

## **A short, sharp (cold) shock: Healthy or harmful?**

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**Background:** Cold-water swimming has recently attracted academic interest as a lifestyle therapy for improving mood and reducing depression (Kelly & Bird, 2022; Massey et al 2020; Van Tulleken et al, 2018). However, sudden immersion in cold-water is not without significant risk to health, including increased blood pressure, increased risk of abnormal cardiac events, and death! (Tipton et al, 2017), these are considered to result from the cold shock response.

**Aim:** The aim of this study was to assess change in mood and cardiac autonomic balance during five minutes of cold-water immersion.

**Method:** Following ethical approval, 10 healthy participants naïve to cold-water immersion were recruited from the student body of the university. Participants were immersed in cold sea water (13°C) for five minutes. Mood was assessed using the Profile of Mood States questionnaire (POMS) at baseline (seven days prior to the immersion) and immediately post immersion. Heart rate was recorded immediately before, and immediately after immersion. Cardiac autonomic balance was assessed by heart rate variability analysis, from which time and frequency measures (RMSSD and Total Power) and a geometric index (Poincare plots) were calculated.

**Results:** Five minutes immersion in cold-water resulted in a significant improvement in total mood disturbance (TMD). The sub-scales of the POMS, indicated improved mood and increased energy status, more vigour, less fatigue, more clear mindedness (less confusion), less tension and even improvement in how they felt about themselves (esteem rating; ERA). Heart rate increased significantly ( $p < 0.001$ ) from 79 to 115 bpm. Total Power was significantly reduced from 4197 to 1812 ( $p = 0.03$ ) and the RMSSD was reduced from 47.8 to 28, indicating a compression of vagal tone and increased sympathetic drive. This was mirrored in the Poincare plots. Figure 1, panel a) presents the results of a single individual prior to immersion, and post immersion are given in panel b).

**Conclusion:** This study confirmed that immersion in cold-water resulted in improved mood. However, this is accompanied by a rapid change in cardiac autonomic balance, characterised by profound withdrawal of vagal tone. Therefore caution is recommended, especially for individuals at high cardiac risk, and appropriate strategies should be developed to reduce the cold shock response.

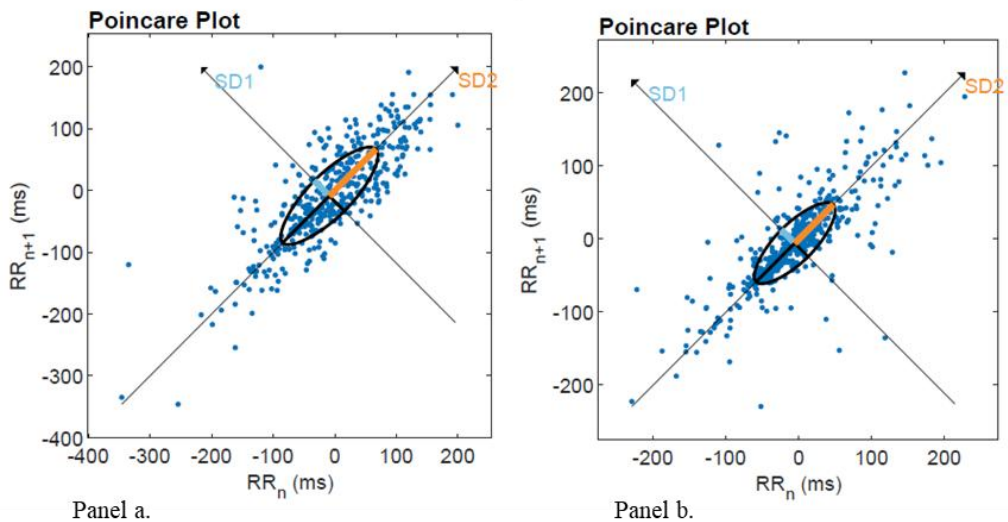


Figure 1. Individual Poincaré plots immediately prior (panel a) and immediately post (panel b) five minutes of cold-water immersion.

### References:

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