ORIGINAL RESEARCH Reappraisal of the toe phenomenon in representations of the Christ Child

The Babinski sign in Renaissance paintings

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Objective To investigate systematically the presence of the Babinski sign in representations of the Christ Child by the greatest painters of the Renaissance.

Design Observational analysis.

Setting Large collection of paintings depicting the Christ Child from Flemish, Rhenish, and Italian schools between 1400 and 1550 CE, searched using published catalogues and Google.

Study sample 302 Renaissance paintings (by 19 painters) depicting the Christ Child.

Main outcome measure Babinski sign, defined as a hallux extension with an amplitude greater than 30°. The presence of stimulation of the sole was also noted.

Results An unquestionable upgoing toe was apparent in 90 (30%) of the 302 paintings. The Babinski sign was present in more than 60% of Christ Child paintings by Rogier van der Weyden, Hans Memling, Martin Schongauer, and Matthias Grünewald. A bilateral Babinski sign was observed in three paintings. Stimulation of the sole was noted in 48/90 (53%) paintings and was always present in paintings by Andrea del Verrocchio, Leonardo da Vinci, and Giorgione. No association existed between the presence of the Babinski sign and the period during which the painter was active.

Conclusions Four main factors were noted in relation to the representation of the Babinski sign in paintings of the Christ Child: the physiological toe phenomenon in infants, the representation of the nudity of the Christ by painters during the 15th century to demonstrate the incarnation, Renaissance painters' need for precise observation of anatomy, and the desire of some Rhenish and Flemish painters to depict very realistic details. Italian Renaissance painters, whether Mannerist or not, tended to idealise the beauty of the human body, and they often did not reproduce the Babinski sign.

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Introduction

Since Babinski's seminal description in 1896, the toe phenomenon, defined as hallux extension during stimulation of the lateral plantar region of the foot, has been considered a strong sign of pyramidal tract dysfunction.[1] Less than a decade after its description by Babinski, some neurologists noticed that eminent Renaissance painters had depicted this neurological phenomenon in representations of the Christ Child.[2 3] Additionally, because the pyramidal tract is not fully developed at birth, dorsiflexion of the big toe can be observed in neonates either spontaneously or on stimulation of the sole of the foot.[3 4] The nature of the plantar reflex in children and the related terminology was a matter of debate for decades and is still discussed.[5 6]

Some isolated attempts to assess the Babinski sign in paintings of the Christ Child have been published.[2-10] In this study we used a strict method to systematically investigate the presence of the Babinski sign in representations of the Christ Child by the greatest painters who were active during the Renaissance.

WHAT IS ALREADY KNOWN ON THIS TOPIC

- Previous investigations of the depiction of the Babinski sign in paintings of the Christ Child in the Renaissance were conducted before the internet era and were therefore incomplete

WHAT THIS STUDY ADDS

- The main factors in the representation of the sign in this period are the physiological toe phenomenon, a trend towards representing the nudity of the Christ Child, and a desire to represent anatomy precisely
- Rhenish and Flemish painters tended to depict realistic details, whereas Italian painters tended to idealise their subjects

Methods

We extensively searched for the presence of the Babinski sign in representations of the Christ Child from the greatest painters between 1400 and 1550 CE. In addition to using the published catalogues, we did Google searches for the term "Christ Child paintings" in conjunction with each of the following terms: "Jesus Christ birth", "Nativity", "Presentation of Jesus in the Temple", "Adoration of the Magi", and "Madonna and Child", to browse the larger collection of paintings depicting Jesus as a newborn.

Our analysis was limited to the most famous painters from the Flemish, Rhenish, and Italian schools. We considered that a hallux extension was indisputable, and represented a Babinski sign, when its amplitude was greater than 30° from the sole of the child's foot. In each case, we also checked for the presence of stimulation of the infant's sole by another person's body part, contact of the foot with clothes, or self-stimulation by the child.

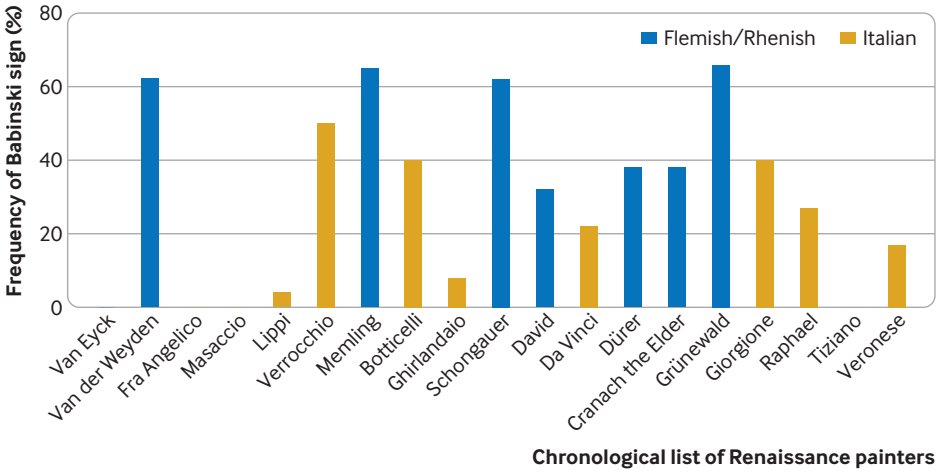

Fig 1 | Chronological overview of 19 painters included in study. Frequency of Babinski sign in paintings by artists

Fig 2 | Details from five paintings depicting a Babinski sign. A: Rogier van der Weyden, *St Luke Drawing the Virgin*, Museum of Fine Arts, Boston (USA). B: Gérard David, *Virgin Among the Virgins* (c1509), Musée des Beaux-Arts de Rouen, Rouen (France). C: Martin Schongauer, *Orlier Altarpiece* (c1470-75), Musée Unterlinden, Colmar (France). D: Verrocchio, *The Virgin and Child with Two Angels* (c1476), National Gallery, London (UK). E: Lucas Cranach the Elder, *The Virgin and Child with a Bunch of Grapes* (c1525), Alte Pinakothek, Munich (Germany)

Overview of corpus of 302 paintings

Artist (dates)	Paintings (n=302)	Babinski sign (n=90)	Stimulation when Babinski sign is present (n=48)
Jan van Eyck (c1390-1441)	6	0	0
Fra Angelico (c1400-1455)	15	0	0
Rogier van der Weyden (c1400-1464)	13	8	2
Masaccio (1401-1428)	8	0	0
Fra Filippo Lippi (1406-1469)	26	1	1
Andrea del Verrocchio (c1435-1488)	8	4	4
Hans Memling (c1435-1494)	17	11	3
Sandro Botticelli (144-–1510)	30	12	9
Domenico Ghirlandaio (1448-1494)	12	1	1
Martin Schongauer (c1450-1491)	8	5	2
Gérard David (c1450-1523)	25	8	4
Leonardo da Vinci (1452-1519)	9	2	2
Albrecht Dürer (1471-1528)	13	5	4
Lucas Cranach the Elder (1472-1553)	47	18	6
Matthias Grünewald (c1475-1528)	3	2	0
Giorgio Barbarelli (1477-1510)	5	2	2
Raphael (1483-1520)	33	9	8
Tiziano (c1488-1576)	12	0	0
Paolo Caliari Veronese (1528-1588)	12	2	0

Results

For 19 painters, we found 302 paintings depicting a Christ Child whose feet were sufficiently visible to allow us to look for the Babinski sign. We found an unquestionable upgoing toe in 90 (30%) paintings. The Babinski sign was present in more than 60% of paintings of the Christ Child by Rogier van der Weyden, Hans Memling, Martin Schongauer, and Mathias Grünewald. Conversely, Fra Angelico, Masaccio, Tiziano, and Jan van Eyck did not depict the Christ Child with an upgoing toe at all (table).

No simple relation existed between the presence of a Babinski sign and the period during which the painter was active (fig 2). The earliest depictions of the Babinski sign were present in paintings by Rogier van der Weyden (*St Luke Drawing the Virgin*, c 1435-40, Museum of Fine Arts, Boston (fig 2, A); *Duran Virgin*, c1430-35, Museo del Prado, Madrid).

We observed stimulation of the sole of Christ's foot in 48/90 (53%) of the paintings in which the Babinski sign was present. It was always present in paintings by Verrocchio, Leonardo da Vinci, and Giorgione and was variably observed in other paintings (table). No association was apparent between the presence of the Babinski sign and the type of painting (Nativity, Presentation of Jesus in the Temple, Adoration of the Magi, or Madonna and Child).

We observed a bilateral Babinski sign in three paintings: *The Virgin and Child with Two Angels* by Andrea del Verrochio (National Gallery, London) (fig 2, D) and two paintings by Leonardo da Vinci (*Madonna of the Carnation*, c1479, Alte Pinakothek, Munich; *Madonna Benois*, c1480, State Hermitage Museum, Saint Petersburg).

Discussion

Until now, no systematic study of the Babinski sign in paintings of the Christ Child from the Renaissance period (1400-1550 CE) has been reported. We did such a study, and we observed that 30% (90/302) of the corpus of paintings portrayed the Babinski sign, with a stimulating factor in 53% (48/90) of cases. Several factors contributed to the depiction of the Babinski sign in the Renaissance paintings of the Christ Child, including the physiological plantar reflex in newborns and children, a revolution in painting in the 15th century; and the need the Renaissance painters felt to use precise observation of anatomy. For Rhenish and Flemish painters, a taste for painting very realistic details explains why they would be more likely to depict the Babinski sign. As for Italian Renaissance painters, whether Mannerist or not, their tendency to idealise the beauty of the human body may explain the fact that they often did not reproduce the Babinski sign.

Out of the shadows: the medical legacy of racism

The barbaric actions of pioneering US gynaecological surgeon J Marion Sims has prompted much debate in recent years. **Sebastian Kaupp-Roberts** discusses the process of coming to terms with history

ANDREW LICHTENSTEIN/CORBIS VIA GETTY IMAGES

Strolling through Berlin on 9 November, casual observers will note the freshly polished brass plaques beneath their feet, some adorned with candles and flowers. Each of these *Stolpersteine* is inscribed with the name, date of birth, and (if known) the date and place of death of a single holocaust victim, usually outside their last known address. Of 75 000 such memorials throughout Europe, around 8600 are in Berlin.

The literal meaning of *Stolperstein* is stumbling block. Literally and metaphorically, they trip up the living as they go about their lives, inviting them to ponder the fate of the dead. This is an example of *Vergangenheitsbewältigung*—a term coined by Germany's post-war generation to describe the process of coming to terms with a history of genocide and murder.

On 25 May 2020 the on-camera murder of George Floyd, a 46 year old African-American man, at the hands of the Minneapolis police triggered unprecedented protests that shook the Western world. "No justice, no peace"—the clarion call of the global Black Lives Matter movement—may have achieved something remarkable. There's a new willingness in Western society to explore and confront the ingrained racism and systemic oppression in its legacy of slavery and colonialism.

Perhaps it's time for *Vergangenheitsbewältigung* to enter the English vocabulary.

The father of modern gynaecology

Most people in the "healing professions" would be appalled at perpetuating the legacy of racist violence. Most of us recall our university teaching on medical ethics, dominated by characters such as Josef Mengele and the Nuremberg doctors' trials. Some may also be familiar with the Tuskegee syphilis trials or the origin of the HeLa cell line, where cells were taken from Henrietta Lacks, an African-American woman, without her consent. But the past still casts a shadow over medicine. One example is J Marion Sims, whose legacy prompts much controversy.

Sims was born in South Carolina in 1813. After graduating in Philadelphia in 1835 he established himself in Alabama, first as a plantation physician in Macon County and then as a gynaecological surgeon in Montgomery. Despite no previous formal training in the specialty he built a thriving practice and became the "father of modern gynaecology," primarily through the pioneering repair of vesicovaginal fistulas—a debilitating consequence of obstructed childbirth leading to continuous leakage of urine into the vagina. He will be familiar to most doctors as the inventor of the Sims vaginal speculum. To this day, any woman undergoing surgery to the vagina and perineum will have been examined and treated using this simple but effective device. Few, however, will be aware of the barbaric methods Sims used.

None of the enslaved women in Sims's experiments was anaesthetised during the lengthy procedures

From 1845 to 1849 he conducted experimental surgery on the enslaved women on his property in Montgomery, many of whom had vesicovaginal fistulas when delivered to him by their owners. He operated on one woman, Anarcha Westcott, more than 30 times. Despite the first successful demonstration of ethyl ether as an anaesthetic in Boston in 1846, none of the enslaved women in Sims's experiments was anaesthetised during the lengthy procedures. He referred to this in an 1857 speech to the New York Academy of Medicine, stating that "they are not painful enough to justify the trouble and risk attending their administration." Instead, assistants restrained his screaming victims as he performed his surgery.

Sims moved to New York in 1853 and founded the US's first dedicated women's hospital. After the outbreak of the civil war in 1861 he toured Europe, bringing his pioneering techniques to a wealthy paying public—treating Empress Eugenie of France. He died in Manhattan in 1883, feted by the medical and social establishment.

A process, not a result

On 15 April 2018—foreshadowing the wave of statue toppling sparked by Floyd's murder two years later—Sims's memorial statue was removed from Central Park by New York City authorities (above). As early as 2006 a painting, *Medical Giants of Alabama*, depicting Sims towering over a recumbent black woman, was removed from display at the University of Alabama Medical Centre. Notably, these efforts came primarily from community activists and not from the medical profession.

How should we view Sims's legacy? Some argue we must consider his actions in the context of the time and place in which he lived and the extent of the injuries from vesicovaginal fistulas. Anaesthesia was not as well developed or as readily available. And we should remember that *Vergangenheitsbewältigung* is not a result but a process of continued engagement and education with no endpoint.

This summer a petition urged the Royal College of Obstetricians and Gynaecologists in London to rename the Sims speculum. The merits and practicalities are complex, but those of us working to safeguard women's health must have this conversation—particularly when black women in the UK are still five times more likely to die in childbirth than white women. Reflecting on the specialty's racist history can help ensure it doesn't have a lasting negative impact on practice.

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The death mask of the Unknown Woman of Seine

The face of CPR

She is known by many names—L'Inconnue de la Seine (Unknown Woman of Seine), the Mona Lisa of Seine, Resusci Annie, and The Most Kissed Girl in the World. She might not have lived to tell the tale, but she has transformed training for medical emergencies and saved many lives. She is the face that we have all kissed during practice for cardiopulmonary resuscitation, but do we ever stop and wonder about the story behind this mesmerising face?

A mysterious death

In the late 19th century the body of a girl was pulled from the Seine in Paris. No one knew her name, her history, or her story. From the firmness of her face, she was predicted to be around 16.

Her body was transported to a mortuary and placed on public display for identification. The pathologist who performed an autopsy was so captivated by the girl's appearance that he wished to preserve the memory of her face. He called a *mouleur* (modeller) to prepare a plaster death mask based on the girl's visage (above).

In the years that followed, the mask was replicated, and copies were sold throughout bohemian Paris.

Who do we think she was?

It was a long held belief that the girl died by suicide, as her body showed no evidence of violence. Some conjectured that she had been murdered. John Goto, an Oxford based artist, created a story that the girl was a Hungarian actress called Ewa Lazlo, who was killed by her lover Louis Argon.

In another tale, L'Inconnue was an identical twin who was born in Liverpool in the 19th century. She was said to have eloped to Paris with a wealthy suitor, never to be seen again by her family. That is, until her twin sister visited Paris and was shocked to see a mask that looked like a reflection of herself.

How did she become Resusci Annie?

In 1956 Austrian anaesthetist Peter Safar and American physician James Elam met at an American Society of Anesthesiologists meeting in Kansas City. Their connection motivated Safar to further research resuscitation, and he showed that mouth-to-mouth breathing could maintain blood oxygen levels in a person who was not breathing. This led to the development

Dollmaker Åsmund Laerdal developed the first manikin for students to practise CPR

of A (airway), B (breathing), and C (circulation) that we now know as ABC in CPR. Later, the line "Annie are you okay?"—used to check for a response in the patient—would feature in Michael Jackson's *Smooth Criminal*, after the singer was inspired by his own CPR training.

Archer Gordon, a member of the American Heart Association's CPR committee, recognised that students practising CPR on one another risked causing rib fractures and pain. To facilitate practice he and Norwegian anaesthetist Bjorn Lind approached a specialist manufacturer of toys and dolls, Åsmund Laerdal to develop a manikin for CPR practice. The project had personal significance for Laerdal, who in 1955 had rescued his 2 year old son from drowning and cleared the water from his lungs. Together, Lind and Laerdal developed an entire line of manikins, and Family Resusci was born in 1960: Resusci Annie, Resusci Andy, and Resusci Baby.

While contemplating the design of the doll, Laerdal recalled a mask—a reproduction of L'Inconnue—on the wall of his grandparents' house, and decided that Resusci Annie would assume that face. Laerdal thought a female doll would be less intimidating for students learning CPR techniques. Resusci Annie was made of polyvinyl chloride, which was a relatively new material at the time, and she had full sized adult dimensions, including a collapsible chest for practising compressions, and open lips to enable simulation of mouth-to-mouth resuscitation.

Three of many variations of Resusci Annie

Annie's legacy

Resusci Annie has likely helped more than 500 million people to train in CPR, saving around 2.5 million lives. These days you can be captivated by her beauty in resuscitation training rooms around the world, but there is one other place you can see her. The Lorenzi model makers in Paris, who produced L'Inconnue's original death mask, continue to produce copies four generations on.

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Judging history's heroes and monsters

We should remember that our descendants will judge us too

Consider the ignominious end of Edward Colston's statue, dragged from its plinth and dumped in the Bristol docks.[1] Raised to commemorate Colston's philanthropy—his name permeates the city—it was toppled because he'd enriched himself in the slave trade. Approval for the protests wasn't unanimous: despite near universal condemnation of racism and slavery, questions were raised about historical context. If the past is a foreign country, should we judge its inhabitants by modern standards? And isn't removing statues just an effort to erase a troubled and complex history?

As Kaupp-Roberts[2] and Loke and McKernon[3] demonstrate in linked articles, these questions are very much alive in medicine today. Kaupp-Roberts maintains that J Marion Sims, developer of the first successful surgical intervention for vesicovaginal fistula and inventor of the Sims vaginal speculum, is a morally questionable figure. Sims declined to use anaesthesia in experimental surgery on female slaves despite earlier successful demonstrations using ethyl ether—hence justifying, Kaupp-Roberts argues, the removal of his statue from New York's Central Park in 2018.

For other commentators, the dismissal of Sims has been too hasty. They argue that critics have discounted the suffering of fistula patients, ignored controversies surrounding the early use of anaesthesia, and distorted the historical record.[4]

And what of "Resusci-Annie"? In the late 19th century a young woman was found dead in the Seine and, by routes too circuitous for fiction, her tranquil and slightly mysterious face was transposed on to manikins for cardiopulmonary resuscitation, making her "the most kissed girl in the world."[3] Should we be concerned about this circulation of her image without anything resembling consent?

Ethical questions

Several ethical questions emerge from these histories. Is the toppling of historical figures morally justified? If we must damn them, what should we make of the good they may have done along with the ill? If Sims was a monster, is removing his statue from Central Park enough? What should we do about his eponymous speculum? Was the unknown woman of the Seine morally wronged?

J Marion Sims, inventor of a vaginal speculum, declined to use anaesthesia in experimental surgery on slaves

Two blind alleys should be rejected at the outset: "presentism"—the idea that past acts should be judged by present standards; and "historical relativism"—the idea that acts can be judged only by the standards of their time. Neither one speaks to the complexity of history or our moral lives. Neither fully acknowledges the paradox that morals can change rapidly (even fairly recently held opinions can seem out of date), yet we can still make moral sense of our distant ancestors' actions. Moral life changes, but it also endures. Intriguingly, we seem much less agitated by praise for historical figures than by their condemnation—but both are forms of transhistorical moral judgment.[5]

One useful way forward is to determine whether alternative moral views or choices were available to historical figures in their own lifetimes. As the philosopher Miranda Fricker puts it, "The proper standards by which to judge people are the best standards that were available to them at the time."[6] If alternative moral views weren't available, judgment is unwarranted—but, if plausible moral alternatives did exist, judgment may be reasonable. To operate without anaesthetic when it's unavailable is one thing; it's another to do so without good reason.

Future judgment

As the Sims debate makes clear, when assessing historical figures we have a duty to gather facts—about their actions, the kinds of people they were, and the moral views and choices available to them. With statues and other contemporary manifestations of historical figures, we must also consider how they represent their subjects and how this may affect modern audiences. Sculpture is an art form. It need not glorify. It can be subtle, raise questions, give voice to suppressed or untold stories, and help enrich our understanding of history.

We must also be aware that any presentism we deploy today could just as easily be deployed by future generations. They may judge us for the racism and inequality highlighted by covid-19, our environmentally destructive consumption, or the industrial slaughter of animals.

Where a moral good is delivered through wrongdoing, we're under an obligation to detach the good as far as possible from both the wrong done and the wrongdoer. If the facts condemn Sims, we should remove his name from the speculum. But it would be absurd to abandon surgery for vesicovaginal fistula.

Finally, what of the unknown young woman and her "stolen" face? Dig further into the story, and the facts become less certain.[7] At the time of her death, putting bodies on view and circulating death masks were customary practice. But they're ethically troubling now. Few people would want an image of a dead loved one widely circulated without consent. So, while I probably wouldn't seek to remove the manikins in circulation, if making them now I might be tempted, out of respect, to anonymise her face.

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