This thesis investigated endurance training adaptations in different phases of the menstrual cycle in non-OC users as well as in OC users. Remarkable differences in trainability were observed between follicular phase-based compared to luteal phase-based trainings as well as between non-OC users and OC users.

The follicular phase-based endurance training showed remarkably higher increase \( (p = 0.038) \) in maximal power output after 12 weeks compared to the luteal phase-based training in non-OC users whereas no difference was observed between quasi-follicular phase- and quasi-luteal phase-based training in OC users.

The hormone analysis on day 11 and on day 25 of the menstrual cycle revealed different hormone milieus between non-OC users and OC users. In non-OC users, the androgen hormones such as estrogen and testosterone were significantly higher in the follicular phase as compared to in the luteal phase. In contrast, progesterone level was significantly higher in the luteal phase. These different hormone milieus might have induced higher training adaptation in the follicular phase compared to the luteal phase.

Estrogen is known to have positive influences on carbohydrate, fat and protein metabolism and it was also repeatedly reported to be an important factor for increasing endurance capacity. In contrast, progesterone displays anti-estrogenic effects and is suspected to enhance protein catabolism in the luteal phase. Therefore, many researchers suggest the ratio of estrogen and progesterone \((E/P)\) over the course of the menstrual cycle to be taken into account. In non-OC users, ratio of \(E/P\) was the highest in FP and the lowest in LP indicating that high \(E/P\) in FP could allow estrogen to mitigate the anti-estrogenic actions of progesterone.

In contrast to non-OC users, concentrations of estrogen, testosterone and progesterone did not differ significantly between the quasi-follicular phase and the quasi-luteal phase in the subjects taking combined monophasic oral contraceptives. Due to the intake of constant concentrations of exogenous estrogen and progesterone over 21 days, the endogenous androgen hormones are suppressed and remain nearly unchanged during
the OC consumption phase. Therefore, OC use caused indifferent levels of estrogen, progesterone and testosterone resulting in comparable trainability between the two phases.

Based on the above described main outcomes, we recommend that non-OC users should consider their individual menstrual cycle for scheduling endurance training sessions, since trainability seems to be effected by the menstrual phase when the stimulus is set with highest results after follicular phased-based training. Furthermore, OC users can perform endurance training without concerning their menstrual cycle, because cycle phase does not have any influences on training adaptation.

Comparing effects of endurance training between non-OC users and OC users, the luteal phase-based training in non-OC users induced the lowest increase in parameters of endurance capacity, while the highest concentration of progesterone was detected, all compared to the training in the follicular phase in non-OC users, in the quasi-follicular phase in OC users and in the quasi-luteal phase in OC users. Moreover, OC users showed a more stable hormonal milieu over the course of the menstrual cycle, resulting in more stable endocrine condition for training adaptation compared to non-OC users during the consumption phase.

Nevertheless, the number of subjects in both studies was small so that final conclusions should be drawn carefully. Therefore, the suspicious lower endurance capacity in the luteal phase in non-OC users should be confirmed in studies with a larger number of subjects to clarify the underlying hormonal influences of endurance training over the course of the menstrual cycle in non-OC users and OC users. Furthermore, endurance training periodization studies with respect to the withdrawing phase, when endogenous production of sex steroid hormones is induced again, as well as larger studies with OC preparations of different androgenicity should be analyzed in future studies in order to better understand the underlying mechanisms of endurance training adaptation in OC users.