

## Reference

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# Benefits of microprocessor stance-and-swing phase-controlled knee-ankle-foot orthoses in a person with knee instability: A case report

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## Products

### C-Brace

## Major Findings

With NEURO HiTRONIC and C-Brace (10 weeks of daily use) compared to NEURO TRONIC (=Baseline):

→ **Clinically relevant enhanced walking and balance abilities, and balance confidence (NEURO TRONIC < NEURO HiTRONIC < C-Brace)**

- Improvement in comfortable walking speed in the six-minute walk test (6MWT)
- Improvement in the Activity Specific Confidence (ABC) scale to values indicating a reduced risk of falling

→ **Improvements in net energy cost of walking (NEURO TRONIC > NEURO HiTRONIC > C-Brace)**

→ **Improvements in perceived daily functioning (NEURO TRONIC < NEURO HiTRONIC < C-Brace) in following questionnaires:**

- OPUS-LEFS
- PROMIS mobility scale
- EQ-5D-5L index value

Only with C-Brace (10 weeks of daily use) compared to Baseline:

→ **Clinically relevant improvement in functional mobility and fall risk**

- Clinically relevant improvement in the Timed-up-and-go test (TUG) to times <13.5 sec (cutoff for fall risk)

→ **Improvements in stair and hill descend**

- Improvements in stair and hill descend indicated by higher Hill and Stair Assessment Indexes

→ **Reduction of fear of falling**

- Reduced fear of falling from high to moderate indicated by improved results in Falls Efficacy Scale-I (FES-I)

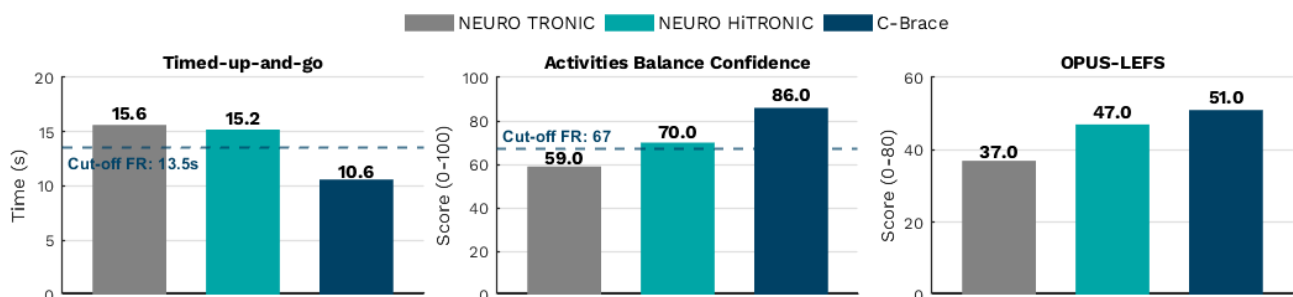
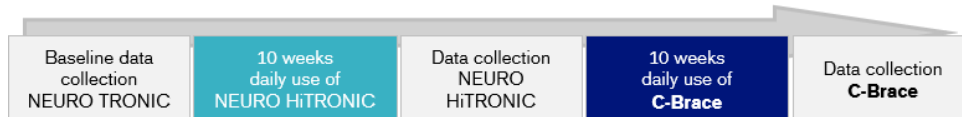


**Figure 1:** TUG, ABC, and OPUS-LEFS outcomes for the NEURO TRONIC, NEURO HiTRONIC, and C-Brace. Lower TUG values and higher ABC and OPUS-LEFS scores indicate better performance. The dashed lines indicate the TUG fall-risk (FR) cut-off (13.5 s) and ABC fall-risk cut-off (67 points).

|                   |                      |                                                            |
|-------------------|----------------------|------------------------------------------------------------|
| <b>Population</b> | Subject:             | 1 male, 67 years                                           |
|                   | Restriction & cause: | residual paresis of left leg due to polio at age of 1 year |
|                   | Previous SCKAFO:     | NEURO TRONIC, since 2020                                   |

## Study Design

Case report



The subject received 2 sessions of gait training before the daily use of the C-Brace.

## Results

|                                         |                                 |        |     |                     |                     |               |                     |
|-----------------------------------------|---------------------------------|--------|-----|---------------------|---------------------|---------------|---------------------|
| Functions and Activities                |                                 |        |     |                     |                     | Participation | Environment         |
| Biomechanics<br>– Static<br>Measurement | Biomechanics<br>– Gait analysis | X-Rays | EMG | Functional<br>tests | Clinical<br>effects | Satisfaction  | Health<br>Economics |

| Category                       | Outcomes                                                                                                                                             | Results for NEURO HiTRONIC and C-Brace                                                                                     |                |          |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------------|----------|
| Functional tests               | 6-min walk test (6MWT) [m/s]                                                                                                                         | Relevantly higher walking speed by 13.1% and 22.6%, respectively, both exceeding Minimal Detectable Change (MDC) of 12.5%. |                |          |
|                                |                                                                                                                                                      | NEURO TRONIC                                                                                                               | NEURO HiTRONIC | C-Brace  |
|                                |                                                                                                                                                      | 0.84 m/s                                                                                                                   | 0.95 m/s       | 1.03 m/s |
|                                | 6-min walk test (6MWT) – Net energy cost [J/kg/m]                                                                                                    | Reduction of net energy cost of walking by 11.4% or 12.4%, both approaching MDC (13.6%).                                   |                |          |
|                                |                                                                                                                                                      | NEURO TRONIC                                                                                                               | NEURO HiTRONIC | C-Brace  |
|                                |                                                                                                                                                      | 4.92                                                                                                                       | 4.36           | 4.31     |
|                                | Hill assessment Index (1-11)                                                                                                                         | Improvements in hill descent only with C-Brace.                                                                            |                |          |
|                                |                                                                                                                                                      | NEURO TRONIC                                                                                                               | NEURO HiTRONIC | C-Brace  |
|                                |                                                                                                                                                      | 5                                                                                                                          | 5              | 7        |
|                                | Stair assessment Index (0-13)                                                                                                                        | Improvements in stair descent only with C-Brace.                                                                           |                |          |
| NEURO TRONIC                   |                                                                                                                                                      | NEURO HiTRONIC                                                                                                             | C-Brace        |          |
| 3                              |                                                                                                                                                      | 3                                                                                                                          | 6              |          |
| Timed up and Go test (TUG) [s] | Slight reduction of time needed to perform the TUG with NEURO HiTRONIC by 2.8% vs. considerable reduction of time by 32.1% with C-Brace (MDC = 20%). |                                                                                                                            |                |          |
|                                | NEURO TRONIC                                                                                                                                         | NEURO HiTRONIC                                                                                                             | C-Brace        |          |
|                                | 15.63 s                                                                                                                                              | 15.20 s                                                                                                                    | 10.60 s        |          |

| Category                       | Outcomes                                                                                | Results for NEURO HiTRONIC and C-Brace                                                                        |                |         |
|--------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------|---------|
| Clinical effects               | Functional gait assessment (FGA)                                                        | No differences were observed.                                                                                 |                |         |
|                                |                                                                                         | NEURO TRONIC                                                                                                  | NEURO HiTRONIC | C-Brace |
|                                |                                                                                         | 16                                                                                                            | 16             | 16      |
|                                | Activities specific balance confidence scale (ABC scale)                                | Balance confidence on the ABC increased significantly by 11 and 24 points, approaching / exceeding MDC of 11. |                |         |
|                                |                                                                                         | NEURO TRONIC                                                                                                  | NEURO HiTRONIC | C-Brace |
| Satisfaction                   |                                                                                         | 59                                                                                                            | 70             | 86      |
|                                |                                                                                         | ABC scores >67 indicate reduced risk of falling                                                               |                |         |
|                                | Falls efficacy scale, short version (FES-I)                                             | FES-I score decreased by 4 points with C-Brace, mean fear of falling was reduced from high to moderate.       |                |         |
|                                |                                                                                         | NEURO TRONIC                                                                                                  | NEURO HiTRONIC | C-Brace |
|                                |                                                                                         | 16                                                                                                            | 17             | 12      |
| Satisfaction - Quality of Life | Berg balance scale (BBS)                                                                | No differences were observed.                                                                                 |                |         |
|                                |                                                                                         | NEURO TRONIC                                                                                                  | NEURO HiTRONIC | C-Brace |
|                                |                                                                                         | 54                                                                                                            | 53             | 53      |
|                                | Patient reported outcomes measurement information system (PROMIS) - mobility scale      | Improvements in the score by 1.9 with NEURO HiTRONIC and 3.6 points with C-Brace.                             |                |         |
|                                |                                                                                         | NEURO TRONIC                                                                                                  | NEURO HiTRONIC | C-Brace |
| Satisfaction                   |                                                                                         | 34.6                                                                                                          | 36.5           | 38.2    |
|                                | Orthotics and Prosthetics User's Survey - Lower extremity functional status (OPUS-LEFS) | Improvements in the score by 10 and 14 points, respectively.                                                  |                |         |
|                                |                                                                                         | NEURO TRONIC                                                                                                  | NEURO HiTRONIC | C-Brace |
|                                |                                                                                         | 37                                                                                                            | 47             | 51      |
|                                | Quality of Life (EQ-5D-5L index value)                                                  | Considerable higher EQ-5D-5L index value by 42% with NEURO HiTRONIC and by 48% with C-Brace.                  |                |         |
| Satisfaction                   |                                                                                         | NEURO TRONIC                                                                                                  | NEURO HiTRONIC | C-Brace |
|                                |                                                                                         | 0.50                                                                                                          | 0.71           | 0.74    |

## Author's Conclusion

"In conclusion, both the NEURO HiTRONIC and C-Brace microprocessor-controlled SSCKAFOs demonstrated clinically relevant benefits compared to the NEURO TRONIC SCKAFO on functional-related outcomes across walking ability, balance confidence and perceived daily functioning. The C-Brace provided greater and additional advantages over the NEURO HiTRONIC in walking speed, balance confidence, and stair and hill descent performance, likely due to its controlled knee flexion resistance functionality." (Raijmakers, 2026)

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