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The effects of 4 months handbike training under free-living conditions on physical fitness and health outcomes

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Abstract

Purpose Handcycling has become a popular mode of propulsion to engage in a physically active lifestyle for wheelchair-bound individuals. Recognizing the encouraging effect of challenging events to initiate training, the HandbikeBattle (HBB) event was created in 2013. During this event, former patients of 9 Dutch rehabilitation centers complete a 20.2 km mountain time trial with 863 meters elevation gain in a handbike (Fig. 1). The purpose of this study was to reveal the effects on physical fitness and health outcomes of 4 months handbike training under free-living conditions in preparation for this event.

Methods 59 Relatively inexperienced handcyclists participated in the HBB of 2013 or 2014. Before (T1) and after (T2) the 4-months training period preceding the event, incremental exercise tests were conducted to determine peak power output (POpeak) and peak oxygen uptake (VO₂peak), respiratory function was tested (forced vital capacity (FVC), peak expiratory flow (PEF)), and anthropometrics were measured (body mass index (BMI) and waist circumference). Changes in outcome measures were tested using repeated measures ANOVA for T1 and T2. To detect possible determinants of large improvements in physical fitness, the median of change in POpeak was used to compare the groups with improvements above and below this value for age, gender, classification, time since injury, POpeak at T1, and shoulder complaints during the training period.

Results The main outcome measures POpeak, VO₂peak and waist circumference improved significantly with 17%, 7% and 4.1%, respectively. The changes in POpeak for each participant individually are shown in figure 2. Furthermore, BMI and PEF improved significantly during the training period as well (2.1% and 3.8%, respectively). FVC, however, was the only measured variable that did not improve significantly. Only age could be detected as possible determinant for large improvements in physical fitness, with an older age for the group with large improvements (43.7 vs. 35.3 years).

Conclusion A challenging event such as the HBB provokes training regimes among participants of sufficient load to realize substantial improvements in physical fitness and health outcomes. Since only age could be detected as a determinant for large improvements in POpeak, insight in the conducted training of handcyclists in free-living conditions is needed in future research. The use of modern technology to monitor handbike training (e.g. online training-logbooks, heart rate monitors and power meters) is necessary to get a better understanding in the positive effects of handbike training on physical fitness and health.

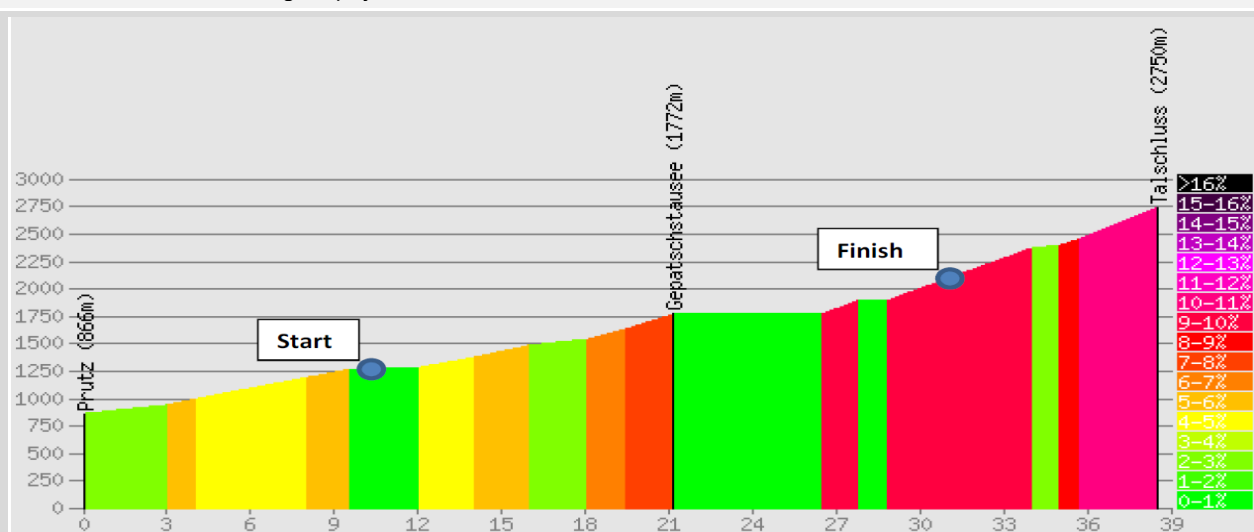


Figure 1. The profile of the 20.2km mountain time trial on the Kaunertaler Gletscherstrasse (Austria).

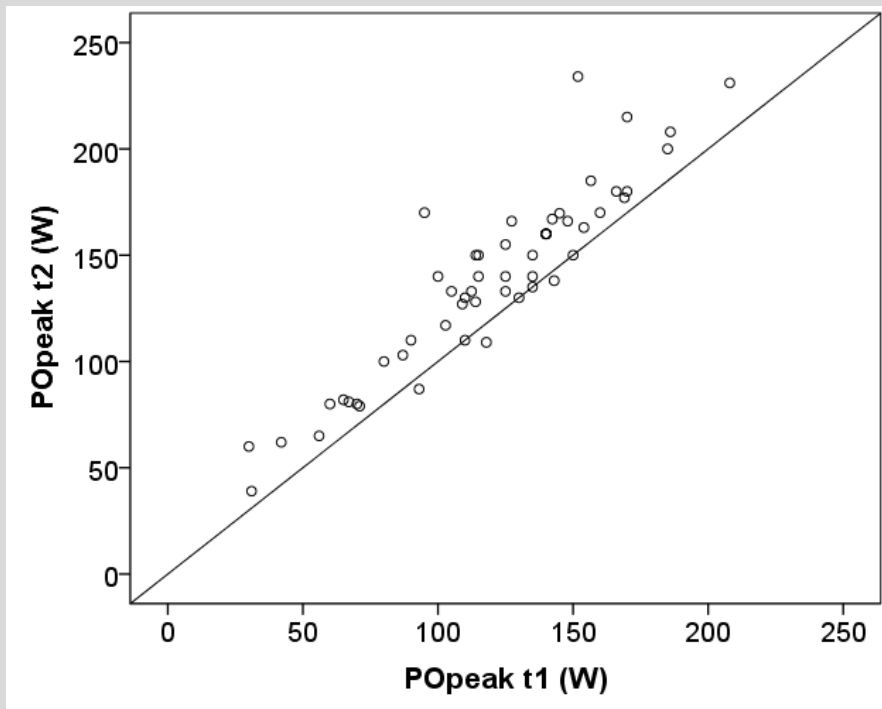


Figure 2. Scatterplot to compare POpeak results of the incremental exercise tests on T1 and T2 (n=51). Data points lie predominantly above the line of identity, indicating an improvement of POpeak over time for those participants.

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