



Heat stress detection in broilers using sensor data

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Background

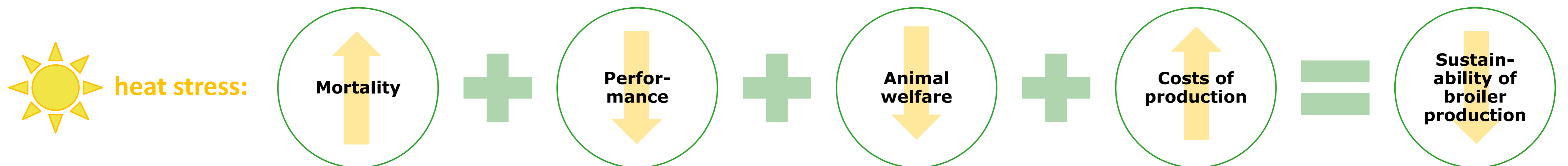


Figure 1. Impacts of heat stress in broiler production.

Objective and methods

We aimed to assess whether individual level data, recorded in an automated manner, could provide information on heat stress in broilers at the individual level. To this end, we:

1) Performed a **literature study** to uncover behavioural indicators of heat stress in broilers that have potential to be recorded in an automated manner at the individual level

2) Linked individual activity patterns to heat stress in broilers, using a **pilot study based on an existing data set** from 2019 when a heat wave occurred in the Netherlands:

- 40 female broilers
- Activity data from RFID system (Figure 2) from day 1 to 28 of life
 - RFID tag on bird's leg
 - Grid of antennas underneath pen floor

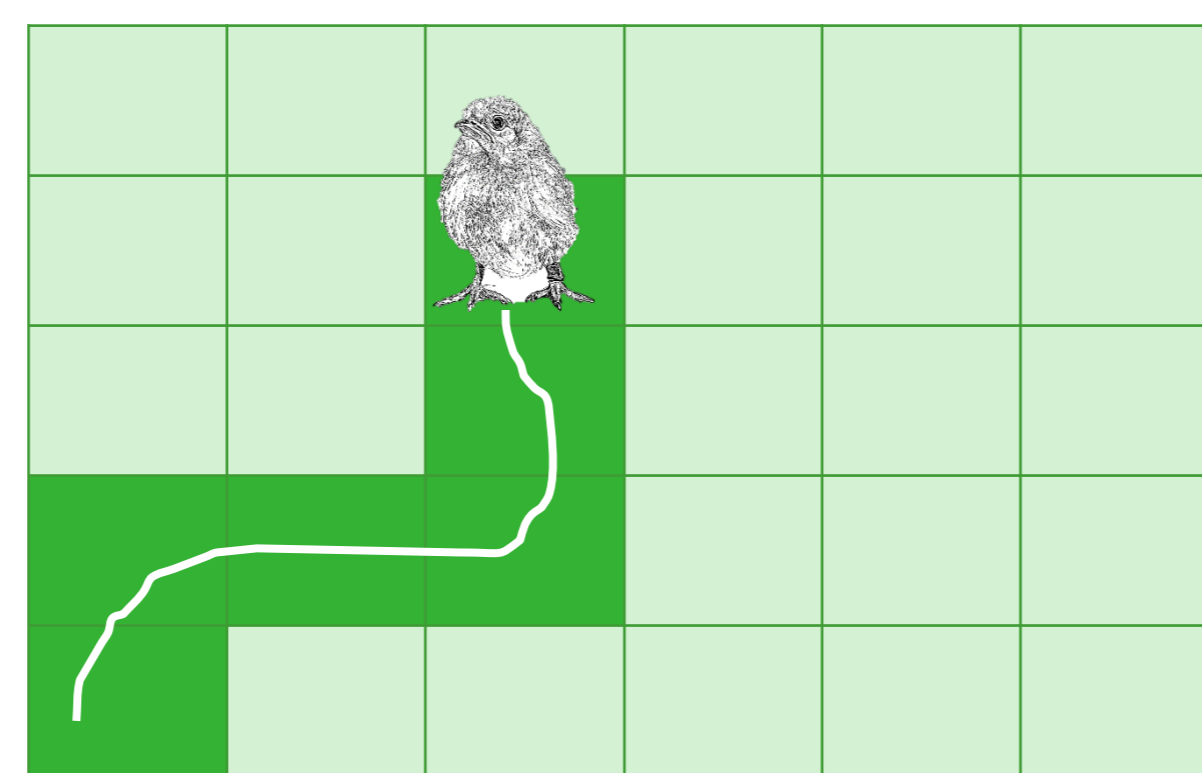


Figure 2. Schematic view of the RFID system.

Results: literature study

The literature study revealed a large number of potential behavioural responses to heat stress in broilers (Figure 3).

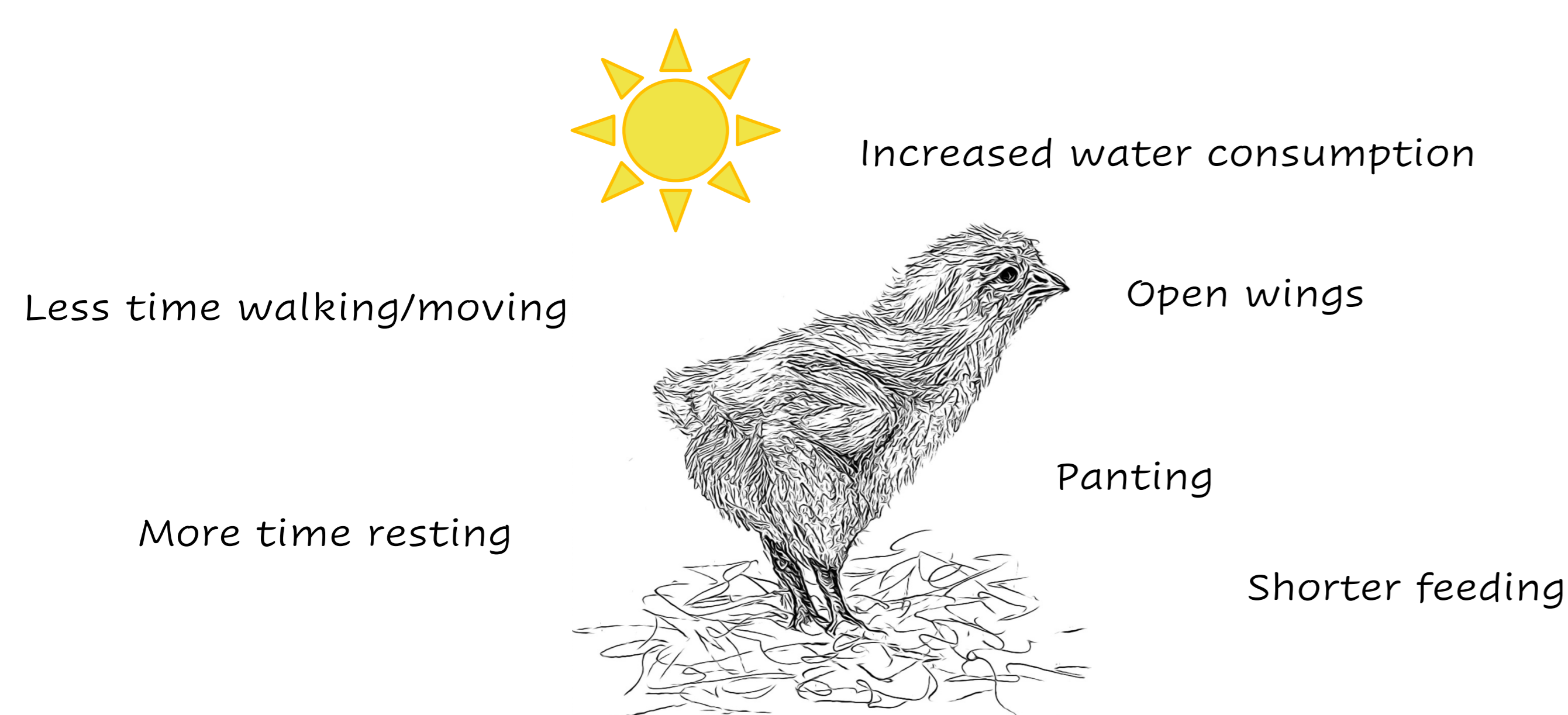


Figure 3. Behavioural responses to heat stress in broilers.

Results: pilot study

We examined activity in relation to temperature, with t_{diff} representing the difference between the realised temperature and the normal aimed-for temperature, for the light and dark periods:

$$activity = \mu + age + period + t_{diff} + period * age + period * t_{diff} + animal + e$$

We observed a decline in activity as the broilers aged, but an increase in activity in the dark periods when t_{diff} increased (Figure 4).

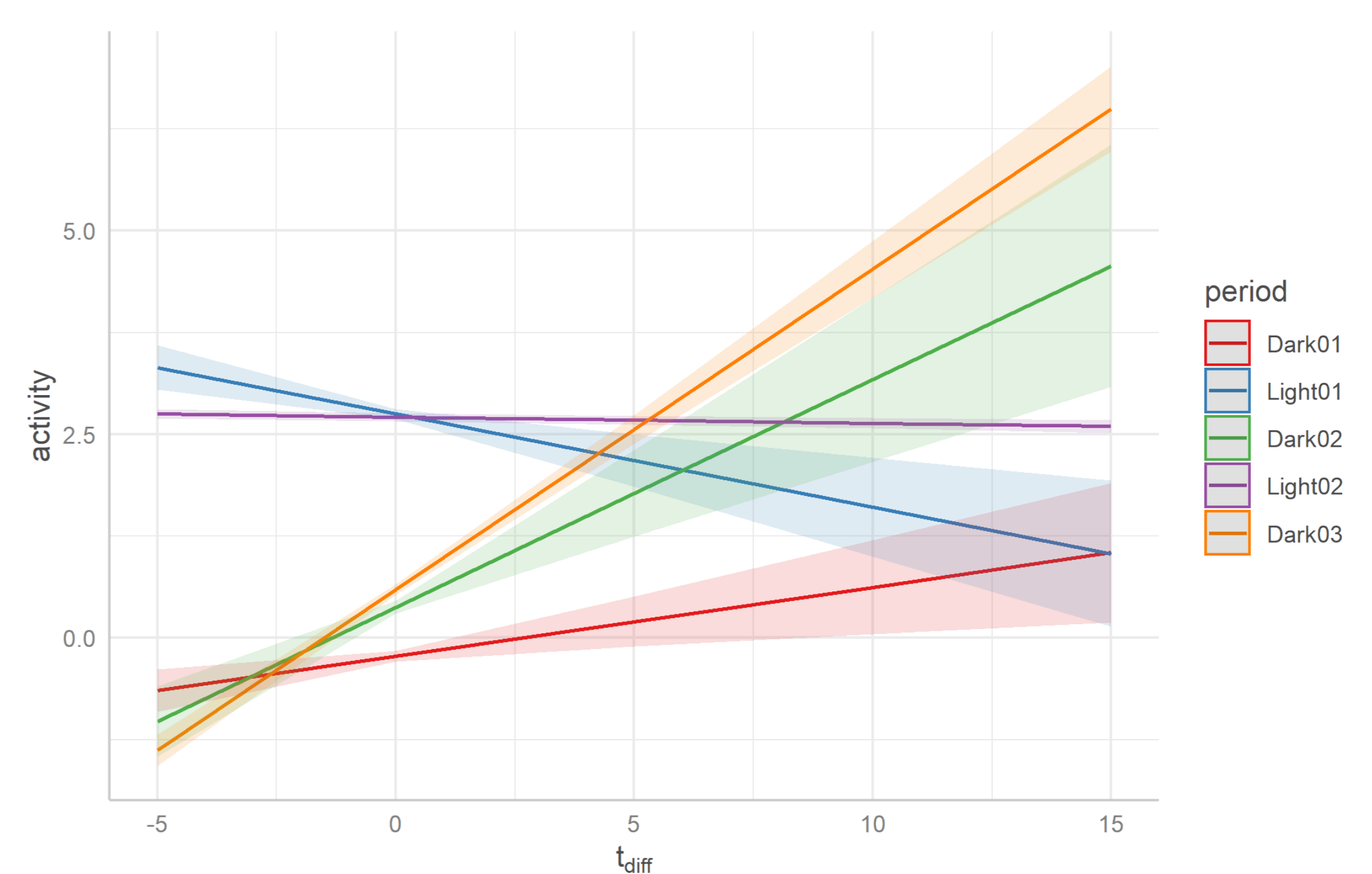
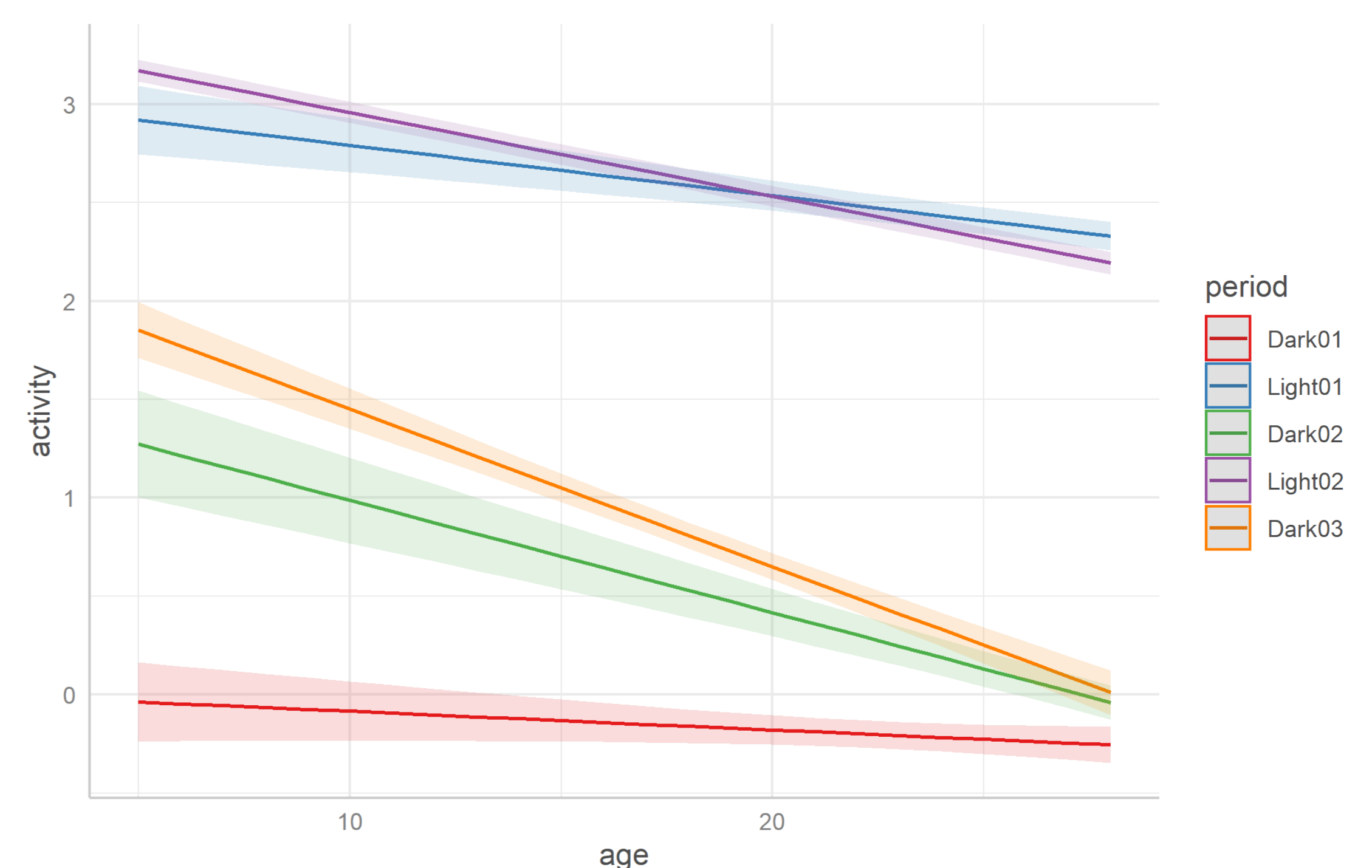


Figure 4. Model-predicted broiler activity in meters/hour/day over time (top) and for different temperature differences (bottom).

Conclusions

- Broiler activity patterns change with higher ambient temperatures, suggesting potential for automated detection of heat stress in broilers
- Follow-up research could focus on differences between individuals, as the random animal effect in our model explained roughly 10% of the observed variance