

<b>Institution:</b> Liverpool John Moore's University		
<b>Unit of Assessment:</b> UOA4		
<b>Title of case study:</b> Touch for Life		
<b>Period when the underpinning research was undertaken:</b> 2000 - 2020		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Prof Francis McGlone	Professor in Neuroscience	2010 - present
Dr Susannah Walker	Senior Lecturer	2014 - present
Dr Ralph Pawling	Senior Lecturer	2015 - present
Dr Paula Trotter	Senior Lecturer	2016 - present
<b>Period when the claimed impact occurred:</b> 2014-2020		
<b>Is this case study continued from a case study submitted in 2014?</b> N		
<b>1. Summary of the impact</b>		
<p>A sustained programme of research has characterised the functional properties of a special class of touch sensitive nerves, CT afferents, focusing on their neurodevelopmental role. Impact from this research has been achieved via three distinct strands: i) contributing to a national policy for ensuring healthy childhood development by providing evidence of the importance of touch to a child's mental wellbeing; ii) implementing and embedding 'touch practices' in schools to counter the negative effects of restricting social touch in school children; iii) invention of tactile stimulation device for use in neonatal care units to stimulate affective touch nerves.</p>		
<b>2. Underpinning research</b>		
<p>This research had its genesis in the discovery of a 2<sup>nd</sup> touch system of nerves innervating the skin of the human body - c-tactile afferents (CT) [R1]. Associated research using a range of convergent animal and human measures in McGlone's lab (<a href="https://somaffect.org">https://somaffect.org</a>), and his collaborators in Sweden, has made a significant global impact in defining the functional properties of CTs, supported by grants (~£1.2M) from academic/industry/charity sources, generating ~70 peer reviewed publications [R1-6].</p> <p>C-fibres, as a class of sensory afferents, play a protective role over the lifespan, e.g. pain/itch, with the CT providing evidence also for a seminal protective role as it codes the reward associated with close physical contact [R2]. Microneurography, neuroimaging, psychophysical, endocrinological, pharmacological, and behavioural studies, orchestrated by McGlone, have helped characterise the exquisite response properties of CTs (caressing touch delivered at ~3cm/sec, ~3 mN, ~32°C), and their central projections to the brain's limbic/reward systems<sup>1</sup>. Research is focussing on CTs contribution during critical neurodevelopmental periods, <i>from the womb to the classroom</i>, based on the plethora of observations showing that tactile neglect leads to a wealth of psychopathologies and immune deficiencies, with little attention however being directed to their neurobiological basis [R2,R3,R5] – what's the mechanism? Neurodevelopment is a dynamic process between genes and environment. Epigenetic research demonstrates the adverse consequences of a lack of touch on brain and behaviour<sup>2</sup>. McGlone has established CT's seminal role in stress and pain regulation in two paradigm shifting publications demonstrating that chronic stress can be regulated solely by a CT scripted sensory input [R5], as can pain [R6]. Three underpinning strands of this research support Sect 4:</p> <p><b>Strand i)</b> as normal developmental processes are interrupted for preterm babies this cohort provide an opportunity to test the hypothesis that CT stimulation plays a critical role in neurodevelopment – a hypothesis supported by a recent paper where preterms were gently stroked in the incubator [R4]. However, a less stressful/ecological means of reintroducing gentle touch was proposed by McGlone in a project, 'Back in the Sac' to develop an 'intelligent massaging mattress' replicating the gentle touch experienced <i>in utero</i>. Two prototypes have been developed</p>		

(one vibrotactile and one pneumatic) for deployment in the NICU. The impact of this seemingly simple intervention is predicted to represent a paradigm-shift in neonatal intensive care [R2, R4]

**Strand ii)** babies undergo frequent painful procedural interventions, but due to the risks with pharmacological analgesics medical staff rely on sucrose for pain relief. McGlone hypothesised that CT stimulation would gate activity in c-nociceptors. A study commissioned at Oxford University proved that CT touch administered prior to a heel-lance in term infants attenuated a cortically recorded EEG pain signal [R6], establishing for the first time that gentle stroking touch reduces a stress response, providing a non-pharmacological method of analgesia.

**Strand iii)** tackled role of CT stimulation for the longer-term development of the child, specifically the argument that restricting touch in nursery and school environments negatively compromises healthy development [R2]. Recent evidence that CT stimulation alone regulates the brain/body's stress regulatory systems, impacting on resilience [R5], has provided empirical evidence for the benefits peer-to-peer touch has on a child's physical and emotional wellbeing.

The importance CTs as another 'protector' led in 2015 to the formation of the International Association for the Study of Affective Touch (<https://iasat.org/>), of which McGlone is co-founder/President.

### 3. References to the research

All research outputs have been through a rigorous peer review process

**R1: McGlone F**, Wessberg J, Olausson H (2014). Discriminative and affective touch: sensing and feeling. *Neuron* 82:737-755.

**R2:** Cascio, C. J., Moore, D., & **McGlone, F.** (2019). Social touch and human development. *Developmental cognitive neuroscience*, 35, 5–11. <https://doi.org/10.1016/j.dcn.2018.04.009>

**R3:** Devine, S. L., Walker, S. C., Makdani, A., Stockton, E. R., McFarquhar, M. J., **McGlone, F. P.**, & **Trotter, P. D.** (2020). Childhood Adversity and Affective Touch Perception: A Comparison of United Kingdom Care Leavers and Non-care Leavers. *Frontiers in Psychology*, 11, 557171. <https://doi.org/10.3389/fpsyg.2020>.

**R4:** Manzotti, A., Cerritelli, F., Esteves, J. E., Lista, G., Lombardi, E., La Rocca, S., Gallace, A., **McGlone, F. P.**, & **Walker, S. C.** (2019). Dynamic touch reduces physiological arousal in preterm infants: A role for c-tactile afferents? *Dev Cogn Neurosci*. 39:100703. doi: 10.1016/j.dcn.2019.100703. Epub 2019 Aug 21. PMID: 31487608; PMCID: PMC6969366.

**R5: Walker SC**, Cavieres A, Peñaloza-Sancho V, El-Deredy W, **McGlone FP**, Dagnino-Subiabre A. C-low threshold mechanoafferent targeted dynamic touch modulates stress resilience in rats exposed to chronic mild stress. *Eur J Neurosci*. 2020 Aug 27. doi: 10.1111/ejn.14951. Epub ahead of print. PMID: 32852872.

**R6:** Gursul D, Goksan S, Hartley C, Mellado GS, Moultrie F, Hoskin A, Adams E, Hathway G, **Walker S**, **McGlone F**, Slater R. Stroking modulates noxious-evoked brain activity in human infants. *Curr Biol*. 2018 Dec 17;28(24): R1380-R1381. doi: 10.1016/j.cub.2018.11.014. PMID: 30562526; PMCID: PMC6303187.

#### Funding:

- a) £235,639 Leverhulme Trust "Investigation of the role of n5-HT in psychological responses to affective touch" September 2013 to August 2015
- b) MRC grant (PI-Nottingham University ~£700K) £10k to LJMU "BE Impact of Early Life", March to June 2018 (for the LJMU work)
- c) BIAL Foundation £40,327 "Arousal Effects on time perception and timed behaviour" July 2017 to June 2018
- d) BIAL Foundation £38,400 "Affiliative touch & Emotion Regulation", October 2016 to September 2016

- e) Case BBSRC Studentship £90,880, November 2013 to September 2017
- f) Pain Relief Foundation (PhD Studentship) £63,618 "Peripheral Pain Mechanisms", March 2014 to March 2017
- g) Salford NHS Trust (PhD Studentship) "C-Tactile Fibre" £3,756
- h) Pain Relief Foundation £27,660 "Spinal Projection Pathway"

#### 4. Details of the impact

This research has laid an evidence-based neuroscientific foundation for the importance of a modality of touch that was, at best, only recognised intuitively and that now, unarguably, is known to play a critical and fundamental role across the lifespan for all 7.8Bn human primates. The Pandemic has provided an unprecedented opportunity to alert the world to how vital social touch is to mental health, reinforcing the recognition that 'touch matters'. Impact delivery is multifaceted in terms of its breadth and depth, generating debate amongst policy makers and demonstrating impact in schools (through peer to peer massage), and in clinical settings (through the development of an intelligent mattress for neonates).

#### Policy Impact

The impact of affective touch over the early-years began to attract media attention after an invited talk to the British Psychological Society (2017), [Source 1] where the neuroscientific evidence that *not touching a child was a form of abuse* was presented. This garnered support in the Times Educational Supplement (2017) [Source 1], an article in the Guardian (circulation 148,169) (March 2018) [Source 2], and a live BBC TV Breakfast interview (October 2018) [Source 3], fuelling a growing societal recognition that affiliative touch is a biological necessity for a child's healthy mental and physical development. Further engagement with the growing interest in affective touch followed with an invited lecture at Play Therapy International conference (Windsor, UK, 2018) [Source 4]. The research was subsequently acknowledged by the All Party Parliamentary Group (APPG) for A Fit and Healthy Childhood, who have a remit to 'promote evidence-based discussion and produce reports on all aspects of childhood health and wellbeing including obesity; to inform policy decisions and public debate relating to childhood; and to enable communications between interested parties and relevant parliamentarians'. Professor McGlone's research was subsequently included in Children's Mental Health Beyond the Green Paper: The role of practice based evidence, produced by the APPG for A Fit and Healthy Childhood (January 2019) [Source 5]. A key recommendation of the report is for the *'Government to commission and fund research into new therapies (in particular touch therapies) and extensions of play and creative arts. Pilot projects designed to test the outcomes of such research must use practice-based evidence and be at all times, sensitive to safeguarding needs'* [Source 5, page 28]. Professor McGlone was invited to present his neuroscience research into affective touch and its impact on mental health to members of the APPG (October 2019).

Professor McGlone's research was further included in a commissioned APPG report *Wellbeing and Nurture: physical and emotional security in childhood* (July 2020) [Source 6]. APPG Chair, Steve McCabe MP said: *'The physical and emotional wellbeing of children matters so much because our future society depends on it. We have all undergone devastating experiences of social isolation during the pandemic, but the priority now is to look forward. Years of the 'me' society' could not save us from Covid19. Now, acting together, we must optimise the emotional and physical wellbeing of every child so that we re-learn how to look out for each other. By teaching children to connect, we will create families and communities that will be strong and healthy.'* [Source 6]. One of the key recommendations of the report, based on Professor McGlone's research, is that 'Positive touch work to become an established part of the school curriculum; possibly as a component of PSHE' [Source 6].

**The benefits of peer to peer touch in educational settings**

Since 2016, the research has gained positive traction within educational environments, with approximately 30 schools incorporating peer to peer massage within the school day. Professor McGlone has collaborated closely with an organisation called Child-2-Child: Kind and Caring Hands, who have used the research [R1, R2, R5] to underpin the peer to peer massage activities, training and resource packs delivered within schools [Source 7]. Jean Barlow from Child-2-Child said 'My work in schools has focused on developing practical strategies to develop children's well-being, based on simple peer to peer games and massage routines. Working with Francis McGlone has been an eye opener to me, providing the explanation as to why positive touch has such an impact on children. Understanding the neuroscience behind the process, and sharing this with teacher colleagues has helped to convince more schools of the benefits of positive touch.' [Source 7]

Teachers who have used the peer-to-peer touch techniques within their classrooms have found significant improvements to the teaching environment and the demeanour of children in a classroom setting. Teachers who use the techniques have noted the following 'Teaching after a peer massage is a wonderful time to teach!' and 'When children come in from the playground, they have been running about. There are lots of emotions. The peer massage makes the children calm and relaxed, a foundation for learning.' Furthermore, 'Peer massage re-engages the children with positive relationships!' and 'the calm atmosphere after peer massage brings the children back to task!' Health and Well-being Consultant, Debora Fawcett, "It teaches children about their own bodies." [Source 8]

Children who engage with peer to peer massage also note the positive benefits of the techniques, e.g. 'I like peer massage it makes me relaxed and calm' and 'when you come in from the playground all puffed out, it helps you get ready for learning!' Children also said that 'It helps me to concentrate on work' and 'If we didn't have the peer massage, I think I would still be a bit jumpy from playtime! [Source 8]

A head teacher, trained in peer massage reported that 'we included a peer massage session every day after lunch. The session enabled the children to take a minute after time on the playground and get ready for the learning that afternoon. After some time and taking feedback from the children, we enlisted 'Wellbeing Ambassadors'. These are Y6 children who lead the session with support of the resources. The children have ownership of the session and have commented on how it 'calms them down' ready to learn. Unfortunately due to the pandemic, we had to postpone these sessions however, the children are still keen to continue and we will resume once it is safe to do so'. [Source 8]

Peer massage techniques outlined in Professor McGlone's research [R1, R2, R5] has had a particularly profound impact for children who have been excluded from other learning environments, with one head teacher commenting 'We have two nurturing independent schools one in Bolton and one in Burnley. Children attending are on the verge of exclusion or which have already been excluded. We introduced peer massage into our school 2019-20. We also use the self-image profile to help are children tell us how they feel about themselves. We use peer massage each morning in circle time, and also if a child has gone into crisis we use hand massage before returning to class or an activity. After some reluctance from staff once we started to see results and improvements in the children's behaviour staff were more eager to engage'. Room leaders from the same school added 'I have noticed with the children in my class that it helps to bring the children with sensory issues calmer and once calmer, the children are then in a place where we can talk to them and they can then put their own strategies in place. I have also found that it has helped to build relationships in the class room with staff to child and child to child'. Following a programme of peer massage, the children have started to use the techniques

independently, with room leaders noting 'if they fall over and hurt themselves, they instantly touch and comfort the area, how does that make the feel they then start to understand. The children understand that it does calm them down' and 'it is very soothing and engaging, the children engage really well with it, they love the close contact with the other children and staff. They do it by themselves when they need to calm down. The training is very detailed and easy to deliver and easy for the children to understand' [Source 8].

Beyond the classroom, a chapter highlighting the importance of the role touch in play has been included in the influential book, *Play Therapy Manual* (2020). A reviewer, based in the US, commented '*I loved this book! As a therapist, I found this book to be extremely helpful in informing my practice. It was grounding to read a text that brings together the worlds of Infant Mental Health and Play Therapy*'. [Source 9]

### **The benefits of touch in a clinical setting**

The research [R4, R6] has been utilised by SC Neonatal Intensive Care (TIN) in Milan, with the Director of the institute noting 'The Experience we have had in my department was particularly positive on the use of affective touch on the different cohorts of premature infants. We saw that using this specific type of gentle touch, babies are calmer and less stressed. In addition, we have demonstrated that a consistent use of five minutes of affective touch administered to preterm babies has a significant beneficial clinical impact on them, more specifically reduces the heartbeat and heart rate as well as increases the oxygen saturation' [Source 10]. This has further led to the development of an 'intelligent mattress' for use with very preterm babies in NICUs, and with paediatricians, as a novel non-pharmacological means of pain relief [Source 10]. Professor Connor Malluci, Consultant Paediatric Neurosurgeon at Alder Hey said 'as Liverpool Health Partners (LHP) lead for the neuroscience and mental health program I strongly endorse this research. LHP are working with Professor McGlone to develop the research stream from the concept of affective touch and its benefit to the developing mind and mental health of young infants. Such work includes the need to trial the mattress in the clinical setting on neonatal units, through to longer term projects leading up to hopefully RCT'S on a national setting looking at its effectiveness in improving the mental health outcome of premature infants long term' [Source 10].

### **5. Sources to corroborate the impact**

**Source 1.** British Psychological Society (2017) presentation and Time Educational Supplement (February 2017)

**Source 2.** No hugging: are we living through a crisis of touch? The Guardian (March 2018) & accompanying circulation figures for The Guardian (March 2018)

**Source 3.** BBC TV Breakfast interview (October 2018)

**Source 4.** PTUK Play Therapy Conference, Windsor, UK (October 2018)

**Source 5.** A report by the all-party parliamentary group on a fit and healthy childhood - children's mental health beyond the green paper: the role of practice based evidence (January 2019).

**Source 6.** A report by the all-party parliamentary group on a fit and healthy childhood - Wellbeing and nurture: physical and emotional security in childhood (July 2020). Accompanying press release

**Source 7.** Testimonial from the director of A Child 2 Child Kind and Caring Hands

**Source 8.** Testimonials from teachers and children who have used peer to peer massage in schools

**Source 9.** Play therapy Book (2020). Routledge and Play Therapy book review (Amazon)

**Source 10.** Testimonials from clinicians advocating for the use of the 'intelligent' mattress