Introduction
A vegetative sleep preparedness has been described in adults during the 100 min before sleep onset, with distal skin vasodilation increasing body heat loss. Sleep onset occurs when core body temperature is decreasing. As a result, promoting distal vasodilation, particularly in hands and feet, increases sleep propensity. The gradient of distal-to-proximal skin temperature (Ts) which features distal skin vasodilation has been demonstrated to be the best predictor for rapid sleep onset. To our knowledge, this process has not been examined in across development. Therefore, we assessed the evolution of Ts before sleep onset (1) in 9-days old preterm neonates and (2) in children aged 6-12 years.

Subjects and methods

Neonates study

29 neonates
9 days old
Postconceptional age: 208±8 days
Birth weight: 1331±343 g

Overnight polysomnography (EEG, EOG)
12hrs, 8pm – 8am,
in incubator air temperature: 32.7 ± 1.4°C

Skin temperature (thermochron iButtons)
Distal (L and R feet)
Proximal (abdomen, L and R subclavicle area)

Actigraphy
Diary for reported bedtime (RB)
Actigraphy for sleep onset (SO)

Results

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<th>WASO Onset</th>
<th>Tair</th>
<th>Tdistal</th>
<th>Tproximal</th>
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- the higher the Tskd, the shorter the WASO episode.
- the smaller the Tskd - Tskf, the shorter the WASO episode.

Duration of the WASO is shorter if:
- Distal skin T (hand, foot, thigh) measured during and at the end of the WASO episode are higher and closer to Tskmax (not observed for T at the beginning of WASO).
- Thermal homogeneity between the 6 local T is higher at the end of the WASO episode.

During the WASO:
- progressive distal vasodilation during the WASO
- progressive homogenisation of the skin T over the whole body

Children study

23 children
Age 6-12 years
Typically developing
No restrictions to usual routines

Skin temperature (thermochron iButtons)
Distal (L and R feet)
Proximal (abdomen, L and R subclavicle area)

Actigraphy
Diary for reported bedtime (RB)
Actigraphy for sleep onset (SO)

Patterns of change in skin temperature are noted in relation to reported bedtime (RB) and sleep onset (SO):
- Tskdistal is lower, and rises more slowly than Tskproximal in the hour before RB, hence a dip in distal proximal gradient (DPG) in that time.
- Tskdistal rises more rapidly than Tskproximal after RB, with corresponding rise in DPG before SO.
- DPG continues to rise after SO, to reach 0 (Tskdistalt - Tskproximal) at around 100 minutes after SO.
- Tskforehead rises slightly in the hour before RB; it lowers prior to SO and is lower than Tskproximal at all time points.

CONCLUSION
We demonstrate for the first time that sleep is preceded by distal skin vasodilation in preterm neonates and children, which may play a key role in facilitating SO. It can be hypothesized that sleep propensity could be improved in neonates and children by mild manipulations of distal skin temperatures, as has been previously shown effective in adults.