

# Conditions Index

## General

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The physiological process of overheating has obvious implications for one's ability to perform cognitively, as well as physically. Early research into this has shown that personal climatisation devices, such as cooling or heating office chair backrests, significantly improve the thermal comfort of users and their cognitive abilities (Rønneseth, 2018).

## Pressure sores and ulcers

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All wheelchair users can be prone to pressure ulcers due to the prolonged periods of sitting. Changes to the skin microclimate—that is, the temperature, humidity, and airflow next to the skin surface—affects the structure and function of the skin, potentially causing damage (Kottner et al., 2018). For instance, when a patch of skin is warmed beyond 33°C (depending on core temperature), local perspiration in the region increases and the accompanying moisture softens the skin (maceration), which makes it more susceptible to breakdown (Lachenbruch, 2005) and increases the risk of pressure ulcers (Kottner et al., 2018).

## Epilepsy

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Overheating and temperature changes are commonly cited triggers for seizures among wheelchair users with epilepsy. Brief heat alone increased brain excitability and induced multiple types of seizures, suggesting that mutations may alter brain thermoregulation and precipitate seizures during temperature elevations (Warner et al., 2017).

## Spinal cord injury (SCI)

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Individuals with a SCI have impaired autonomic thermoregulation, causing a loss of vasomotor control and sweating below the level of lesion due to the disruption of the sympathetic nervous system (Yoda et al., 2015). Consequently, they are susceptible to hyperthermia and subsequent heat exhaustion and even heat stroke.

## Multiple Sclerosis (MS)

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Of all the people living with MS, it is estimated that up to 80% experience temporary worsening of clinical signs and neurological symptoms, and symptomatic premature fatigue with heat exposure (Davis et al., 2010). Heat sensitivity is one of the primary barriers to performing daily activities and participating in exercise and rehabilitation (Reynolds et al., 2011).

## Cerebral Palsy (CP)

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People with CP typically display an impairment in muscular coordination and movement efficiency which results in a greater metabolic cost of movement for a set intensity, relative to able-bodied individuals (Griggs et al., 2020). As a result, metabolic heat production for a given external workload is significantly greater in those with CP (Maltais et al., 2004). This lower efficiency of movement and higher energy cost can cause an earlier onset of fatigue, exacerbated by an additional environmental heat load (Griggs et al., 2020).

## Muscular dystrophy (MD)

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Muscular dystrophies (MD) currently comprise over 30 clinical disorders, and are characterised by progressive skeletal muscle weakness and wasting (Morgan & Zammit, 2010). Skeletal muscles represent up to 35% to 45% of total body mass and are responsible for many vital functions including thermoregulation (Dufresne et al., 2015). In some MD impairments of the autonomic nervous system have been described with all the consequences for thermoregulation.

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## Medication and thermal regulation

Many classes of drugs can predispose their users to heat-related illnesses, including heat stroke. Among heat-interacting medications are antidepressants, antihistamines, antipsychotics, and diuretics. Drugs can interfere with normal thermoregulatory function in multiple ways, mediated through: the hypothalamus, which sets normal body temperature; changes in cardiac output, peripheral vasodilation, sweat rate or due to renal function and/or body dehydration (Lomax et al. 1998).

## Hyperhidrosis:

Hyperhidrosis is a common condition in which a person sweats excessively. As such, maintaining a stable body temperature is important to avoid excessive sweating, which can lead to skin conditions, body odor, and have an emotional impact on emotional wellbeing.

## Ehlers Danlos syndrome (EDS)

Patients with EDS can have problems with their thermoregulation due to dysautonomia, therefore they are more prone to experiencing heat related discomfort.

## Autonomic neuropathy & Central nervous system (CNS) disorders

Thermoregulation, in response to cold and heat stress, is a vital function of the autonomic nervous system. By keeping body core temperature within a degree or two of 37°C, thermoregulation sustains a healthy body and enables normal cellular function. Autonomic neuropathy, such as small fiber neuropathy, diabetic neuropathy, cholinergic neuropathy, autoimmune autonomic ganglionopathy, and CNS disorders have an impact on the body's ability to regulate the temperature, which can result in all kinds of heat induced symptoms and can even cause heat stroke (William, 2016).

## Skin conditions

Sitting for long periods can mean that parts of the skin are not sufficiently exposed to circulating air throughout the day. This heightens the risk of developing heat rash because the sweat ducts are unable to "breathe" properly (evaporative cooling). Furthermore, repeated exposure to heat also means that these rashes may inflame the deeper layer of the skin. Heat rash can be especially dangerous if it affects large areas of skin since the lack of ability to sweat in those regions can lead to heat-related illnesses like heat cramps, heat exhaustion, or heat stroke. Heat and moisture also play a role in other skin conditions. Conditions like cholinergic urticaria (heat hives), psoriasis, and eczema can be aggravated or induced by heat.

## Autoimmune diseases

There are more than 80 types of autoimmune diseases (e.g. type 1 diabetes (Yardley et al. 2013), rheumatoid arthritis, systemic lupus erythematosus, inflammatory myopathies, MS, Sjögren syndrome, and inflammatory bowel disease), in which the immune system attacks your own healthy cells by mistake. For many people with an autoimmune disease, heat makes their symptoms worse and they experience heat intolerance. This can trigger flare-ups that include excessive fatigue, muscle aches, pain, inflammation and swelling, as well as an increased risk of overheating for some.