

Research Evidence of the Benefits of the Natural-Fit Handrim

The research evidence demonstrates that you pay a price with every push on the skinny, round tube standard handrim. The price is less efficiency, more effort, and more fatigue and pain. In contrast, the same research shows that the ergonomic grip of the Natural-Fit improves performance and efficiency with every push:

- The Natural-Fit provides a 16% reduction in effort to grip the rim.
- You can cover the same ground with less work and less fatigue.
- Multiply the effort saved on every push by 2000-3000 – that's the average number of times wheelchair users push on their handrim in a single day.

The bottom line is that the ergonomic grip matters. Every push. Every day.

Background and Details of the Research:

The Natural-Fit is the most extensively researched wheelchair handrim on the market today. Most recently, two papers have been published that demonstrate the extent to which the Natural-Fit benefits the end-user by improving the grip on the handrim, making wheelchair propulsion more efficient, and reducing pain in the hands and wrists. One paper was published in the journal *Assistive Technology* in 2006 (Volume 18, pp. 123-143) and another was published in the *Journal of Spinal Cord Medicine* in 2008 (Volume 31, pp. 62-69). Research on the Natural-Fit has also been funded by the National Institutes of Health (NIH) through their Small Business Innovation Research (SBIR) program (Grant #R43 HD39962-01). Here are some highlights from the published research:

End-User Outcomes

Two comprehensive questionnaire studies have been conducted with users of the Natural-Fit:

- In a 2004 study, 46 users completed questionnaires
- In a 2005 study, 82 users completed questionnaires
- Responses to questionnaires in both studies were anonymous
- Use of the Natural-Fit ranged from 2 weeks to over 2 years, and average duration of use was 6-9 months

The results of both questionnaires indicated that the Natural-Fit led to important reductions in pain in the hands and wrists. Since using the Natural-Fit:

- 76%-85% of respondents reported less pain in the hands
- 71%-80% of respondents reported less pain in the wrists
- Reports of reduced pain were more pronounced as time using the Natural-Fit increased

The 2005 questionnaire also examined daily function. Since using the Natural-Fit:

- 67% of respondents reported that daily tasks were "less work"
- Each of eight activities of daily living were perceived, on average, as less difficult

NIH-Funded Research: The Effect on Wheelchair Propulsion Biomechanics

The National Institutes of Health (NIH) funded research comparing wheelchair propulsion when using the Natural-Fit versus using a standard handrim.

- A prototype Natural-Fit Handrim was used during a two-week trial period with before and after measurements of propulsion efficiency.
- After the two-week period, wheelchair users generated significantly more forward force with a lower hand gripping moment (16% reduction in effort to grip the rim) with the Natural-Fit than with a standard handrim.
- With the Natural-Fit, hand gripping moments were reduced without any reduction in overall power output toward propelling the wheelchair. This means that less work was required to achieve the same outcome.
- This is the best indication of a healthier propulsion stroke with the Natural-Fit Handrim.

References for Research Summarized Above:

Koontz, A.M., Yang, Y., Boninger, D.S., Kanaly, J., Cooper, R.A., Boninger, M.L., Dieruf, K., Ewer, L. (2006). Investigation of the Performance of an Ergonomic Handrim as a Pain-Relieving Intervention for Manual Wheelchair Users, *Assistive Technology*, 18, 123-143.

Dieruf, K., Ewer, L., Boninger, D.S. (2008). Factors related to improved symptoms and function with use of the Natural-Fit contoured wheelchair handrims, *Journal of Spinal Cord Medicine*, 31, 62-69.