REST HUB
Environment Ready

Heat Acclimation & Acclimatisation

Heat acclimation/acclimatisation are critical strategies for optimally preparing athletes to compete in thermally challenging environments. Repeated exposure to hot/dry or hot/humid conditions maximises physiological adaptations, thereby improving athlete performance, health, and thermal comfort in the heat. It may also be used as a training stimulus (e.g., during pre-season training camps or rehabilitation from injury).

Heat acclimatisation involves exposure to thermally stressful outdoor conditions that induce a rise in skin and core temperatures, and profuse sweating. When heat acclimatisation is not possible, heat acclimation can be prescribed, involving exposure to thermal stress in an artificial environment (e.g., heat chamber or tent, sauna, hot bath).

Implementation

Ideally, heat exposures should occur across consecutive days, for a minimum of 4-7 days. The majority of physiological adaptations occur during the first 7 days of heat exposures (Figure 1).

For more complete adaptations and an improved retention of physiological adaptations, ~15-21 exposures across a 3-4 week period may be optimal.

To maximise heat adaptations, accumulate time where core (38.5-39.5 °C) and skin temperatures (≥35 °C) are elevated, and sweating is profuse. This can be achieved via active or passive exposure:

Active exposure	Can be implemented immediately following a regular training session or as a standalone session. Where possible, environmental conditions should replicate, or be more thermally stressful, than those anticipated at the competition location to ensure specificity of adaptations. As a guide, aim for standalone sessions to be ≥60 minutes in duration[1]. Following a warm-up, aim for a steady state heart rate (HR) of ~75-85% of maximum HR via continuous or intermittent exercise. Work rate may need to be reduced to maintain a steady state HR.
Passive exposure	Where possible, implement immediately following a regular training session when body temperature is already elevated. Strategies may include sauna exposure (70-80 °C) or hot water immersion (39-42 °C). As a guide, aim for post-exericse sauna exposures to be 10-20 minutes, and post-exercise water immersion to be 20-40 minutes in duration[1]. Duration should be based on tolerance and individual rates of adaptation.

During heat exposures, drink to thirst. In the hour following, rehydrate by consuming at least 1.5 x body mass lost. Incorporate an electrolyte supplement, as required, to increase fluid absorption.

Following a heat exposure block, adaptations will decay (~2-4 weeks). Subsequent heat exposures can be prescribed within an athlete's overall schedule to maintain adaptations.

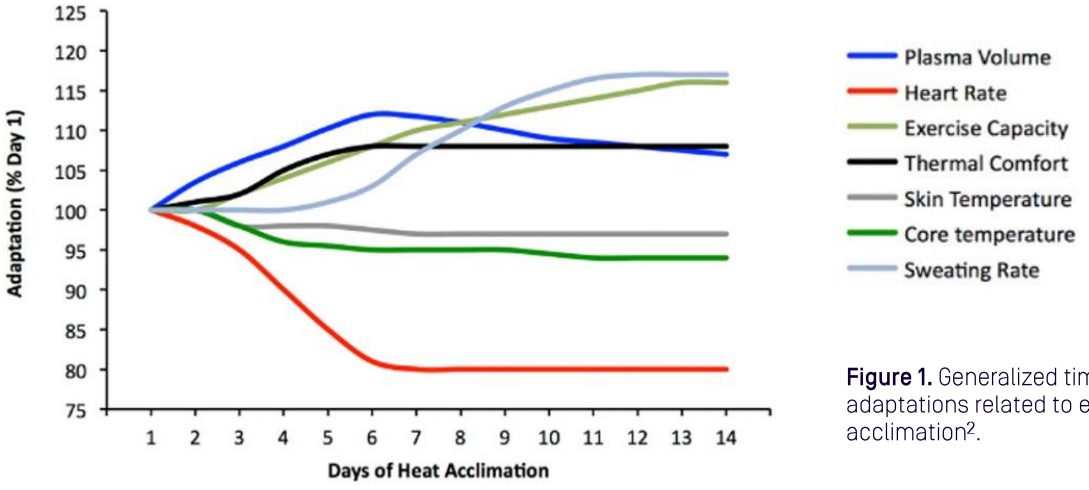

Figure 1. Generalized time course of adaptations related to exercise-heat acclimation[2].

Considerations

- The duration of a heat acclimation regime should consider what adaptations are required, as well as how they complement the wider training regime. For example, shorter interventions will target changes in thermal comfort, heart rate, and core temperature; with longer interventions required for changes in exercise capacity and sweat rate (Figure 1).
- The planning and prescription of heat exposures should be carefully considered within a training plan. A range of approaches for implementing heat exposures leading up to major competitions are shown in Figure 2.
- Both passive and active heat exposures can be extremely physiologically and perceptually taxing. As a result, fatigue should be closely monitored and managed, and sufficient opportunities should be given to nap, recover, and rehydrate to ensure adequate recovery.
- During heat exposures, supervise and monitor athletes for signs of heat illness to ensure safety.
- Perceptual scales (e.g., rating of thermal comfort, rating of perceived exertion) and physiological measures (e.g., heart rate, core temperature) can assist when assessing individual tolerance and adaptations.
- Where possible, incorporate heat exposures early in the training cycle. Benefits of early integration include:
    1. Increased athlete familiarity with heat acclimation/acclimatisation to optimise implementation during future specific preparation/competition phases.
    2. Increased opportunities for practitioners to assess individual athlete variability and adjust protocols accordingly.
    3. Increased rate of re-acclimation, provided physiological adaptations have not fully decayed. A shorter re-acclimation period may be particularly advantageous during final phase preparations where the focus is also on minimising fatigue and tapering for competition.

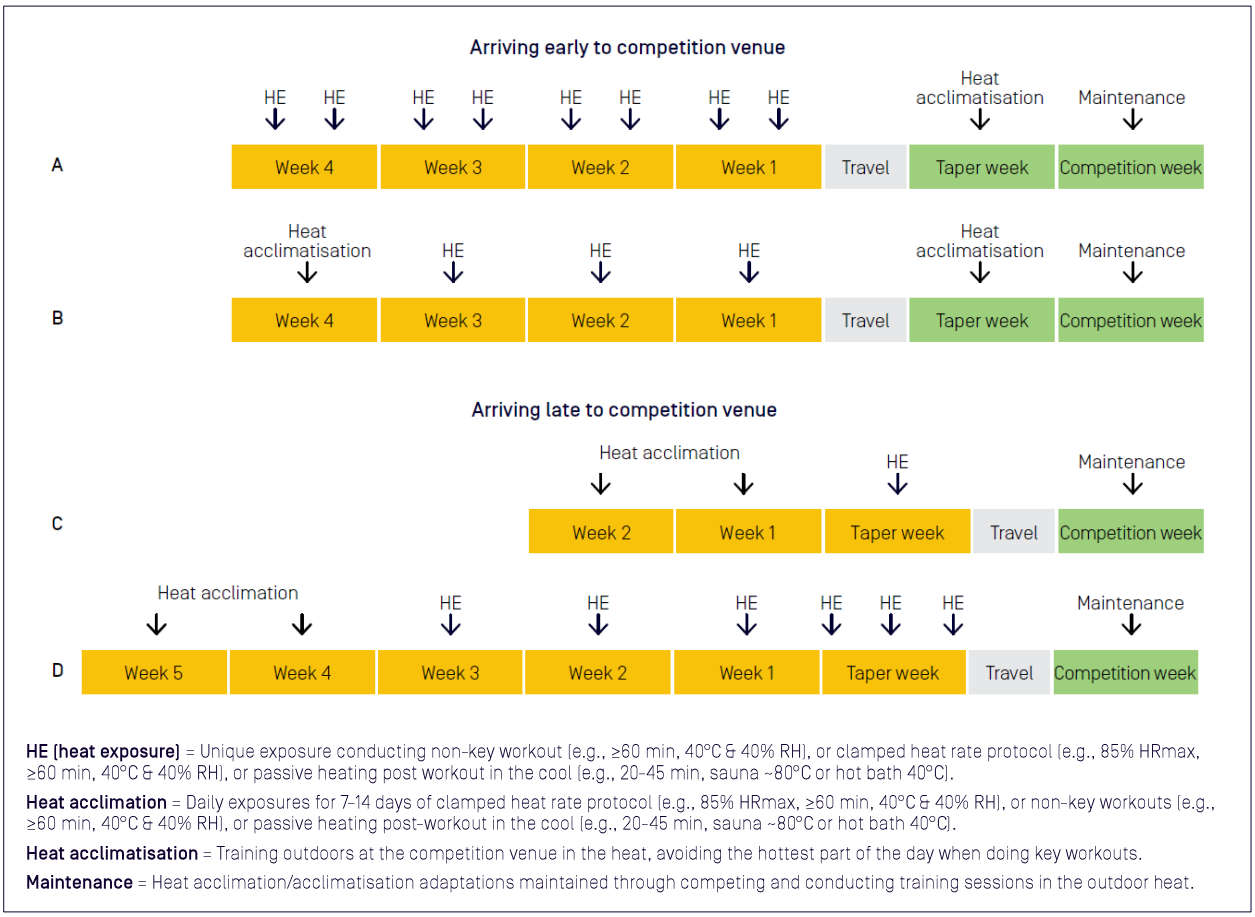

Figure 2. Strategies for inducing heat adaptations ahead of major competition based on arriving at the event location early (1-2 weeks) or late (1-3 days) in relation to competition day. Athletes arriving early can (A) initiate the adaptation process by conducting one to two heat exposure sessions per week for 4-8 weeks prior to traveling and then training outdoors in the heat once on site, or (B) undertake 7-14 days of heat acclimation 4-6 weeks before departure followed by a heat exposure maintenance session(s) per week prior to traveling and then training outdoors in the heat once on site. Athletes arriving late can (C) heat acclimate for 7-14 days 2-3 weeks before traveling and conduct a heat exposure maintenance session(s) in taper week prior to traveling, or (D) extend this approach by heat acclimating 4-6 weeks before departure and performing a short (3-4 days) re-acclimation protocol the week prior to traveling. The heat acclimation maintenance sessions in Strategy B (weeks 3, 2 and 1), C (taper week) and D (weeks 3, 2 and 1) are not required but will help maintain adaptations. Based on individual circumstances (e.g. training phase, workout, facilities, logistical support) a particular approach or combination of heat acclimation regimens and individual heat training sessions can be used to induce adaptations[3].

Recommended Reading

[1] Périard J, Eijsvogels T, Daanen H. Exercise under heat stress: Thermoregulation, hydration, performance implications, and mitigation strategies. Physiol Rev. 2021 Oct 1;101(4):1873-1979. doi: 10.1152/physrev.00038.2020.

[2] Périard J, Racinais S, Sawka M. Adaptations and mechanisms of human heat acclimation: Applications for competitive athletes and sports. Scand J Med Sci Sports. 2015 Jun;25 Suppl 1:20-38. doi: 10.1111/sms.12408.

[3] Saunders P, Garvican-Lewis L, Chapman R, Périard J. Special environments: Altitude and heat. Int J Sport Nutr Exerc Metab. 2019 Mar 1;29(2):210-219. doi: 10.1123/ijsnem.2018-0256.

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