Sustained swimming at moderate speeds is considered beneficial in terms of the productive performance of salmonids, but the causative mechanisms have yet to be unequivocally established. In the present study, the effects of moderate exercise on the bioenergetics of rainbow trout were assessed during a 15 week growth experiment, in which fish were reared at three different current speeds: 1 BL s\(^{-1}\), 0.5 BL s\(^{-1}\) and still water (approximate to 0 BL s\(^{-1}\)). Randomly selected groups of 100 fish were distributed among twelve 600 L tanks and maintained on a restricted diet regime. Specific growth rate (SGR) and feed conversion ratio (FCR) were calculated from weight and length measurements every 3 weeks. Routine metabolic rate (RMR) was measured every hour as rate of oxygen consumption in the tanks, and was positively correlated with swimming speed. Total ammonia nitrogen (TAN) excretion rates showed a tendency to decrease with increasing swimming speeds, yet neither they nor the resulting nitrogen quotients (NQ) indicated that swimming significantly reduced the fraction of dietary protein used to fuel metabolism. Energetic budgets revealed a positive correlation between energy expenditure and the current speed at which fish were reared, fish that were forced to swim and were fed restrictively consequentially had poorer growth and feed utilization. The results show that for rainbow trout, water current can negatively affect growth despite promoting minor positive changes in substrate utilization. We hypothesize that this may be the result of either a limited dietary energy supply from diet restriction being insufficient for both covering the extra costs of swimming and supporting enhanced growth.