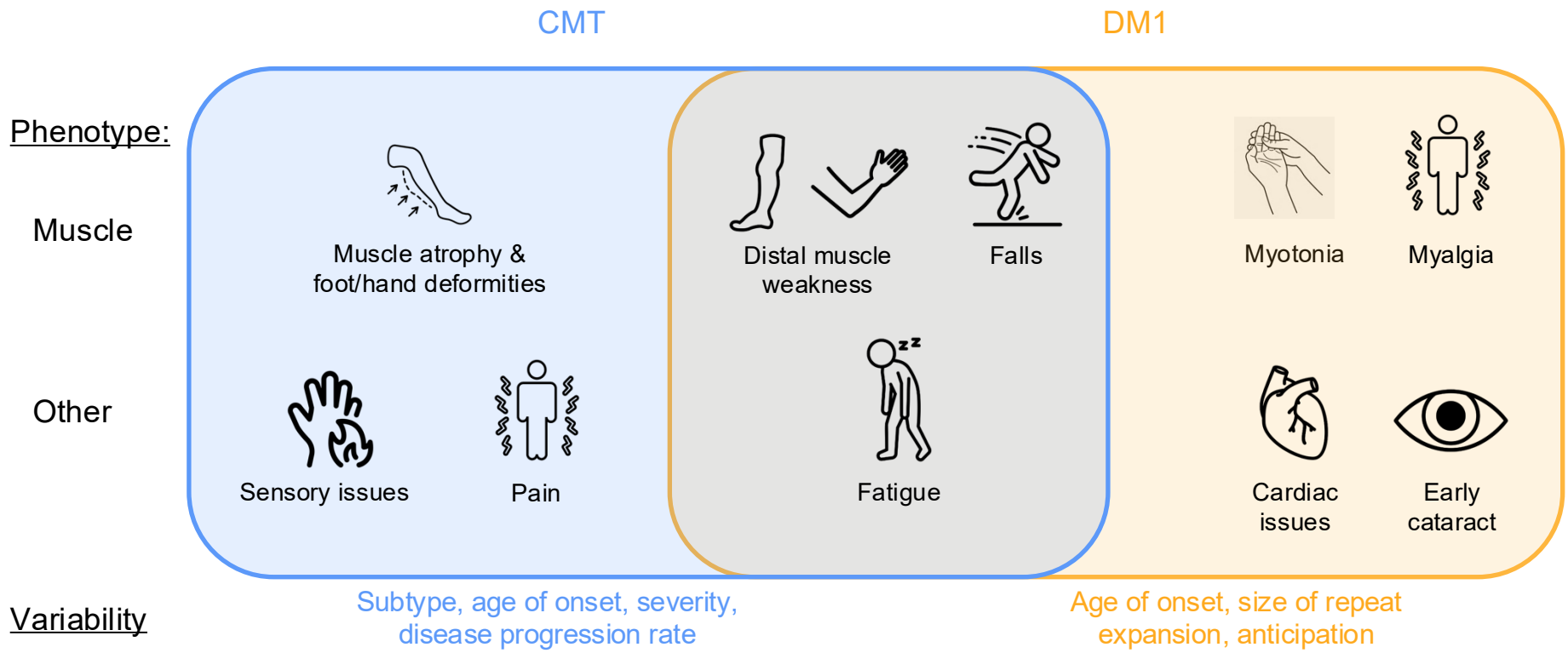


- 88% of patients recorded at least 50h in 1-week periods, 97% in 2-week periods and 100% in 3-week periods .

Intra-class correlation coefficient of peak ambulation speed for different recording period lengths.

	1-week period	2-week period	3-week period
ICC(1,1) [95% CI]	0.971 [0.940 - 0.990]	0.986 [0.967 - 0.995]	0.967 [0.899 - 0.990]
Standard Error Measurement	0.04 m/s	0.03 m/s	0.04 m/s

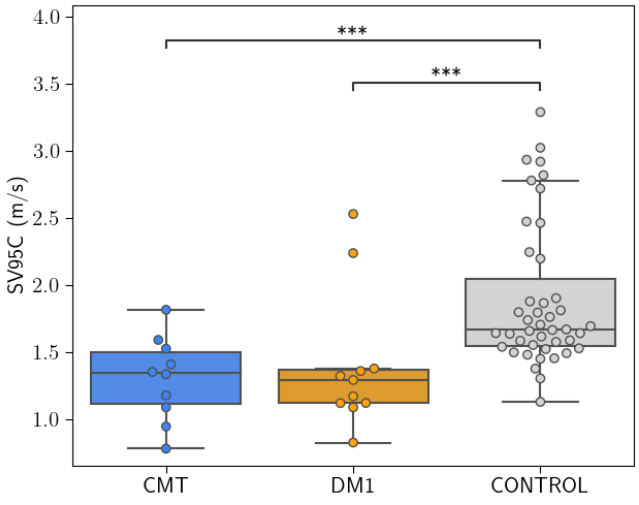
CMT and DM1 are two diseases with distal weakness



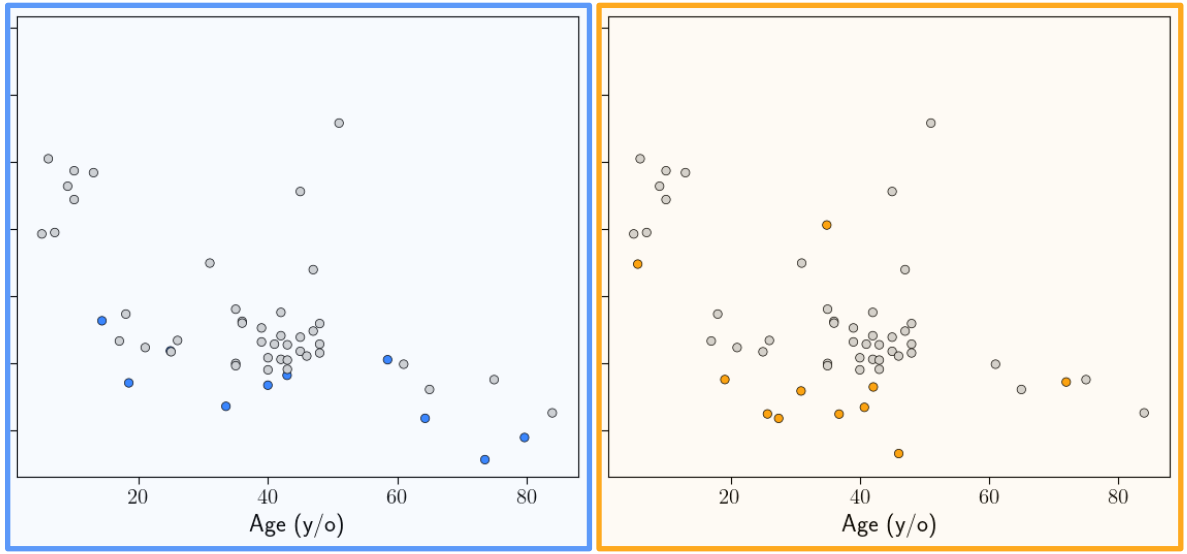
CMT=Charcot-Marie-Tooth disease; DM1=myotonic dystrophy type 1.

SV95C variable significantly separated patients from controls at all ages

Baseline SV95C by Cohort



Baseline SV95C by Subject's Age



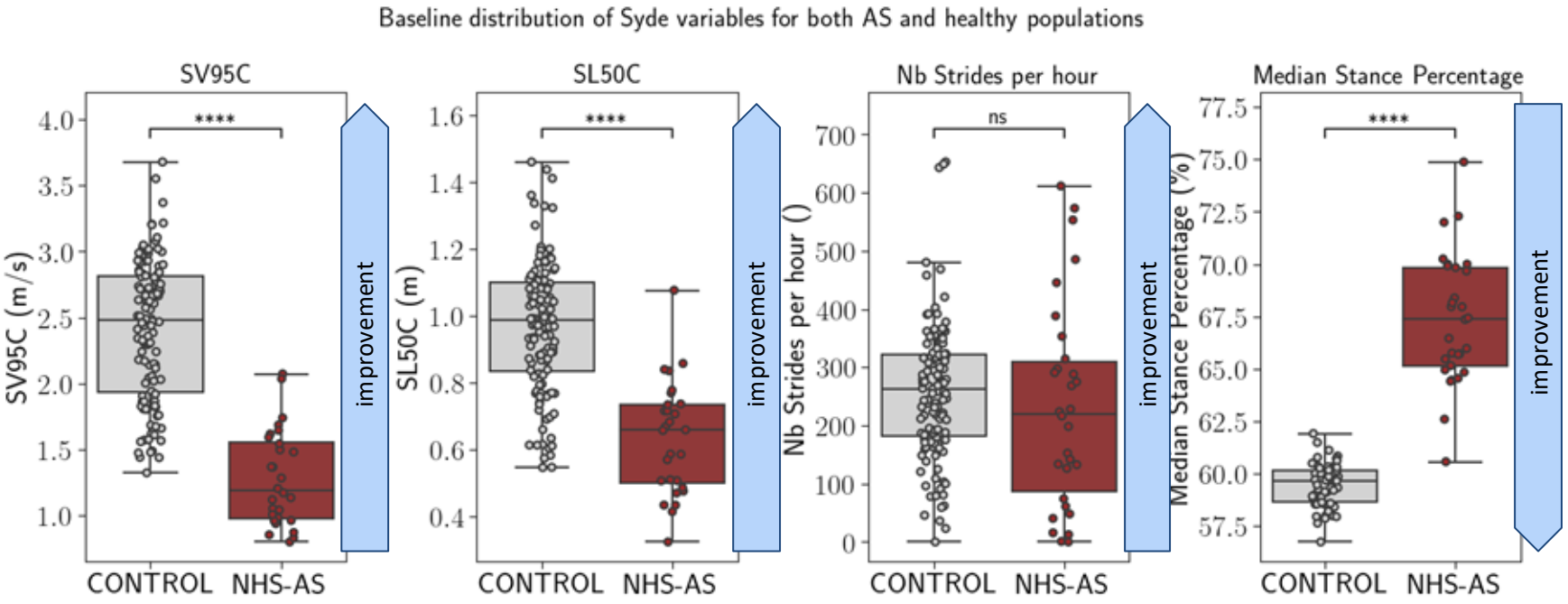
Mann Whitney U test: ns=not significant, * p<0.05, ** p<0.01, *** p<0.001.

Control CMT DM1

CMT=Charcot-Marie-Tooth disease; DM1=myotonic dystrophy type 1; SV95C=stride velocity 95th centile; y/o=years old.

HOW CAN WE OBJECTIVELY QUANTIFY WALKING IN REAL LIFE FOR ANGELMAN PATIENTS ?

Syde functional variables clearly separate AS population from healthy population, not the activity



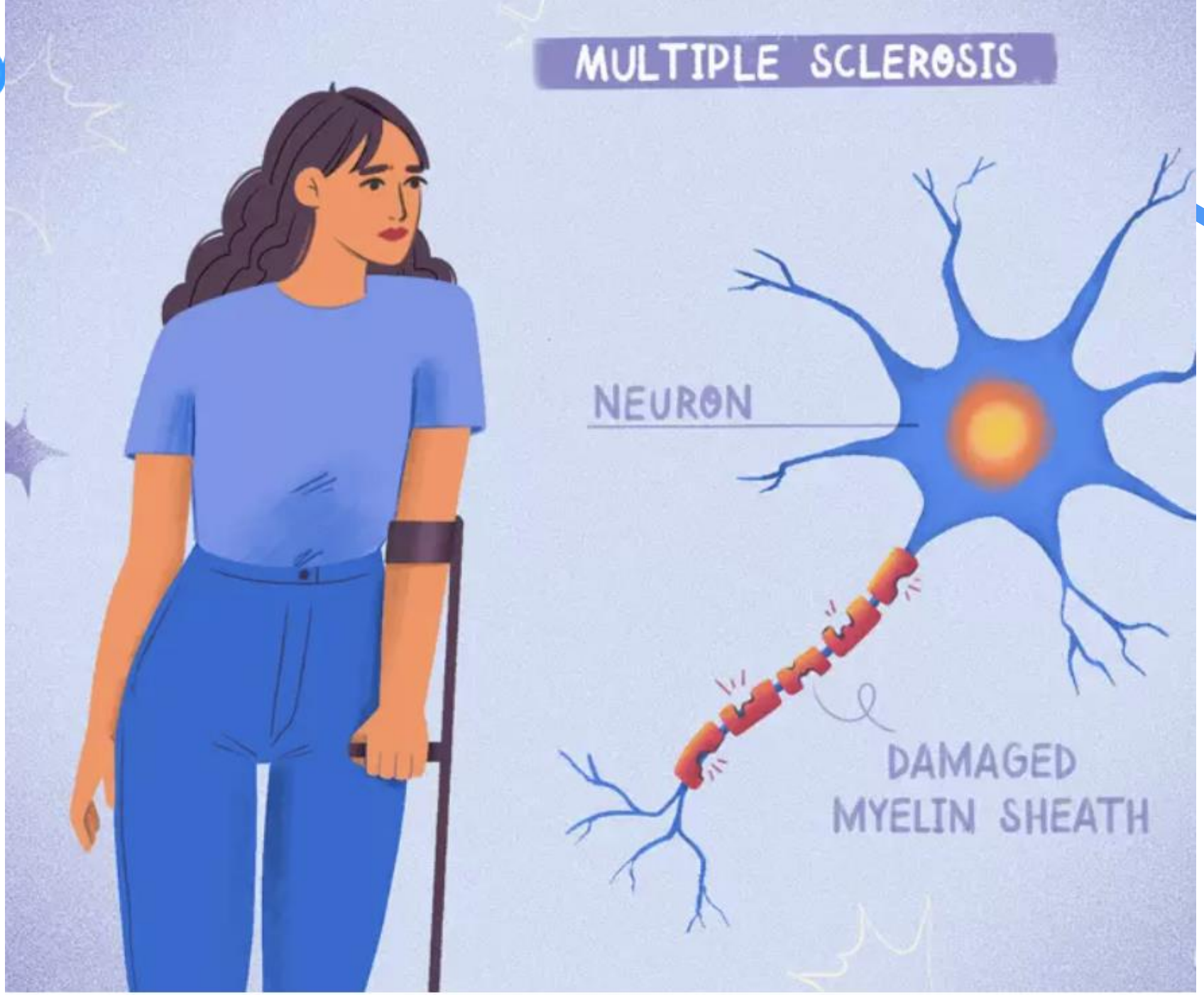
N	120	28

N	120	28

N	127	30

N	58	29

*Mann-Whitney U Test p-value: ns: non significant, *:p<0.05, **:p<0.01, ***:p<0.001, ****:p<0.0001*


MULTIPLE SCLEROSIS
NEURON
DAMAGED
MYELIN SHEATH

Stride-level measurement of gait as an early sensitive marker of disability progression in ambulatory patients with multiple sclerosis

Margaux Poleur,[a] Barbara Willekens,[b,c] Bertrand Degos,[d] Damien Ricard,[e] Vincent van Pesch,[f] Annick Mélin,[g] Oihana Piquet,[h] Alexis Tricot,[h] Laurie Médard,[a] Mona Michaud,[h] Emilie Lommers,[i] Anna-Victoria De Keersmaecker,[b,c] Irene Coman,[d] James Overell,[j,k] Alexandra Goodyear,[l] Paul Delmar,[j] Qing Wang,[j] Helen Hayward-Koennecke,[j] Céline Cluzeau,[h] Damien Eggenspieler,[h] Paul Strijbos,[j] and Laurent Servais[m,n,*]

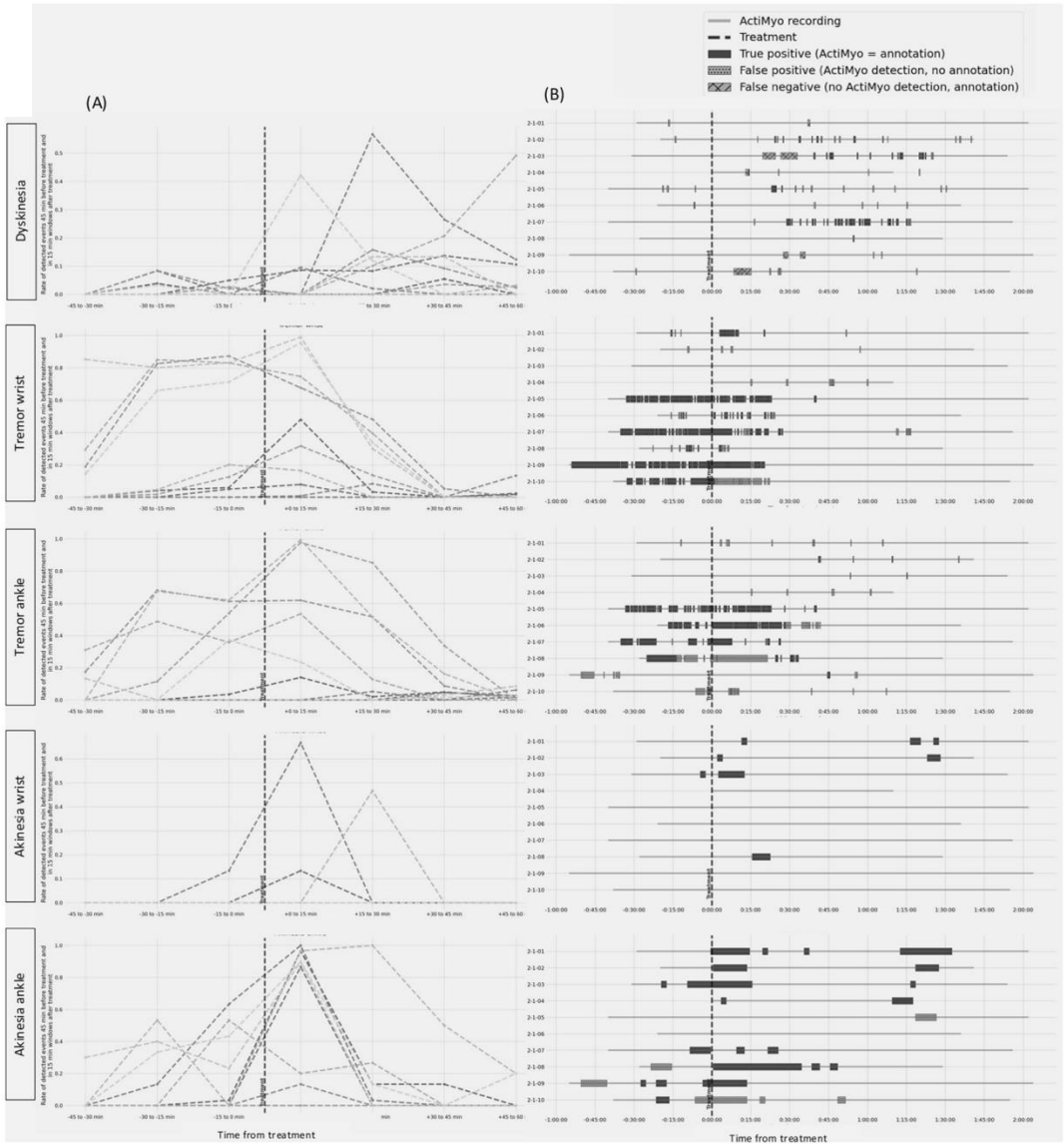
scientific reports

Check for updates

OPEN

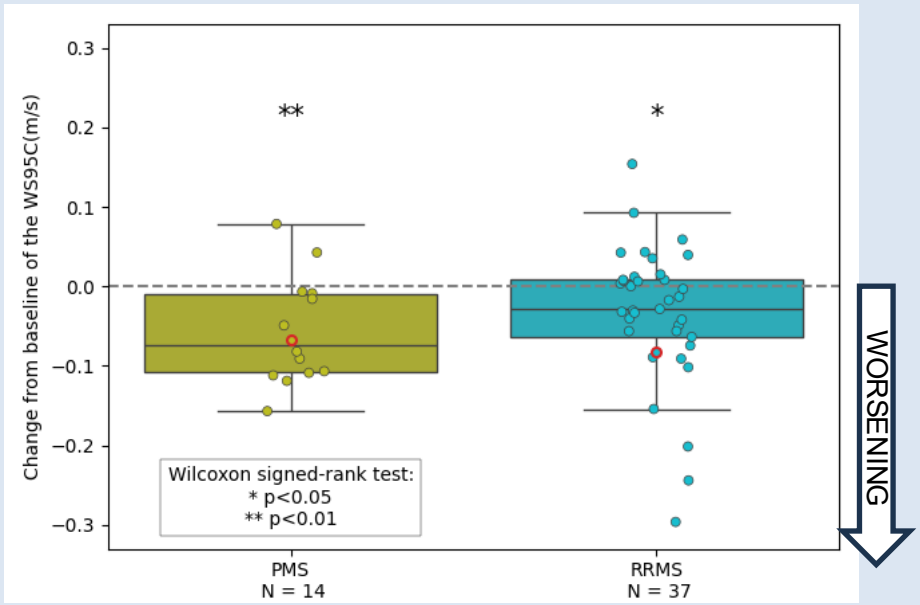
Wearable inertial device for monitoring Parkinson's disease symptoms: a pilot study in a controlled environment

Margaux Poleur[1,8], Teresa Gidaro[2,8], Stéphanie Delstanche[1], Jean-Marc Gurruchaga[3], Alexis Tricot[4], Léopold Bancel[4], Stéphane Palfi[3], Laurent Servais[1,5,8] & Bertrand Degos[6,7,8]



WS95C shows a significant decline at 1 year in both progressive and non progressive patients

- Adherence
- Reliability
- Known-group validity
- Converge nt validity
- Ability to detect change

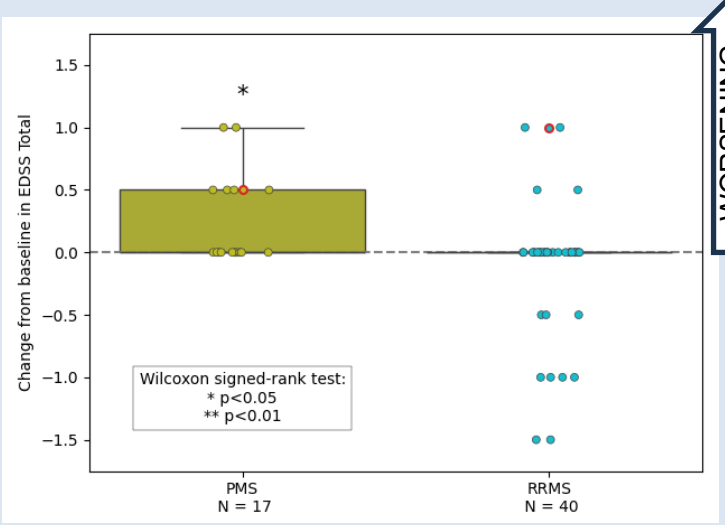


PMS= progressive multiple sclerosis, RRMS= relapsing remitting multiple sclerosis, WS95C= walking speed 95th centile

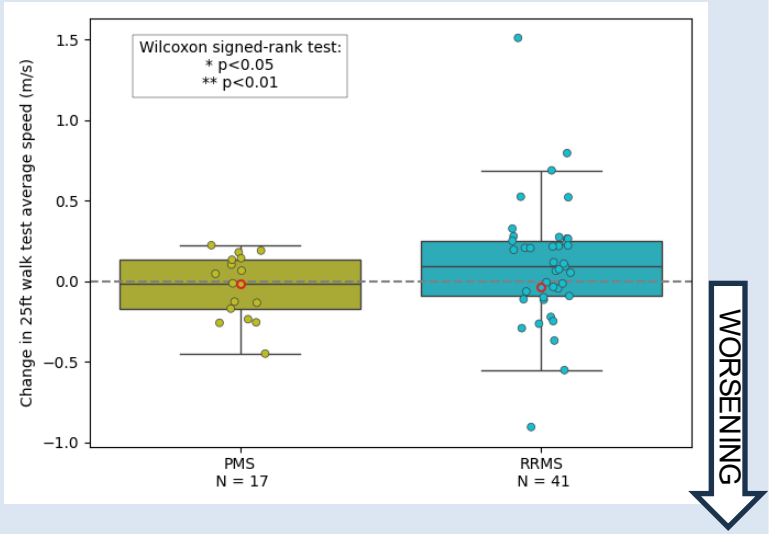
While EDSS total score detects change only for progressive patients & T25FW does not capture change

- Adherence
- Reliability
- Known-group validity
- Converge nt validity
- Ability to detect change

EDSS



T25FW speed



- Participants who experienced relapse(s) between visits

EDSS = Expanded Disability Status Scale, T25FW = Timed 25 Foot Walk (best performance), PMS= progressive multiple sclerosis, RRMS= relapsing remitting multiple sclerosis.

FEASIBILITY, RELIABILITY AND CLINICAL VALIDITY OF STRIDE VELOCITY AS A REAL-LIFE DIGITAL OUTCOME IN KNEE OSTEOARTHRITIS

Camila Gonzalez Barral[1,2], Margaux Poleur[3], Nicolas Bovy[1], Georgia Stimpson[4], Axel Boyer[5], Frederique Guilbert[6], Rita Deroisy[7], Laura Witkam[6], Damien Eggenspieler[2], Jean-François Kaux[7], Laurent Servais[1,4]

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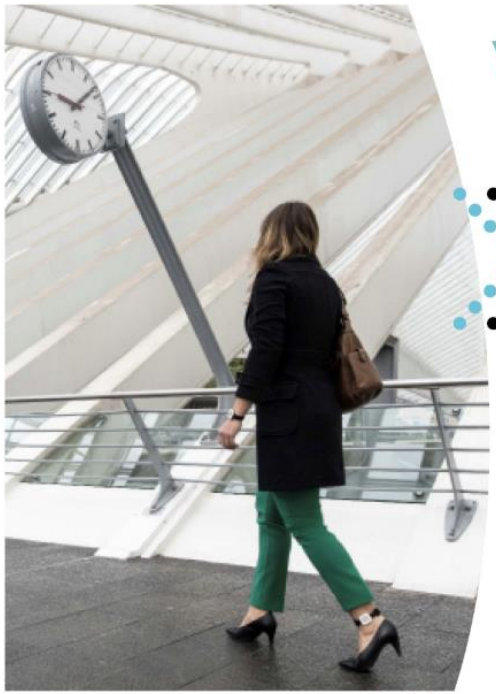


Vous souffrez d'arthrose du genou ?

Vous pouvez aider la recherche à avancer afin de mieux comprendre l'impact de cette maladie sur la mobilité.

Qui ?
Personnes de 40 à 70 ans atteintes d'arthrose du genou.

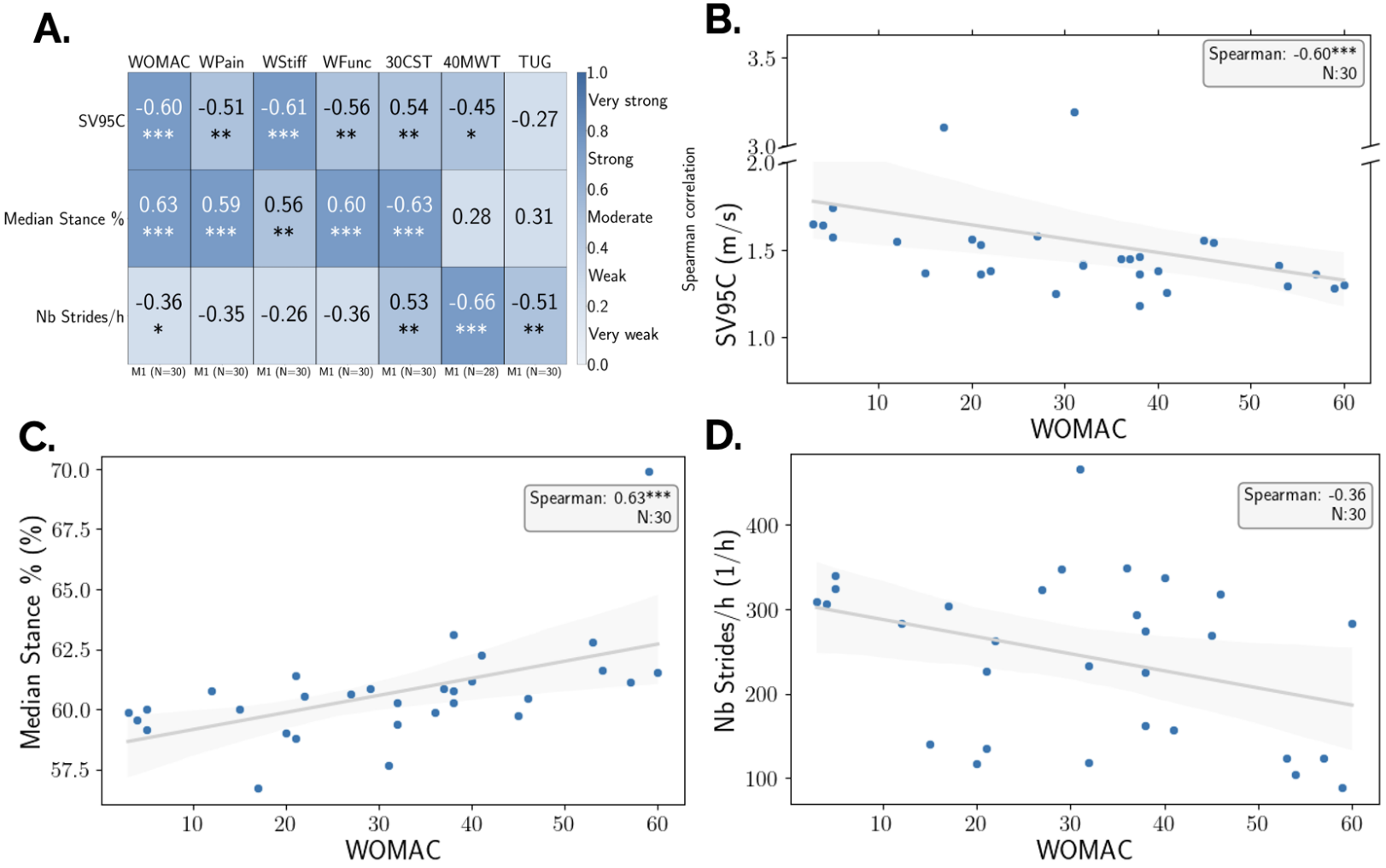
En quoi consiste l'étude ?
Port de capteurs au poignet et à la cheville pendant 2 mois.
Deux visites à l'hôpital – Aucun traitement, aucun risque.

Intéressé(e) ?
Contactez le Centre de Référence des Maladies Neuromusculaires

Centre de Référence des Maladies Neuromusculaires:
camila.gonzalezbarral@citadelle.be +32 (0)4 321 82 22

CHU de Liège

Citadelle Hopital


A.
WOMAC WPain WStiff WFunc 30CST 40MWT TUG
SV95C
-0.60 *** -0.51 ** -0.61 *** -0.56 ** 0.54 ** -0.45 * -0.27
Median Stance %
0.63 *** 0.59 *** 0.56 ** 0.60 *** -0.63 *** 0.28 0.31
Nb Strides/h
-0.36 * -0.35 -0.26 -0.36 0.53 ** -0.66 *** -0.51 **
M1 (N=30) M1 (N=30) M1 (N=30) M1 (N=30) M1 (N=30) M1 (N=28) M1 (N=30)
Spearman correlation
1.0 Very strong
0.8
Strong
0.6
Moderate
0.4
Weak
0.2
Very weak
0.0
B.
Spearman: -0.60***
N:30
SV95C (m/s)
WOMAC
C.
Spearman: 0.63***
N:30
Median Stance % (%)
WOMAC
D.
Spearman: -0.36
N:30
Nb Strides/h (1/h)
WOMAC

Take home message

Home-based continuous measure of individual movements

-is applicable to a broad range of conditions

-allows the evaluation of patients otherwise difficult to evaluate (Angelman, toddlers…)

-opens the possibility to reduce the number of patients and the duration of trials

-opens the possibility to individualized monitoring of treatments

-is not device or algo agnostic.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1974-2023