

**TABLE.** Commonly Cited Risk Factors for Heat-related Illnesses

Risk Factor	Supporting Evidence
Biological	
Sex	Evidence for sex as a risk factor is mixed and may depend upon illness severity or sociological factors. A case-control analysis that directly evaluated sex and EHS risk found no sex influence, but studies investigating prevalence by heat illness severity show conflicting findings: Earlier findings show women at a greater EHS risk, while more recent findings show men at greater EHS risk and women at greater heat exhaustion risk. If sex difference for heat-related illness risk exists, it may not be related to physiological but, instead, cultural or practical factors (for example, anecdotal reports from allied militaries state that some women may voluntary dehydrate due to limited latrine access, but this remains to be investigated). <sup>7,28,29,38</sup>
Race and ethnicity	Non-Hispanic Black individuals appear to be at greater risk for heat illness, but physiological factors are unclear. Individuals with sickle cell trait (more prevalent in non-Hispanic Black individuals) have increased risk of heat illness, but race has been shown previously to increase risk independent of sickle cell trait status. <sup>39</sup>
BMI	Each 1 unit increase in BMI is associated with 3% increase in relative EHS risk, along with higher risk of more minor heat illness. <sup>7</sup>
Physiological	
Acclimatization	Gradual adaptation to heat decreases heat illness risk. <sup>3,23</sup>
Poor physical fitness	Poorer fitness status increases risk for heat-related illness. <sup>10,26</sup>
Respiratory infection	Respiratory infections affect risk for all forms of heat illness. <sup>29</sup>
Behavioral	
Hydration	Hydration before and during activity can reduce risk of heat-related illness. Dehydration increases body temperature during training in heat and increases rate of body temperature rise. Dehydration may influence performance and ability to continue activity. While starting an activity well-hydrated and remaining hydrated help reduce heat illnesses risk, hydration alone does not protect individuals from heat illness. Hydration is only 1 of many risk mitigation measures. Avoiding alcohol 48-72 hours prior to training can help maintain appropriate hydration, as alcohol acts as a diuretic. <sup>40</sup> Alcohol can also induce fatigue or alcohol-related symptomology during training. <sup>41-43</sup>
Supplementation and medication	Certain medications and supplements (e.g., stimulants) can increase body temperature, with potential increased heat illness risk, but no direct risk analysis has been conducted. Energy drinks with high amounts of caffeine and supplements are not regulated by the FDA and may contain harmful ingredients that can exacerbate elevated body temperature during exercise and heat stress, and may may influence heat-related illness risk. <sup>44-46</sup>
Sleep	Although often characterized as a risk factor, there is limited evidence to support the assertion that sleep deprivation is a risk factor for heat illness; no physiological mechanism is known. Adequate sleep may help ensure best preparation for training and thereby aid risk reduction for heat-related illness. <sup>47</sup>
Personal motivation	Individuals inclined to exert themselves harder (e.g., candidates for promotion or elite level training) are at increased risk if inclined to ignore or minimize accepted physiological or perceptual indicators of fatigue or overheating. <sup>48</sup>
Environmental	
Weather	Radiant heat load and humidity are factors in high WBGT, an aggregate temperature measure incorporated in DOD guidelines, which allow for flexible training times (e.g., earlier in the day), reduced radiant heat loads, work-to-rest ratios, and fluid replacement guidelines. Other weather factors such as heat index or UTCI have been proposed, but the most widely accessible, with greatest data, is WBGT. <sup>49-51</sup>
Load carriage	Higher weight loads intensify body heat production and thereby increase physical burden to diffuse that heat. <sup>9</sup>
Clothing	Greater clothing insulation (e.g., Army combat uniforms) increase thermal load of an activity by decreasing capacity for heat dissipation. <sup>9</sup>

Abbreviations: EHS, exertional heat stroke; BMI, body mass index; FDA, Food and Drug Administration; WBGT, wet-bulb globe temperature; DOD, Department of Defense; UTCI, Universal Thermal Climate Index.