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Affective touch induces cardiovascular changes in preterm infants

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Outline

- The role of affective touch during development and in perinatal care
- Investigating the role of affective touch in preterm infants
- Putative role of affective touch in osteopathic care
- Directions for further research

Touch…

- Plays a fundamental role in nurture and attachment during development (Walker & McGlone 2013 for review).
- Plays a central role in osteopathic diagnosis and care and in the development of therapeutic relationships.

Touch and development

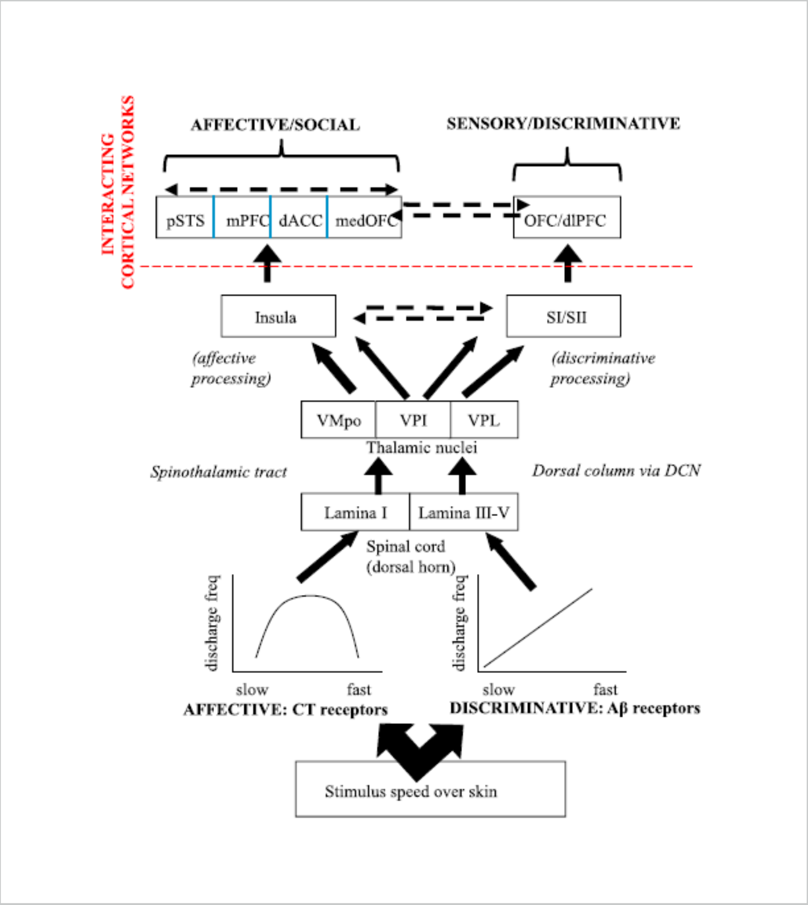
- Harlow and Zimmermann (1958) and Harlow and Harlow (1962) found that the absence of comforting touch led to long lasting psychological stress in monkeys.
- Tactile nurturing interactions during the neonatal period impact the subsequent expression of adult behaviour by altering sensitivity to neuropeptides such as oxytocin and arginine vasopressin (Cushing and Kramer, 2005).

Affective touch, homeostasis and embodiment

- Tactile interactions involving affective touch are fundamental in critical periods of development, when the infant is learning to respond to changes in both their homeostasis and in the external environment (Cruccianelli and Filippetti, 2018).
- Through early proximal and embodied interactions with other bodies, affective touch may function as an experiential "glue" connecting the feeling of one's body *from outside* with the feeling of one's body *from the inside* (Cruccianelli and Filippetti, 2018).

Affective touch

- Affective touch refers to a form of gentle touch mediated by a specialised tactile system, the c-tactile (CT) afferent system, whose role is to provide or support emotional, hormonal, and behavioural responses to skin-to-skin contact with conspecifics (McGlone et al. 2014).



Touch in perinatal care

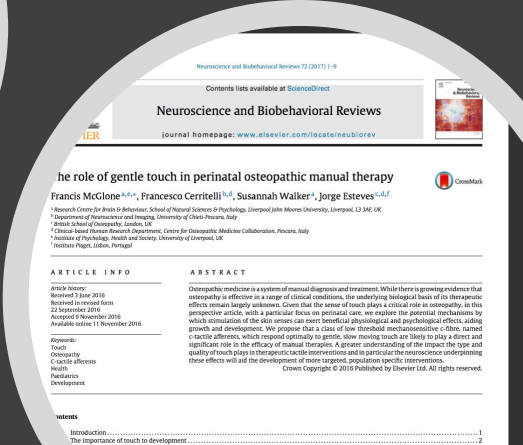
- Touch plays a central role in perinatal care including a range of Neonatal Intensive Care Unit interventions used to improve neurodevelopmental and health outcomes (Ohlsson and Jacobs, 2013; Chan et al., 2016; Lanaro et al., 2017; Maitre et al., 2017).

Some evidence…

- Kangaroo Care reduces neonatal morbidity and mortality (e.g.,Conde-Agudelo and Díaz-Rossello, 2016).
- NIDCAP have positive effects on the neurodevelopment of preterm infants (Ohlsson and Jacobs, 2013).
- Osteopathy is effective in reducing the length of hospitalization (LOS) in premature infants (Lanaro et al., 2017).

What about the mechanisms?

We have recently argued that the CT afferent system, which respond optimally to gentle, slow moving touch, is likely to play a direct and significant role in the efficacy of skin-to-skin contact interventions and manual therapies such as osteopathy particularly in perinatal care (McGlone et al., 2017)



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he role of gentle touch in perinatal osteopathic manual therapy

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ABSTRACT

Osteopathic medicine is a system of manual diagnosis and treatment. While there is growing evidence that osteopathy is effective in a range of clinical conditions, the underlying biological basis of its therapeutic effects remain largely unknown. Given that the sense of touch plays a critical role in osteopathy, in this perspective article, with a particular focus on perinatal care, we explore the potential mechanisms by which stimulation of the skin senses can exert beneficial physiological and psychological effects, aiding growth and development. We propose that a class of low threshold mechanosensitive c-fibre, named c-tactile afferents, which respond optimally to gentle, slow moving touch are likely to play a direct and significant role in the efficacy of manual therapies. A greater understanding of the impact the type and quality of touch plays in therapeutic tactile interventions and in particular the neuroscience underpinning these effects will aid the development of more targeted, population specific interventions.

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Affective touch in term-born infants

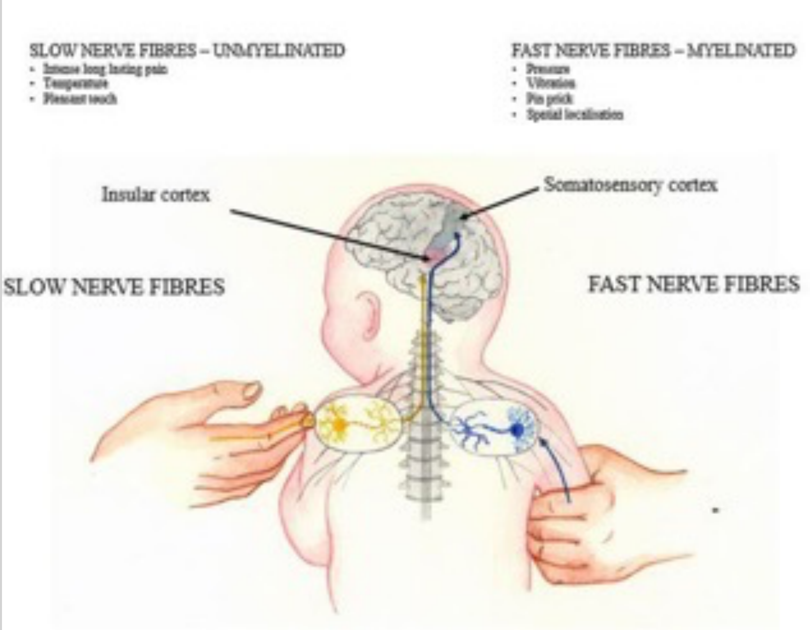
- Jönsson et al (2018) found evidence of strong cortical activations in response to slow stroking (velocity 3 cm/s) in the insular cortex and temporal lobe in 2-month old infants.
- Tuulari et al (2018) investigated brain responses to gentle skin stroking in term-born infants aged 11-36 days and found significant activations in the postcentral gyrus and posterior insular cortex. They argued that the neonate brain is responsive to gentle stroking in early infancy and that regions associated with somatosensory and socio-affective processing are activated.

...but in preterms

- Research on affective touch in preterm infants is still scarce and focused on the somatosensory system.
- Maitre et al (2017) found that skin-to-skin human contact such as breastfeeding and massage led to stronger brain responses to light touch, whilst in contrast painful experiences such as injections and tube insertions are associated with reduced somatosensory cortical responses to light touch.

Aims of the study

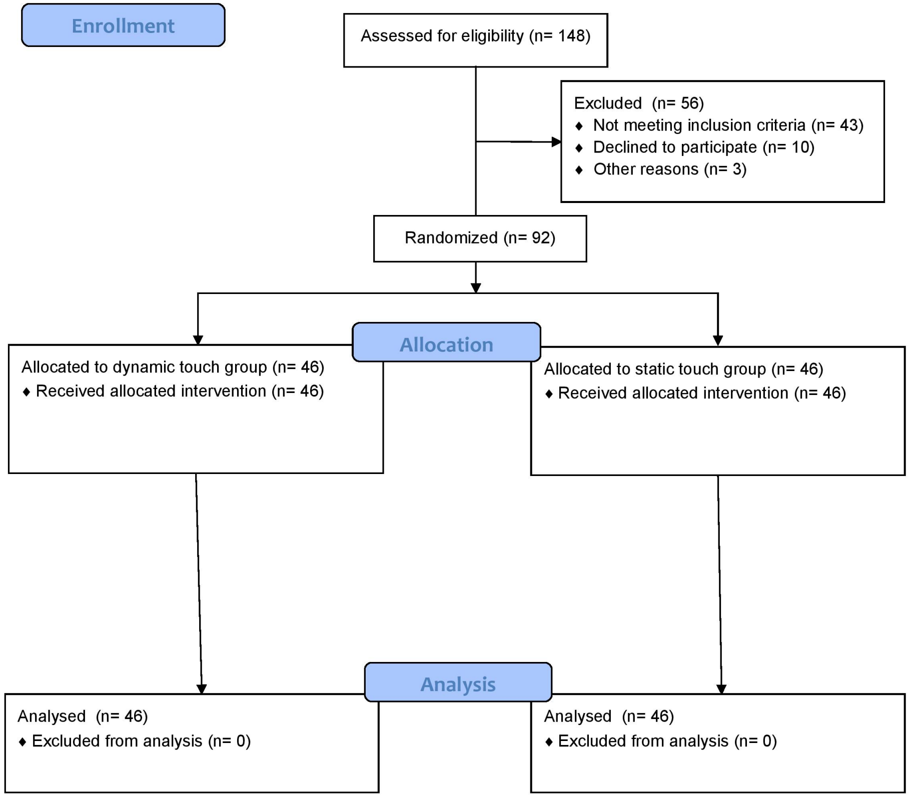
- To explore the extent to which a repeated slow gentle stroking skin-to-skin contact produces acute effects on heart rate and blood oxygen saturation in contrast to a static discriminatory touch stimuli.



Methods

- Randomised, single blind study with the use of block design.
- The primary outcome was the before-after differences in heart rate. Secondary outcomes included changes in SpO2.
- Infants who were admitted to the NICU at Buzzi Hospital in Milan were eligible for inclusion. Inclusion criteria - born in Buzzi hospital, gestational age (GA) between 28 and 36 weeks, male or female, and without clinical and/or congenital complications. Exclusion criteria included lack of guardian consent, gestational age > 37 and <28 weeks, congenital or genetical disease, or other co-morbidities.

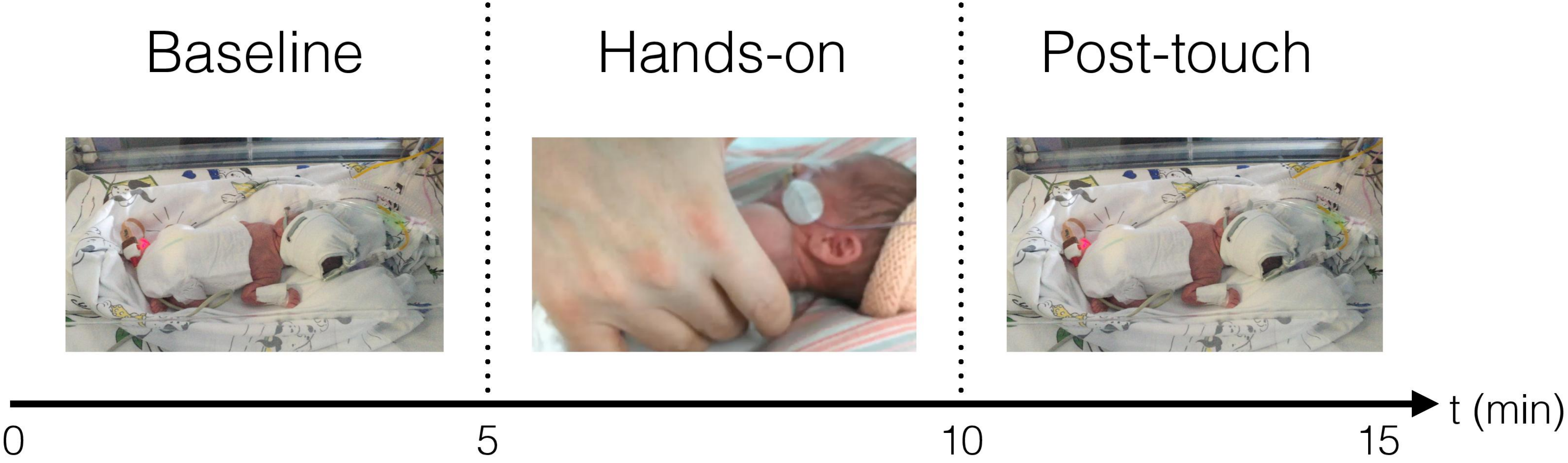
Randomization and masking



Training protocol

- All operators underwent a pre-established training protocol to ensure the dynamic stimulus with delivered at a consistent force and velocity; the dominant hand was used to apply the stroking.
- A visual metronome was used to increase consistency within and between operators. The stroking velocity (approximately 3cm/sec) was controlled by a visual metronome that moves across the same length of computer screen as the area of skin to be stroked at the correct speed.
- Open source software Psychopy was used to programme the training sessions.

Interventions



Analysis

- Data were analysed both unweighted and weighted.
- A mixed method ANOVA 2 x 3 (2=groups - dynamic vs static; 3=timepoint) was performed both unweighted (with no confounding factors) and weighted (with confounding factors: gender, gestational age and weight at birth).

Results

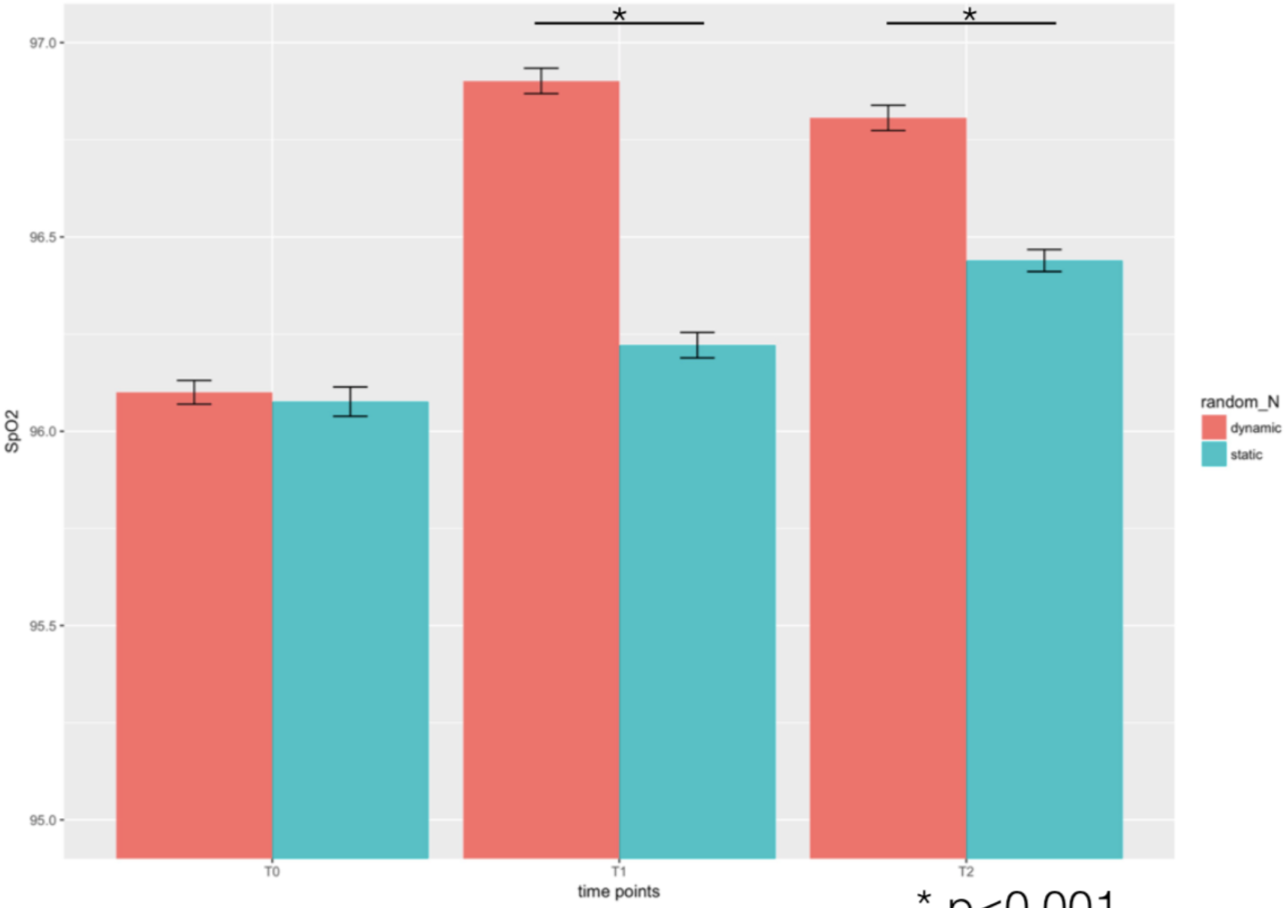
Baseline (n=92)

	Dynamic (n=46)	Static (n=46)	p>|t|
GA	32.8±4.0	33.9±4.1	0.18
Weight at birth	2027±799	2173±948	0.43
Male*	23 (50)	21 (46)	0.8

numbers are mean±sd. P values from t test; * N(%), p values from X^2

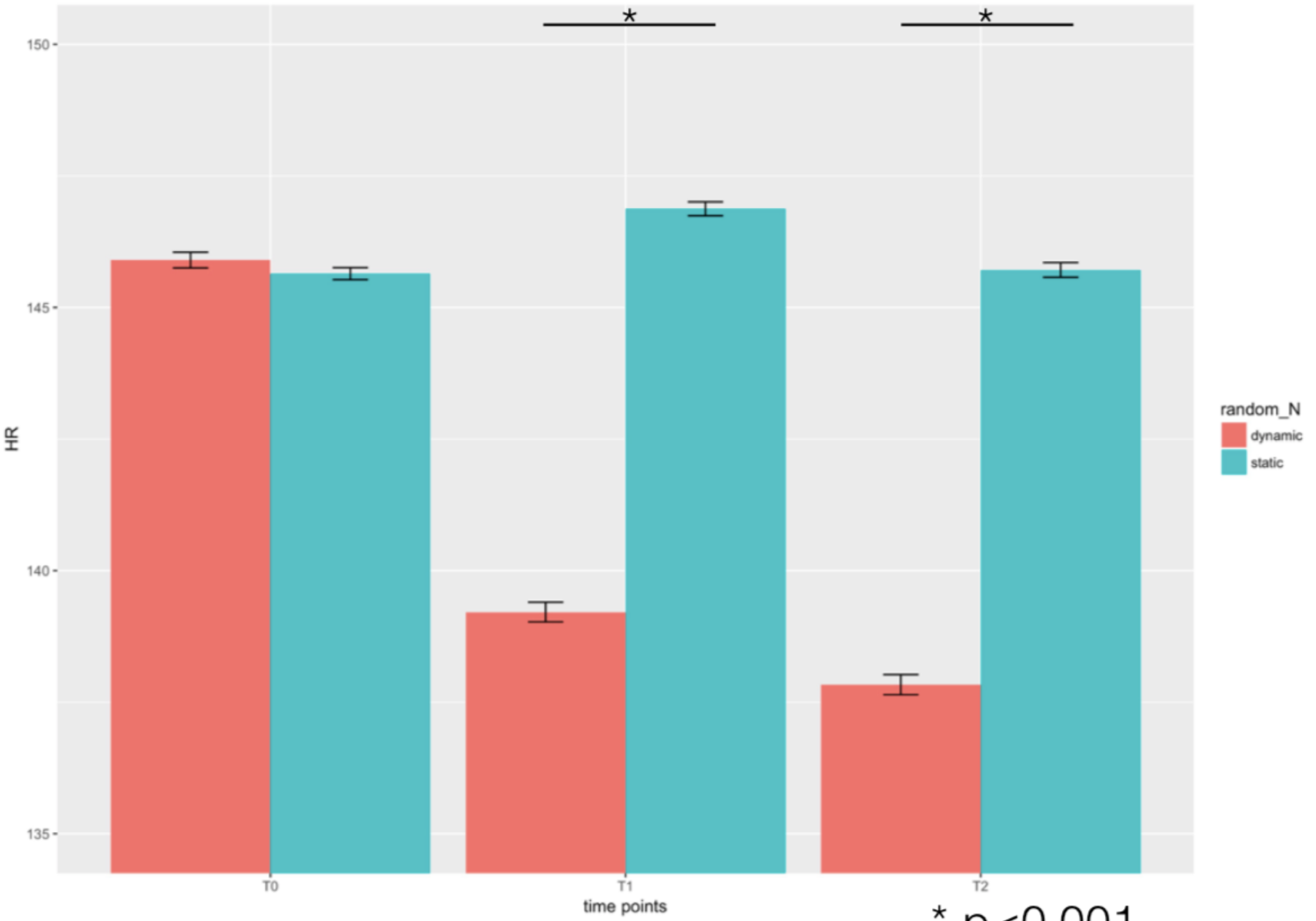
Groups are homogenous also in terms of stooling, pathologies, type of nutrition, type of respiration

Results



* $p<0.001$

Results



* p<0.001

Discussion

- We predicted that the specificity CT afferent response to slow velocity stroking would be evident from both the physiological heart rate and blood oxygen saturation data.
- Our results are in line with our initial hypotheses - the deceleration in heart rate indicates a reduction in arousal and subsequent increased parasympathetic activity (e.g., Fairhurst et al., 2014). The observed increases in blood oxygen saturation are likely to be attributed to the calming effects of gentle stroking (see Neshat et al., 2016). Arguably, our findings may have been enhanced by the delivery of gentle stroking at skin temperature, which ideally targets CT afferents (Ackerley et al (2014).

Further research

- The results of our study provide an important first step towards understanding the role of affective touch, particularly the role of the CT afferent system, in the efficacy of skin-to-skin contact interventions and manual therapies such as osteopathy in perinatal care.
- Further research will investigate the effects of gentle stroking in preterm infants on a range of physiological parameters including responses to heel pain, changes in heart rate variability and SpO2, changes in salivary cortisol levels and in pro-inflammatory cytokines.

Conclusion

- In our novel study, we investigated the extent to which a repeated slow gentle stroking skin-to-skin contact produces acute effects on heart rate and blood oxygen saturation in contrast to a static discriminatory touch stimuli. We found that the claiming effects of gentle stroking contributed to a significant reduction in arousal and an increase in parasympathetic system activity.
- These findings provide preliminary evidence indicating that the CT afferent system plays an important role in the efficacy of osteopathy, other manual therapies and skin-to-skin contact clinical interventions.

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