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# REDEFINITION OF POSITIONING THROUGH AN ANALYSIS OF COMPONENTS EFFECTS ON HEALTH : A SCOPING REVIEW

WOFT, Bangkok, February 2026

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Pascal Laforêt PhD.MD,

# Introduction

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**10,6 ± 3h**  
manual wheelchair users



**11,7 ± 3,7h**  
power wheelchair users



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(Sonenblum & al, 2016; Sonenblum & al, 2011)

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The wheelchair becomes the primary means of mobility, and the seat becomes the only postural support for performing daily life activities



Weakened body



with impairments of seated postural control and postures accentuated by the seating configuration

Spinal Cord (2000) 38, 425–434  
© 2000 International Medical Society of Paraplegia All rights reserved 1362–4393/00 \$15.00  
www.nature.com/sc

#### Sitting position–Posture and performance in C5–C6 tetraplegia

I Bolin<sup>\*1</sup>, P Bodin<sup>2</sup> and M Kreuter<sup>2</sup>

<sup>1</sup>Department of Occupational Therapy, Sahlgrenska University Hospital, Göteborg, Sweden; <sup>2</sup>Department of Physiotherapy, Sahlgrenska University Hospital, Göteborg, Sweden

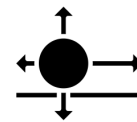
Kyphotic posture in the spinal cord injured patient"





The wheelchair becomes the primary means of mobility, and the seat serves as the only postural support for performing daily life activities

Weakened body



Subjected to constant overall mechanical load

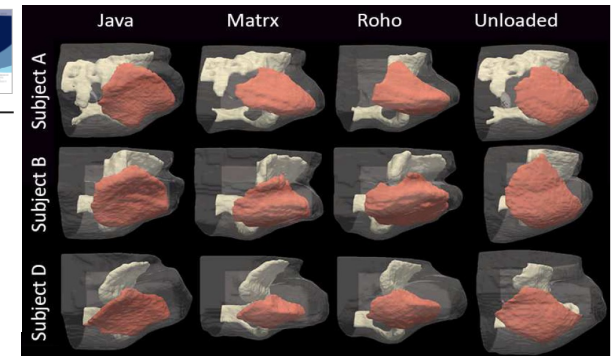


Journal of Tissue Viability  
Volume 27, Issue 3, August 2018, Pages 162-172



Measuring the impact of cushion design on buttocks tissue deformation: An MRI approach

Sharon E. Sonenblum<sup>a</sup>, Jason Ma<sup>b</sup>, Stephen H. Sprigle<sup>b</sup>, Thomas R. Hetzel<sup>c</sup>, John McKay Cathcart<sup>d</sup>



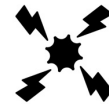
→ Deformation of the tissues in the sacral-ischial area under load-bearing conditions



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The wheelchair becomes the primary means of mobility, and the seat serves as the only postural support for performing daily life activities

Weakened body



Pain

*Disability & Rehabilitation*, 2012; 34(9): 770–778  
Copyright © 2012 Informa UK, Ltd.  
ISSN 0963-8288 print/ISSN 1464-5165 online  
DOI: 10.3109/09638288.2011.619620

**informa**  
healthcare

RESEARCH PAPER

### The pain experiences of powered wheelchair users

Andrew O. Frank<sup>1,\*</sup>, Lorraine H. De Souza<sup>2</sup>, Julia L. Frank<sup>2</sup> & Claudius Neophytou<sup>2</sup>

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<sup>2</sup>Centre for Research in Rehabilitation, School of Health Science and Social Care, Brunel University, Uxbridge, Middlesex, United Kingdom

55 (86%) of users experienced episodes of chronic pain while using the wheelchair

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The wheelchair becomes the primary mean of mobility, and the seat serves as the only postural support for performing daily life activities



Weakened body

- Fatigue
- Discomfort
- ...

And finally, impact on health including social participation

Seating configuration is used to prevent/control/compensate these problems





## WHEELCHAIR SEATING DEFINITION (POSITINING IN WC):

Doyon & al, 1992 : « process aiming to place a person in a required position using a posture assistive device»

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Restrictions of this definition regarding technology & health path progress:

- Only orthopedics concerns : « **a** required position, using **posture assistive device** »
  - What about the functional use of the wheelchair?
- No concerns regarding the control of overall mechanical load and pressure injury risk management
- No concerns about dynamic wheelchair seating ...

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# REGARDING ACTUAL PRACTICES AND TECHNOLOGICAL ADVANCEMENTS SINCE 90'S:

Scoping review, by using the keywords of the definition



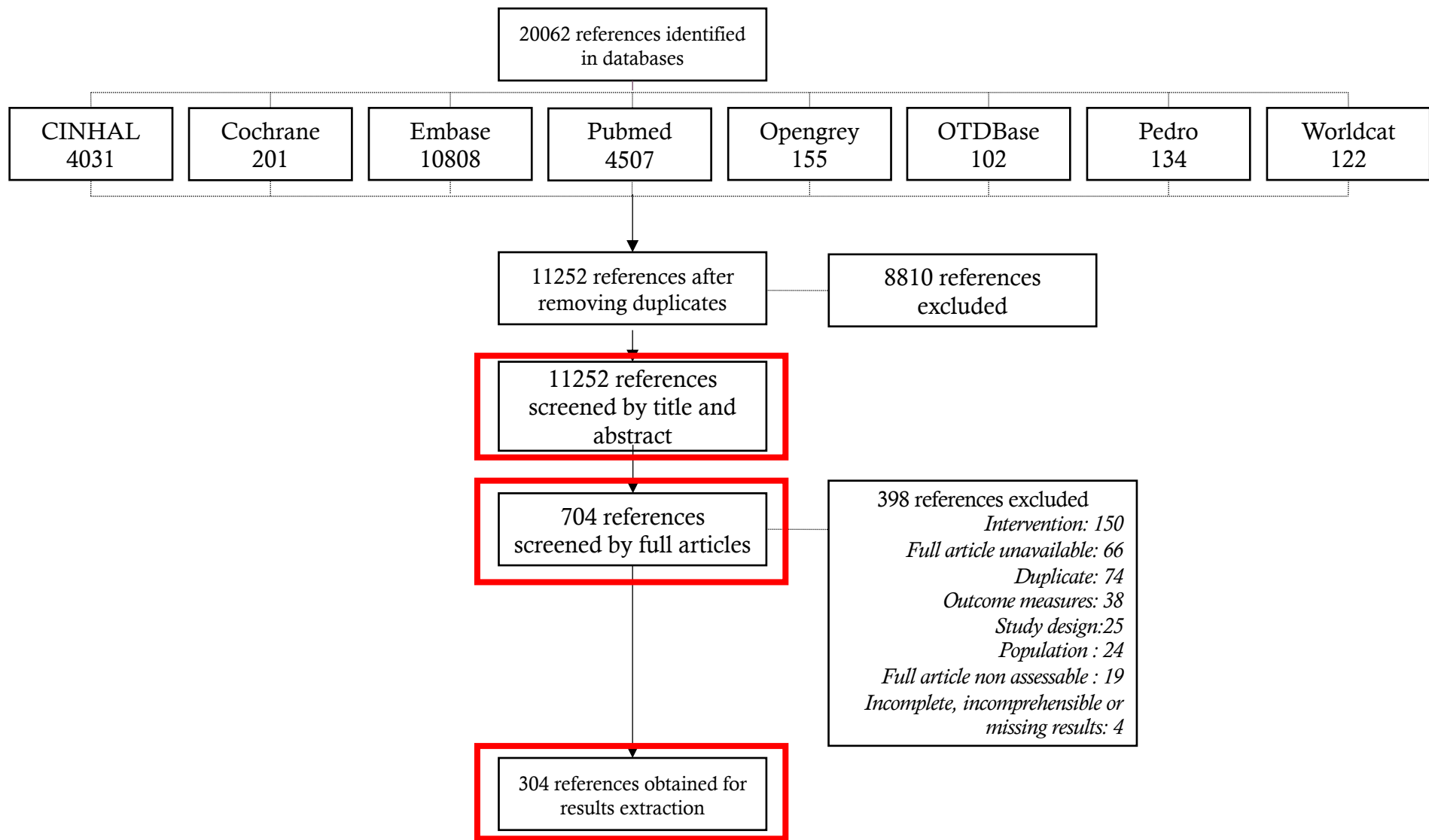
« Process aiming to place a person in a required position using a posture assistive device »

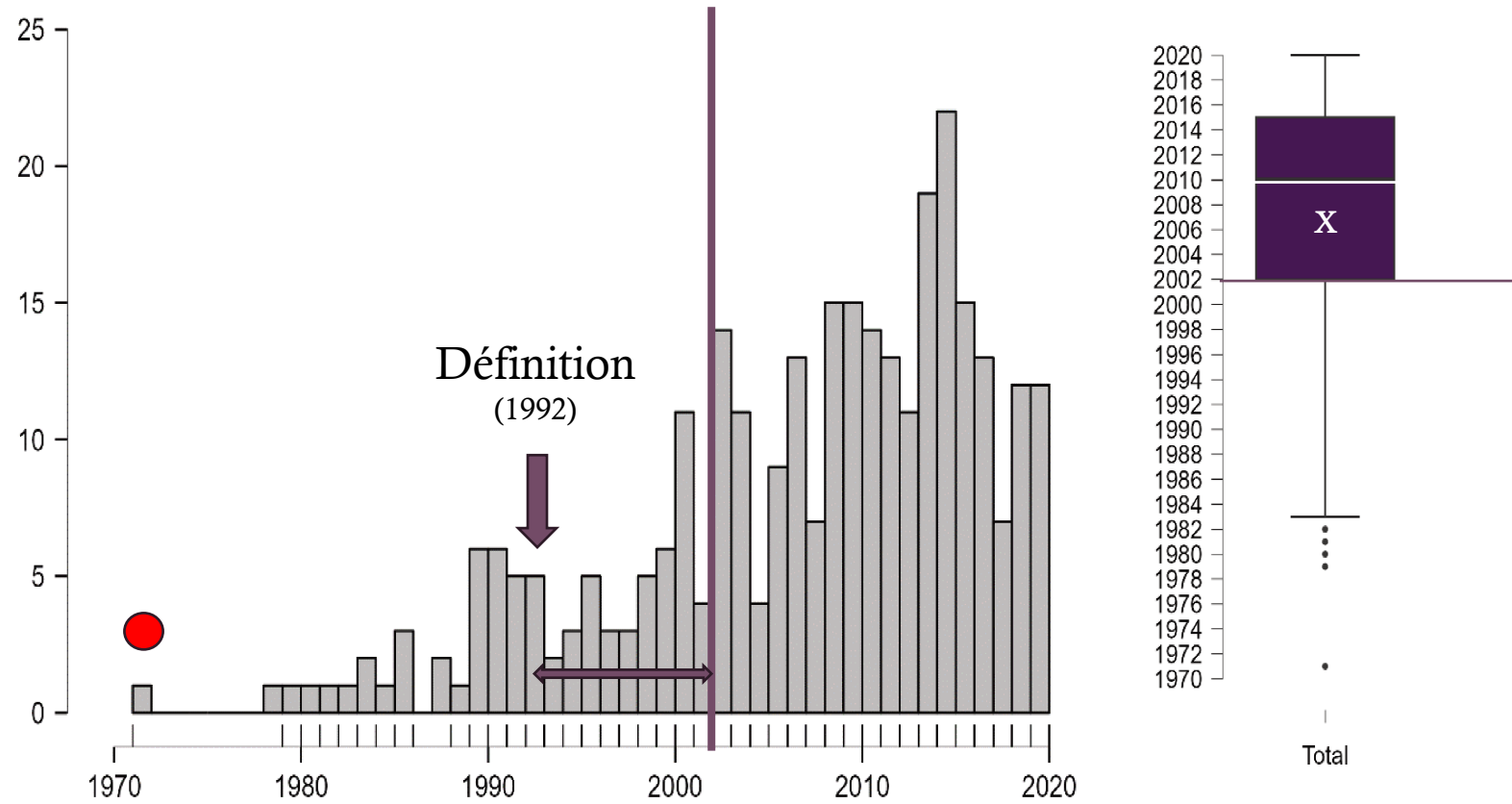
Process

Posture/position

Posture assistive devices  
→ Wheelchair

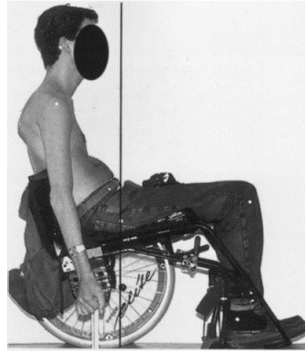
including all components of the wheelchair



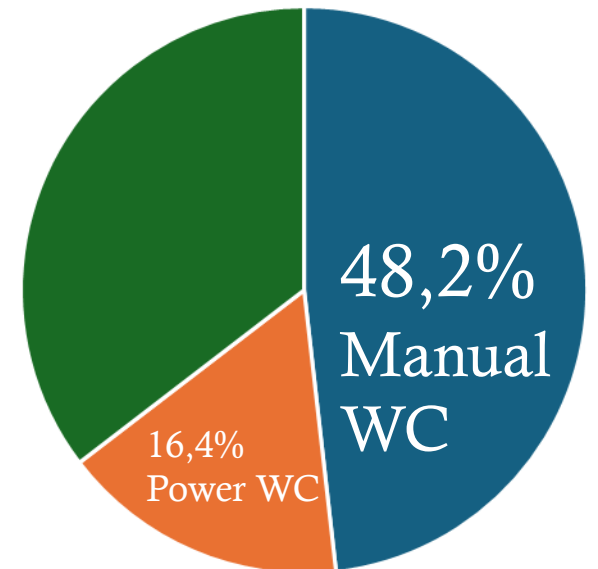
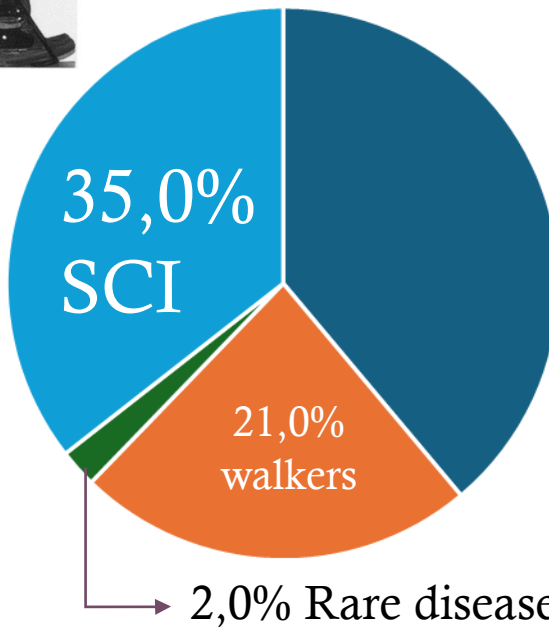
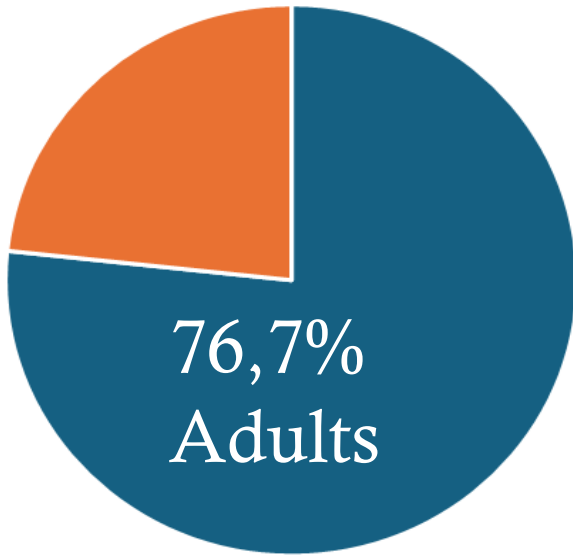


Evolution of publication numbers about wheelchair seating

Need to update the definition



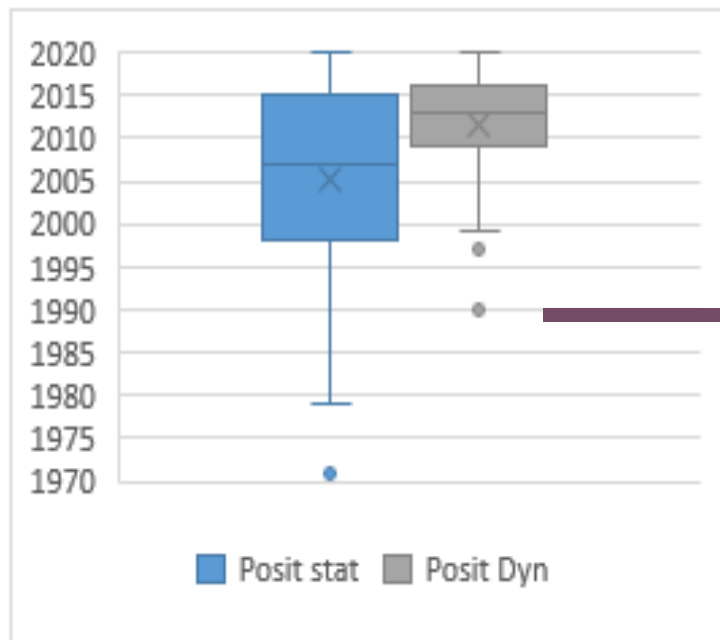
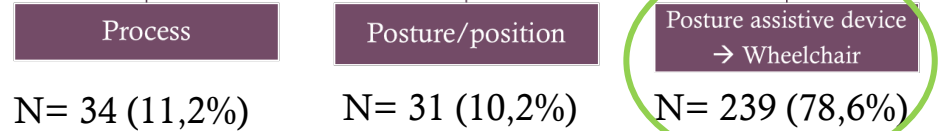
## Reference population



Quasi experimental design : 54,9%

- $N_{med}$  participants: 17,0

« Process aiming to place a person in a required position using a posture assistive device»



Definition

Distribution of WC seating stat/dynamic publications  
70,3% static wheelchair seating

WC components	N publications (%)
<b>Seating system</b>	<b>81 (39.5%)</b>
Static	32 (39.5%)
Dynamic	49 (60.5%)
<b>Cushions</b>	<b>75 (31.4%)</b>
Static	67 (89.3%)
Dynamic	8 (10.7%)
<b>Seat</b>	<b>36 (15.1%)</b>
Static	32 (88.9%)
Dynamic	4 (11.1%)
<b>Backrest</b>	<b>26 (10.9%)</b>
Static	18 (69.2%)
Dynamic	8 (29.8%)
<b>Legrest</b>	<b>8 (3.3%)</b>
Static	6 (75.0%)
Dynamic	2 (25.0%)
<b>Belts</b>	<b>7 (2.9%)</b>
<b>Joystick position</b>	<b>2 (0.8%)</b>
<b>Sling in WC</b>	<b>2 (0.8%)</b>
<b>Armrest</b>	<b>1 (0.4%)</b>
<b>Headrest</b>	<b>1 (0.4%)</b>



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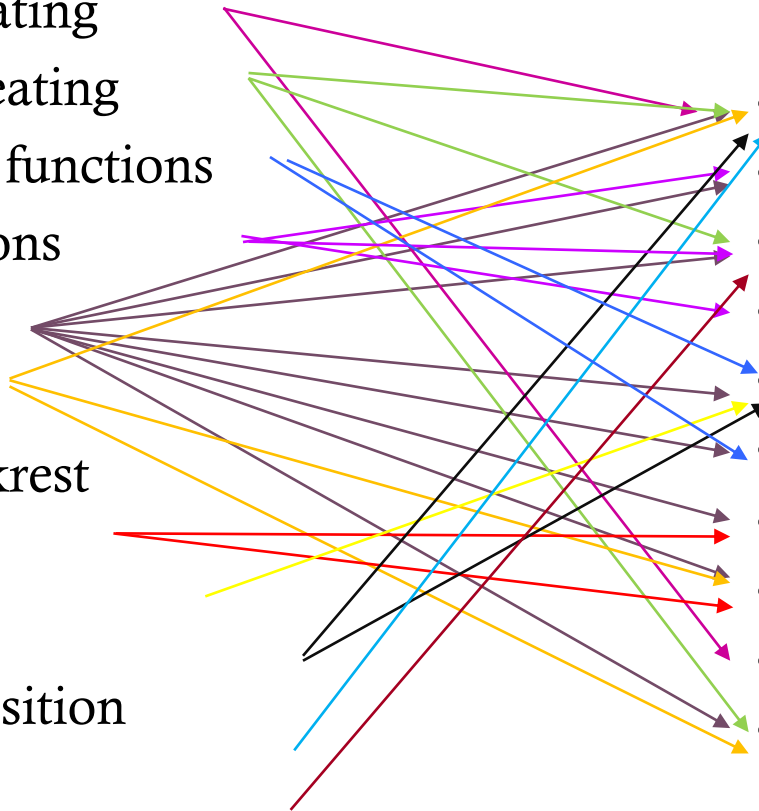
## Wheelchair components

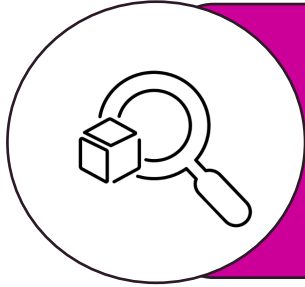
- Molded seating
- Modular seating
- Power seat functions
- Seat positions
- Cushions
- Backrests
- Power backrest
- Belts
- Legrests
- Joystick position
- Legrest
- Armrest



## Outcome measures

- Postural alignment
- Propulsion performances
- Pain
- Preserving musculoskeletal health
- Pressure distribution
- Blood perfusion
- Stability
- Reaching tasks
- Daily life activities
- Comfort





Finally ...

## What is wheelchair seating? Population of users?

- Broad topic, many studies, low level of evidence
- Not just “posture devices“ that influenced WC seating
  - indissociability between the rolling/frame part of the wheelchair and the seating system
  - Importance of dynamic seating
- The possibility to share some features between age, conditions and use of wheelchair

# Process [...] of selecting and/or configuring a wheelchair in its static and dynamic dimensions [...].

to place a person in a required position using a posture assistive device

## Identification of seating wheelchair factors in people with neuromuscular disorders: an expert's consensus with Delphi method

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This study has been published in Plos One. (Scan me!)  
<https://doi.org/10.1371/journal.pone.0290627>



### INTRODUCTION

Spinal muscular atrophy II (SMA) and Duchenne muscular dystrophy (DMD) are rare neuromuscular diseases with motor impairments that require the use of a power wheelchair from childhood [1,2]. Several factors, such as neuromuscular scoliosis or prolonged sitting, further impact health and quality of life. Postural setup can be aggravating, protective, or facilitating. However, this remains underexplored and recommendations are not very precise.

### AIM

Aim was to identify 10 seating electric wheelchair that ensure the health and quality of life for users with SMA II or DMD through expert consensus and to compare their differences.

### MATERIALS & METHODS

The Delphi method, involving 3 panels of experts, was used independently with a group of healthcare professionals and 2 groups of users with SMA II and DMD. Four iterative electronic questionnaires, ensuring the anonymity of the experts from each other, were used. The data collection was validated by an ethics committee.



### RESULTS

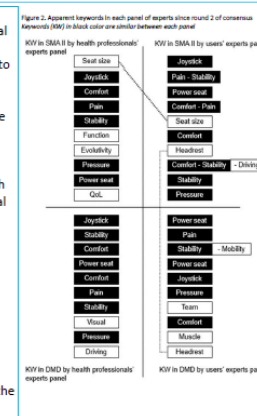
74 experts participated, including 11 rehabilitation physicians, 14 occupational therapists, 6 surgeons, 21 SMA II users, and 22 DMD users. First survey allowed to identify 151 factors by health professionals and 86 by users for SMA II and also 159 and 82 for DMD. During the second survey, 10 criteria were selected using a scale of importance, for each disease. Six of them were finally common to both populations and were mentioned several times within each panel:

- Comfort
- Stability
- Pain prevention
- Use of power seat functions
- Joystick access in all positions
- Pressure injury prevention

The 3rd and 4th surveys confirmed the selection of criteria, with a consensus ranging from 74% to 100%, except for power seat functions (30-33%) among the panel of professionals.

### DISCUSSION & CONCLUSION

Before the beginning of the consensus, 52% of the professionals indicated that the criteria would be different. However, 6 of them are similar in both populations. These criteria were also found in the literature for other populations of power wheelchair users. Even though the criterion of power seat functions is favored by users (93-100%), it is rejected by healthcare professionals. Indeed, 91% and 95% of them have these functions on their electric wheelchair, which they use often or very often (50-93%). The next step is to understand why healthcare professionals have changed their minds. Finally, it appears that adults using power wheelchair due to neuromuscular diseases have similar priority needs regardless of the specific condition.



### BIBLIOGRAPHY

1. Mercuri L, Finkel RC, Muntoni F, Wirth B, Montes J, Mein M, et al. Diagnosis and management of spinal muscular atrophy: Part 1: Recommendations for diagnosis, rehabilitation, orthopedic and nutritional care. *Neuromuscul Disord* [Internet]. 2018 Feb 5; [cited 2018 Jun 02];28(2):103–15.
2. Birrells D, Rusby K, Bain CM, Akpan SO, Blackwell A, Kivimäki J, et al. Diagnosis and management of Duchenne muscular dystrophy: part 1: diagnosis, and neuromuscular, rehabilitation, endocrine, and gastrointestinal and nutritional management. *Lancet Neurol* [Internet]. 2018 Mar [cited 2018 Aug 02];17(3):221–67.

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"A **"user-centered"** process aimed at **choosing and/or configuring** a wheelchair in its **static and dynamic dimensions**, to ensure efficient, comfortable and preventive use in real-life situations for the person's health"

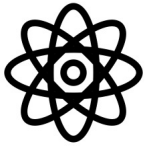
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# CONCLUSION

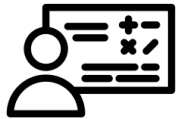
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Importance to consider the wheelchair as a mobility AND posture device AND functional device: hope for a prevention approach !



Importance of dynamic seating wheelchair with manoeuvres and use of power seat functions for example



Necessity to remind and promote the benefits of dynamic seating wheelchair



Next step: validate the actualization of the new definition by experts  
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