Measurements of the coefficient of dynamic friction for Cross-country skiing

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In cross-country skiing, the result of competition depends on the preparation whether we can prepare the skiing equipment having an appropriate friction between the ski and the snow surface. The previous researches on the friction reported that coefficient of dynamic friction (μ) is associated with the material and the shape of ski. The selection of the shape and materials is possible to prepare in advance. On the other hand, the wax also related to the μ, has been selected empirically by the weather conditions. According to the previous report, μdepends on temperature and snow temperature; $\mu$is under (over) 0.05 (0.10) when the temperature is one (seven) degrees and snow temperature is minus four (zero) degrees, respectively. The selection of optimum wax should be judged form the physical results of quantitative measurements. It would be desirable to measure the μat the site of the venue. Although there have been reports of the μmeasurements in the laboratory, the difficulty arises when we use in the venues because the instruments are too large (6m length). Our study aims 1) to develop a compact instrument to measure the coefficient of dynamic friction between ski and snow surface, and 2) multi-point meteorological observations on the venue for cross-country skiing. This study focused on 1).
The ski carrying on the weight of 5Kg is connected to the force gauge. To develop a compact instrument, it has become the 90 degrees bending structure by pulley. The weight was moved 1m at a constant speed using an electric reel. The tension measured by force gauge was recorded by intervals of one tenth second. The average tensile force as F, we deduced the coefficient of dynamic friction μ, using the equation of $\mu= F / 5$ (Kg) ×9.8.

Keywords: cross-country skiing, coefficient of dynamic friction