Further, the distance from the floor to the earlobe joint was highly significant decreased of different loads when compared to the 0% body weight load. And no significant changes were found in step length between the 20% and 30% load conditions.

The results of this study demonstrate that with the increase of the backpack weight, the distance from the floor to the earlobe joint and trunk motion range have been decreased, simultaneously step length and trunk inclination angle have been increased.

The findings showed that there is a significant positive relationship between load conditions and trunk inclination angle and the same relationship between load conditions and the step length on the other hand this relationship was negative compared with the distance from the floor to the earlobe joint.

Based on the questionnaire, 55.3% of the students walk by foot in which 45.70% walk a distance more than 1 km from their house door to the school. In addition, the average weight of the students’ backpacks is 16.7% of their body weight.

76 schoolchildren from Saarland, Germany participated in the experiment. The participants (age = 6.7 ± 0.6 years, height = 122.9 ± 6.1 cm, weight =23.83 ± 3.7 kg, BMI = 15.7 ± 1.6 kg/m²) with different backpack weights (0%, 10%, 20% and 30% body weight) were walking on the treadmill at speed of 3 km/h for 20 minutes duration, 5 minutes for each backpack weights.

The video recordings were made at the last 10 seconds of each five-minute walk. In examination, three complete gait cycles or six step lengths were taken for one time point.

![Figure 1: without a backpack](image1)
![Figure 2: 10% of body weight](image2)
![Figure 3: 20% of body weight](image3)
![Figure 4: 30% of body weight](image4)

**Terminology**

Regular: 

- **n.s.** not significant
- **p = 0.000** significant

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**Literature**


