For most of us, locomotion's dual tasks of creating forward propulsion while maintaining postural control are smoothly integrated into an effortless accomplishment that forms the backdrop for many of our other daily activities. At each end of the life spectre, however, these dual tasks can present quite a challenge to infants and frail elderly. Lacking experience and the proper sub-skills, infants spend years acquiring and perfecting the art of locomotion. Frail elderly, on the other hand, have many decades of experience but increasing functional limitations and underlying diseases may force them to adjust their routines. Although both groups are struggling with the same task, the underlying constraints and thus the resulting challenges are different. In this presentation, we investigate what we can learn by comparing strategies of posture and gait that infants and frail elderly employ to cope with these challenges. To this end, we will take a look at several variables: base of support, the division between double support and single support phases, and variability in strategies.

The base of support is created by foot placement and reflects strategies of postural control. Infants learning to walk typically expand their base of support by making shorter steps, placing their feet wider apart and rotating their feet outward. Although frail elderly also tend to shorten their steps, some narrow their base of support while others tend to widen their base of support, for example elderly with dizziness or after being physically fatigued.

The division of a step cycle in double support and single support phases also reveals strategies of postural control. Here, infants employ several strategies. One strategy is to throw oneself forward and walk while falling. This results in short stride times and short periods of double and single support. Another strategy is to balance the body on two feet, make a careful step forward, shift weight, and re-balance again on both feet. A third subgroup swivels itself around its longitudinal axis to make a step forward, also resulting in prolonged periods of double support prior to and following a step. Frail older persons walk slowly and tend to have both feet on the ground a higher percentage of the gait cycle than healthy persons walking at the same speed.

Finally, we will present some data on the variability in strategies of posture and gait. Infants typically explore their possibilities and limitations, endlessly varying their movements in their quest for proficient solutions. Frail elderly tend to be less active and display more stereotypical solutions that can vary between subgroups. For example, sideways acceleration during gait is characterized by low variability, whereas more variability is displayed in the direction of propulsion. Increased step variability is found both sideways and in the forward/backward direction.

These results will be discussed with respect to maintaining mobility in old age.

Keywords: Biomove session, Motor Control, Variability