

# Harmony vs other socket systems

## Pistoning

### Major Findings

With vacuum-assisted socket system (VASS):

→ **A better fit of the socket is achieved during walking compared to a suction socket system**

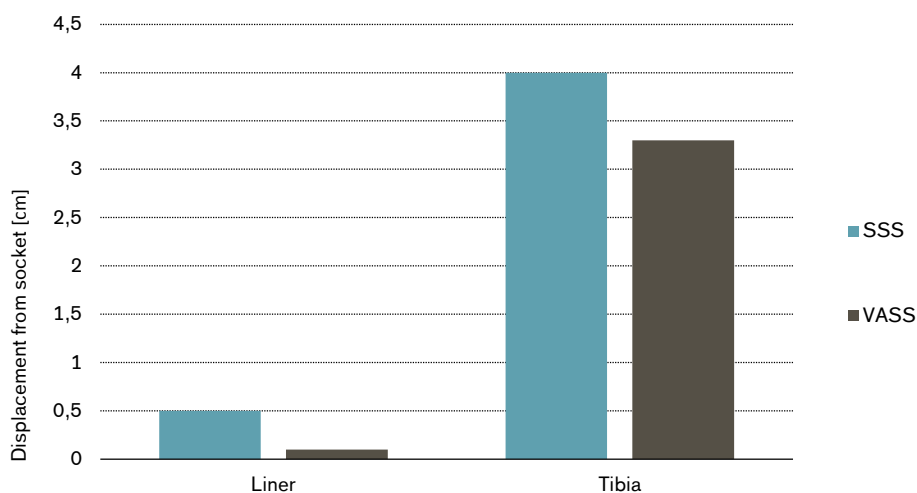
Pistoning of the liner decreased by 80%

Pistoning of the tibia decreased by 18%

→ **A better fit of the socket is achieved during weighting and unweighting the prosthesis compared to pin suspension system**

Pistoning decreased by 83%

### Decreased pistoning with VASS



For mean displacements of the liner and tibia from the socket, the unloaded conditions were subtracted from the loaded conditions. Vacuum-assisted socket system (VASS) was compared to suction socket system (SSS). (Board et al 2001)

### Clinical Relevance

Good socket fit results in comfort of the amputee, health of the skin and the effective transfer of forces from the residual limb to the socket, such that the amputee has better control over the prosthesis and can perform daily activities without damaging tissue or experiencing pain.

### Summary

A better socket fit is achieved with VASS compared to a suction socket system, measured by reduced liner displacement (80% lower) and tibia displacement (18% lower) relative to the socket (Board et al 2001). Also Klute et al (2011) showed that the changes of distance between the prosthesis and the residual limb was decreased with VASS (1 mm) compared to the pin suspension system (6 mm). Therefore, a better fit is maintained with a vacuum condition.

A study investigating the effect of different socket types in combination with electronic VASS on transfemoral amputees, showed, that the vertical movement tended to be decreased by 44% with brimless compared to ischial ramus containment (IRC) socket design (Kahle & Highsmith 2014).

## References

| Year | Author | Title   |
|------|--------|---|
| 2014 | Kahle  | The effects of vacuum-assisted suspension on residual limb physiology, wound healing, and function: A systematic review   |
| 2014 | Kahle  | Transfemoral sockets with vacuum-assisted suspension comparison of hip kinematics, socket position, contact pressure, and preference: Ischial containment versus brimless |
| 2011 | Klute  | Vacuum-Assisted Socket Suspension Compared With Pin Suspension for Lower Extremity Amputees: Effect on Fit, Activity, and Limb Volume                                     |
| 2006 | Street | Vacuum Suspension and its Effects on the Limb   |
| 2001 | Board  | A comparison of trans-tibial amputee suction and vacuum socket conditions   |

Board, W. J., Street, G. M., & Caspers, C. (2001). A comparison of trans-tibial amputee suction and vacuum socket conditions. *Prosthetics and Orthotics International*, 25(3), 202–209. doi:10.1080/03093640108726603

Kahle, J. T., Orriola J.J., Johnston W., & Highsmith, M. J. (2014). The effects of vacuum-assisted suspension on residual limb physiology, wound healing, and function: A systematic review. *Technology & Innovation*, 15(4), 333–341.

Kahle, J. T., & Highsmith, M. J. (2013). Transfemoral sockets with vacuum-assisted suspension comparison of hip kinematics, socket position, contact pressure, and preference: Ischial containment versus brimless. *Journal of Rehabilitation Research and Development*, 50(9), 1241–1252. doi:10.1682/JRRD.2013.01.0003

Klute, G. K., Berge, J. S., Biggs, W., Pongnumkul, S., Popovic, Z., & Curless, B. (2011). Vacuum-Assisted Socket Suspension Compared With Pin Suspension for Lower Extremity Amputees: Effect on Fit, Activity, and Limb Volume. *Archives of physical medicine and rehabilitation*, 92(10), 1570–1575. doi:10.1016/j.apmr.2011.05.019

Street, G. M. (2007). Vacuum Suspension and its Effects on the Limb. *Orthopädie-Technik*, 04, 1–4.

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