

---

## Mechanisms Of Fatigue In Off Road Motorcycle Athletes

Motorcycle racing is high speed, mentally challenging and physically demanding. Motorcycle racing includes; road racing, motocross, supercross, endurance and rally racing. Road racing is a speed contest on specially designed asphalt circuits. Motocross and supercross are off-road disciplines that feature man made dirt courses of jumps and tight turns. Endurance and rally races are long-distance races which tests the ability and durability of the rider. The best example of endurance racing is the Dakar Rally with riders navigating 5,000 kms of gravel, dirt, sand, mud, streams and extreme weather changes. This review aims to investigate fatigue and underperformance in off road motorcycling athletes. This review will not explore fatigue and underperformance in road racing motorcycle athletes.

Fatigue and underperformance in off road motorcycle athletes can be attributed to a number of factors. The published literature on physiological fatigue in off road motorcycle athletes identifies high than normal blood lactate levels leading to metabolic acidosis, an increase in plasma oxidative stress and damage and significant increases in blood flow and hemodynamic variables and as the main physiological factors that hinder recovery and result in fatigue.

Off road motorcycle racing involves both aerobic and anaerobic demands. Endurance and cross country rally racers have similar anthropometric and physiological characteristics to healthy control individuals, while motocross racers have more muscle mass, superior isokinetic strength and greater aerobic power compared to healthy controls (Gobbi, Francisco, Tuy & Kvitne, 2005).

Fatigue in off road motorcycling racing motocross is primarily due to the constant jumping and landing movements and the continual involvement of all muscle groups. Oxidative stress can impede the body's ability to function by creating free radicals. Over time oxidative stress can have serious consequences damaging cells, decreasing cardiovascular health and inducing fatigue and underperformance. Ascensao et al., (2007) studied ten elite athletes and found that motocross resulted in an increase in plasma oxidative stress and damage.

Sanna et al., (2017) studied the hemodynamic changes in fifteen off road endurance athletes. They noted substantially increased cardiovascular stress as measured by an increase in Heart Rate (HR), Stroke Volume (SV) Cardiac Output (CO), and an increased Ventricular Emptying Rate (VER) which resulted in an increased Ventricular Filling Rate (VFR). In addition, studies conducted by (Ascensao et al., 2008; Simoes, Crisp, Verlengia & Pellegrinotti, 2015) concluded that the high intensity of off road racing increased blood lactate levels and impaired maximal isometric handgrip strength resulting in muscle fatigue and a decline in performance.

Chronic Exertional Compartment Syndrome (CECS), known as arm pump in off road motorcycle racers is a neuromuscular condition that triggers fatigue and underperformance. The published literature on neuromuscular fatigue indicates that CECS results in a loss of feeling in the fingers, wrist and hand. Studies by (Goubier & Saillant, 2003; Torrado, Cabib, Morales, Valls-Sole & Marina, 2015) examined the mechanisms of neuromuscular fatigue of motorcycle racers.

Goubier and Saillant (2003) measured the forearm compartmental pressures of two elite off

---

road motorcycle racers before and after a simulated race. The combination of vibration, grip and repeated arm movements increases blood flow causing a growth in muscle volume up to 20 per cent. They observed handgrip weakness and determined the increase in compartmental pressure resulted from the continuous contraction of the flexor muscle.

Torrado, Cabib, Morales, Valls-Sole and Marina (2015) simulated the braking and throttle actions of motorcycle racers. The forearm muscles are encased in a thin non-elastic membrane. They evaluated the results of twelve participants and determined that repetitive contractions of the forearms explained why the forearm filled with blood and lactic acid and hindered the ability of racers to perform with the degree of accuracy that is required.

Fatigue and underperformance may also be the product of anxiety, fear, or a lack of sleep. The published literature on sleep deprivation in motorcycle riders indicates that sleep deprivation affects concentration and impairs performance. Bougard and Davenne (2011) examined the effects of sleep deprivation on motocross performance. They used a combination of laboratory and field tests and tested the balance, flexibility and maximal anaerobic alactic power of eight motocross racers. This study was limited by the small sample, but they found sleep deprivation significantly affected muscular performance in the laboratory tests. They suggested the results indicated the risk of injury increased when a rider was affected by a lack of sleep.

In addition, (Mohd Talib et al., 2015) explored the symptoms of fatigue in motorcyclists. They concluded that psychological fatigue, demonstrated by a decline in concentration and slow reaction times contributed to underperformance. They also concluded that these symptoms lead to sleepiness which contributed to motorcycling accidents.

In conclusion, off road motorcycle competition requires competitors to have endurance, versatility, strength, control and superior coordination to overcome the toughest terrain and obstacles. The published research indicates a variety of physical, physiological and psychological factors play a role in the failure of athletes to recover from competition racing and contribute to fatigue and underperformance. The small sample size of some of the research constrains the results and further research is needed to confirm the findings.