Since physical inactivity especially prevails during winter months, we set out to identify outdoor alternatives to indoor cycling (IC) by comparing the metabolic and cardiorespiratory responses during alpine skiing (AS), cross-country skiing (XCS) and IC and analyse the effects of sex, age and fitness level in this comparison. Twenty one healthy subjects performed alpine skiing (AS), cross-country skiing (XCS), and IC. Oxygen uptake (VO$_2$), total energy expenditure (EE), heart rate (HR), lactate, blood glucose and rate of perceived exertion (RPE) were determined during three 4-min stages of low, moderate and high intensity. During XCS and IC VO$_{2\text{max}}$ and EE were higher than during AS. At least 2½ hours of AS are necessary to reach the same EE as during one hour of XCS or IC. HR, VO$_2$, lactate, and RPE$	ext{arms}$ were highest during XCS, whereas RPE$	ext{whole-body}$ was similar and RPE$	ext{legs}$ lower than during AS and IC, respectively. Weight adjusted VO$_2$ and EE were higher in men than in women while fitness level had no effect. Male, fit and young participants were able to
increase their EE and VO2 values more pronounced. Both AS and XCS can be individually tailored to serve as alternatives to IC and may thus help to overcome the winter activity deficit. XCS was found to be the most effective activity for generating a high EE and VO2 while AS was the most demanding activity for the legs. Key points: During cross-country skiing and indoor cycling VO2max and energy expenditure were higher than during alpine skiing. Approximately 2½ hours of alpine skiing are necessary to reach the same energy expenditure of one hour of cross-country skiing or indoor cycling. Alpine skiing and cross-country skiing can be individually tailored to serve as sports alternatives in winter to activity deficit. By applying different skiing modes as parallel ski steering, carving long radii and short turn skiing, metabolic and cardiorespiratory response can be increased during alpine skiing. Male, fit and young participants were able to increase their energy expenditure and VO2 more pronounced with an increase in intensity compared with their counterparts.

Stichworte: Borg, blood lactate, cross-country skiing, cycling, energy expenditure, fitness level, oxygen uptake, gender

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