

Women have greater (Metabolic) Stress Response than Men

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AT GLANCE : Stress-hyperglycaemia is common in ICU and associated with increased morbidity and mortality. Glycaemic control is hard to achieve safely due to inter- and intra- patient variability. **What if women and men had different metabolic response to treatment?**

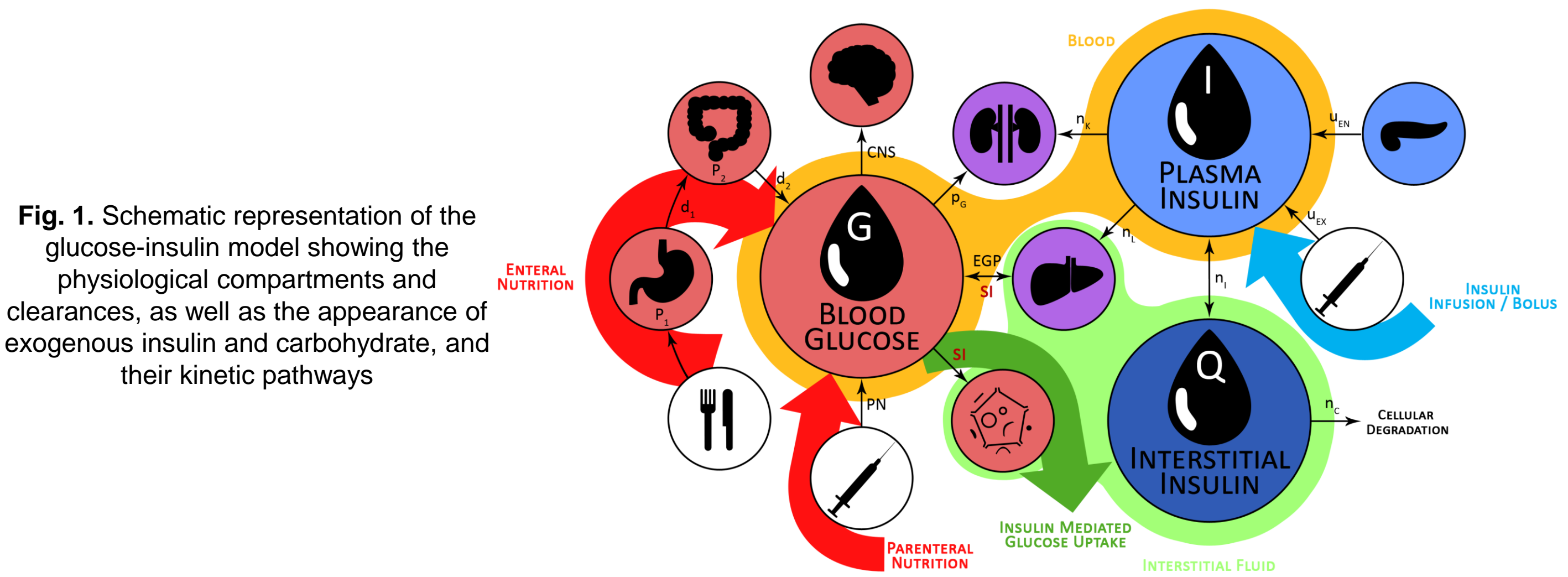
TAKE HOME MESSAGE : **WOMEN ARE MORE INSULIN RESISTANT THAN MEN**, PROBABLY REFLECTING HIGHER STRESS RESPONSE

Background & Objectives

- Stress-hyperglycaemia is a common complication in the ICU, essentially due to increased insulin resistance and endogenous glucose production.
- Glycaemic control (GC) has shown improved outcomes but was proven difficult to achieve safely, increasing risks of hypoglycaemia.
- Validated physiological models of glucose and insulin pharmacokinetics allow to identify key physiological parameters such as patient-specific **insulin sensitivity (SI)**.
- This study aims to assess whether there exists a difference between gender in metabolic stress response to injury in the context of GC, and show if there is a difference in the difficulty to control patients according to gender.

Methods

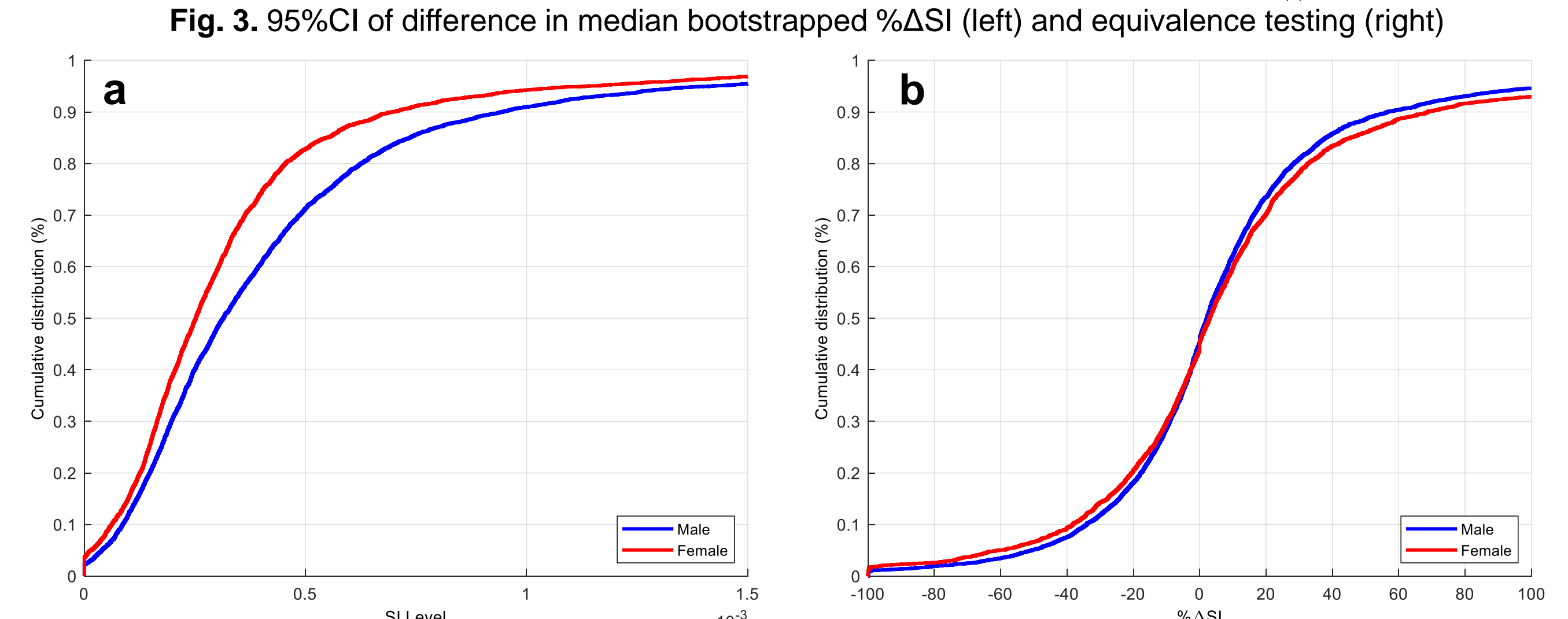
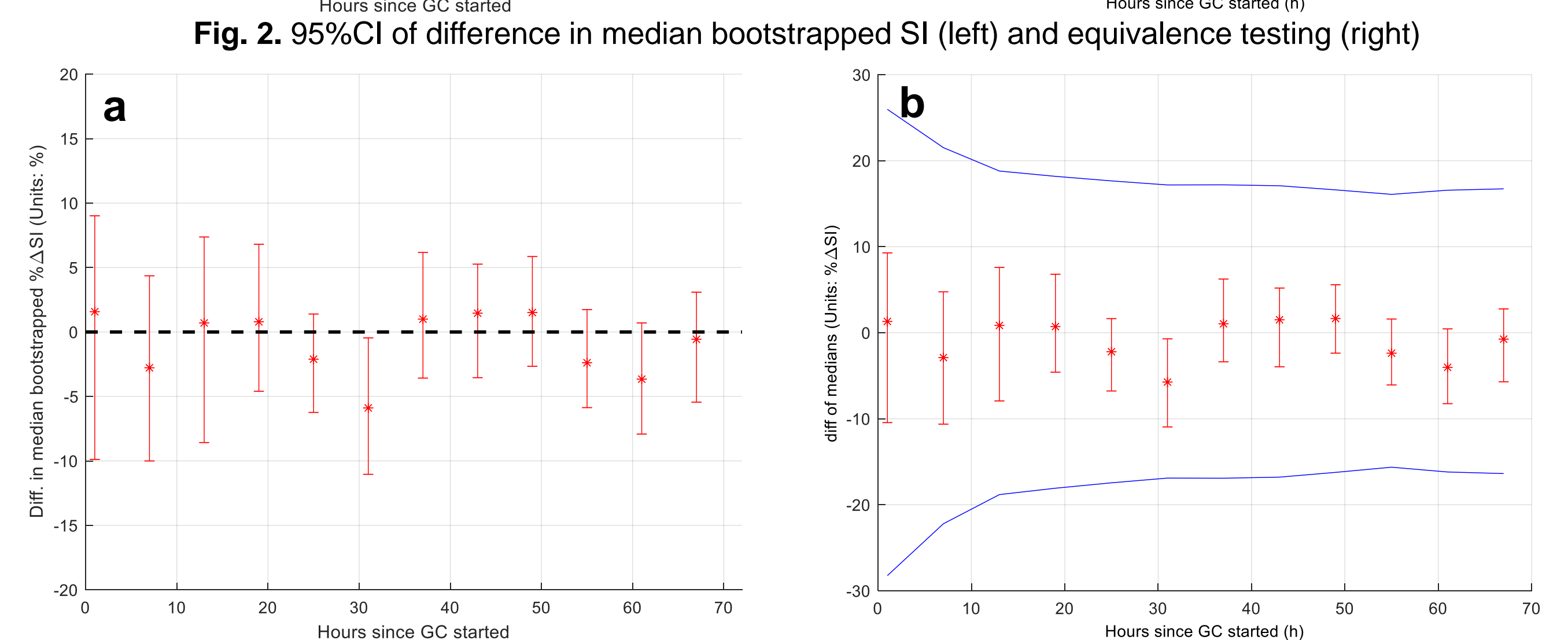
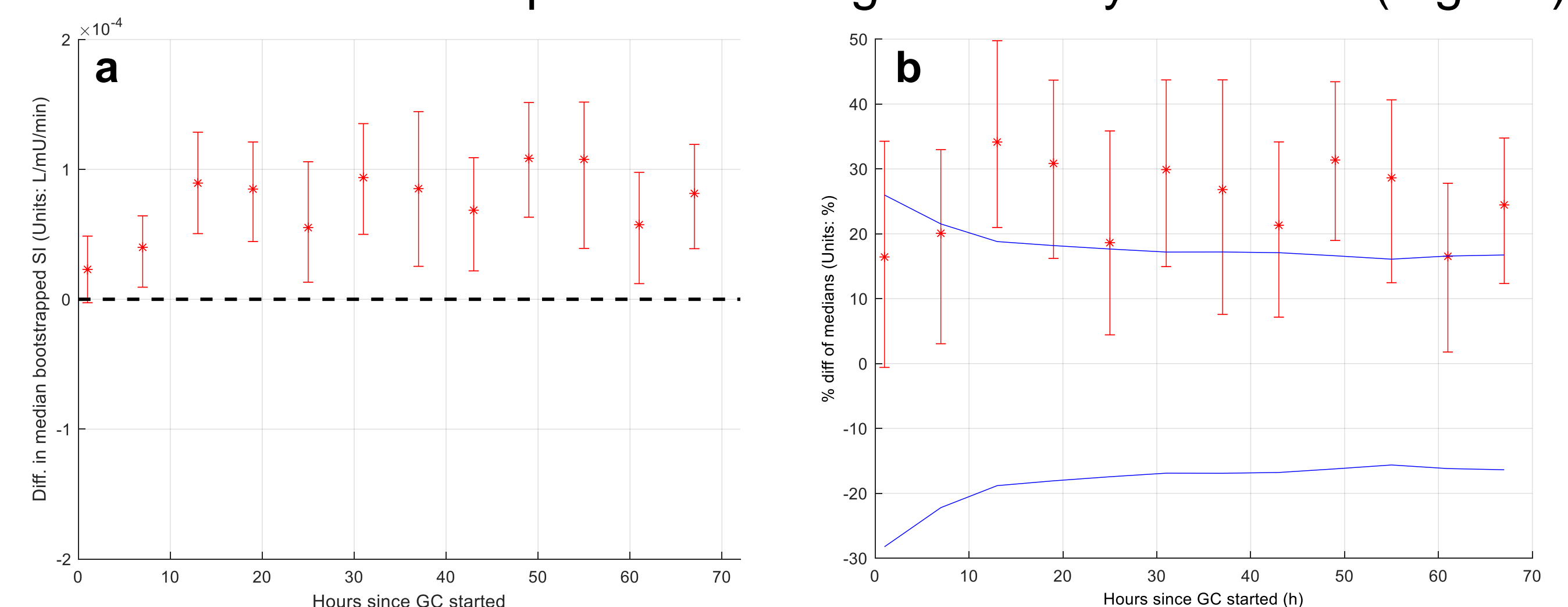
- A validated physiological model (Fig. 1) is used to hourly **identify SI** from clinical data, using integral based methods. Hour-to-hour percentage variability in SI levels (**% Δ SI**) is also computed.
- Blood glucose, insulin, and nutrition retrospective data from 145 SPRINT GC patients are used.
- Demographic characteristics between male (N=91) and female (N=54) sub-cohorts are similar (age, mortality severity, ICU length of stay, GC duration), as well as GC outcomes.
- Bootstrapping methods are used for hypothesis testing (due to large data sample size), where difference between groups is significant ($p < 0,05$) if the 95% CI in bootstrapped difference in medians crosses zero.
- Equivalence testing is used to determine if the difference is clinically different. A difference is considered equivalent if the 95% CI in bootstrapped difference in medians fall within a clinically set equivalence range (based on BG measurement errors).



Results

Data is analysed using 6-hour blocks over the first 72h of GC control.

- Females are significantly more insulin resistant** (95%CI of difference in median bootstrapped SI does not cross 0) than males (Fig. 2a, Fig. 3a). This difference is not clinically equivalent (Fig. 2b).
- Differences in % Δ SI are never significant** (95%CI of difference in median bootstrapped SI crosses 0, Fig. 2a and Figure 3b). This difference is within equivalence range for every 6-h block (Fig. 2b).



Conclusions

- Equivalent variability suggests both cohorts should benefit from same quality of GC.
- Women are more insulin resistant than men. All else equal, this suggests **women have a stronger stress response to injury** than men, potentially explaining the higher insulin resistance.