High-intensity exercise may induce cause unfavorable disturbances in the nitric oxide / reactive oxygen species balance and have the opposite effect. In contrast, endothelial function indeed appears to be impaired in individuals submitted to high-intensity, sustained aerobic training. For instance, elite Olympic athletes trained for aerobic sports show impaired flow-mediated dilation of the brachial artery, compared to non-trained, age- and sex-matched control subjects. Usually, professional military members personnel are required to perform regular and demanding intensive physical training, including endurance and resistance exercise, to maintain high-level physical fitness and military skills for the physically demanding tasks they perform. Nevertheless, high-intensity aerobic physical activity exercise during special military training- as for riot control-associated with unfavorable climatic conditions, such as high temperature and humidity, can also lead to adverse effects. For instance, the risk of exertional rhabdomyolysis and death in military personnel who engage consistently in regular and strenuous exercise is higher than in the civilian population. Riot-control agents, which are frequently used in military settings, include o-chlorobenzylidene malonitrile (CS), which is grouped with several other irritant agents referred to as “tear gas” and pepper (capsaicin) spray. These agents are generally supposed to be sub lethal irritant incapacitants. The main toxic prominent effects of these agents are related to respiratory, ocular, gastrointestinal and cutaneous alterations. Nevertheless, cardiovascular effects, including tachycardia and transient hypertension, have been already described. These effects appear to be related to sensory-autonomic reflexes, or anxiety, pain, or psychological distress. Interestingly, it has already been reported that appearance toxic symptoms after heavy exposure to CS in a field training setting may be associated with strenuous physical exercise. The physiological imbalances induced by all these factors involved in special military training may ultimately have impact on the microcirculation, the responsible for tissue perfusion. The main aim of the present study is to evaluate the effects of strenuous exercise, related to special military training for riot control, on systemic microvascular endothelial function and skin capillary density. Materials and Methods: Endothelium-dependent microvascular reactivity was evaluated in the forearm skin of healthy military trainees (age 23.4 ± 2.3 yr; n = 15) using laser speckle contrast imaging coupled with cutaneous acetylcholine (ACh) iontophoresis and post-occlusive reactive hyperemia (PORH). Functional capillary density was assessed using high-resolution, intra-vital color microscopy in the dorsum of the middle phalanx. Capillary recruitment (capillary reserve) was evaluated using PORH. Microcirculatory tests were performed before and after a 5-wk special military training for riot control. Results: Microvascular endothelium-dependent vasodilatory responses were markedly and significantly reduced after training, compared with values obtained before training. The peak values of microvascular conductance obtained during iontophoresis of ACh or PORH before training (0.84 ± 0.22 and 0.94 ± 0.72 APU/mmHg, respectively) were markedly reduced after training (0.47 ± 0.11 and 0.71 ± 0.14 APU/mmHg; p < 0.0001 and p = 0.0037, respectively). Endothelium-dependent capillary recruitment was significantly reduced after training (before 101 ± 9 and after 95 ± 8 capillaries/mm2; p = 0.0007). Conclusions: The present study showed that a 5-wk strenuous military training, performed in unfavorable climatic conditions, induces marked systemic microvascular dysfunction, mainly characterized by reduced endothelium-dependent microvascular vasodilation and blunted capillary recruitment.