

Skin Complexion and the Blush

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Manuscript accepted for publication by *Emotion Review*

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Abstract

The implications of variation in skin pigmentation for the blush have attracted discussion for centuries. Two longstanding positions are identified. First, the blush has been identified with shame, giving rise to claims that because peoples with dark skin did not blush they did not have the capacity to experience shame. Second, the meaning of a visible blush can be ambiguous. A review of more recent theorising and empirical research suggests that: people blush whatever their level of pigmentation; the blush tends to be associated with embarrassment rather than shame; it serves both intra-individual and communicative functions, influencing perceptions of the blusher. Nevertheless, there has been little systematic investigation into the impact that the relative discernibility of the blush might have on emotional experience or the functions that it serves.

Keywords

Discernibility of the blush, shame, skin complexion, historical perspectives, Darwin, cultural factors

Introduction

How significant for emotional experience is the visibility of the blush? Does its significance vary among individuals or societies whose different levels of skin pigmentation render their blush either more or less readily discernible by others? Its visibility has played an important element in explanations of the blush for centuries, notably regarding the question: Do people with dark skin pigmentation blush? The question became salient when Greek, Roman and Arabic voyagers first encountered Africans, were struck by the colour of their skin, and framed hypotheses about the causes of their dark skin, why it had come about, and what it signified. Their fascination extended to using words for black to name geographical regions such as Niger and Ethiopia, the latter deriving from Greek words for burnt and skin. The underlying assumption was that there is something inherently different about peoples with dark skin and this difference warranted explanation (Gates, & Curran, 2021). For example, the Bordeaux Academy, located in the city whose wealth derived from the international slave trade, launched an essay competition in 1741 on the theme, ‘What is the physical cause of the Negro’s color, the quality of their hair, and the degeneration [la dégénération] of both?’ (Gates & Curran, 2021, p. 52). A second, persistent, theme has been that the blush is identified with shame, giving rise to the claim that the dark-skinned could not experience shame (Iyengar, 2005).

The paper begins with a brief survey of historical positions that have been adopted on explanations of variation in skin complexion and its implications for the blush. There has been a dearth of empirical research into this issue; possible reasons for this are explored. The small number of relevant empirical findings are reviewed. Finally, a framework is outlined for researching how cultural variation in the blush might be analysed to suggest how its relative discernibility might impact on emotional experience.

It is important to locate this issue in the context of the emergence of the notions of different races with distinctive characteristics, notions that became entrenched with the expansion of colonisation, slavery and the international slave trade (Goldenberg, 1997). (A note on language in this paper: Writers, including Burgess and Darwin, used terminology such as ‘race’, ‘racial characteristics’, and ‘racial

types' as if they were established biological categories (Browne, 2006, p. 111), and used labels for different ethnic groups that are also considered offensive today. This language is used here only in historical context.) It is also relevant to consider the history of ideas about the association of the blush with shame along with speculations about the potential implications of lack of discernibility of the blush for this association. A neglected topic here is intra-societal variation in skin pigmentation, notably the phenomenon of 'passing', where a member of one 'race' manages to be accepted as a member of a different one. First, these issues are placed in the context of historical attempts to account for differences in skin colour in terms of religion and race, and their displacement by hypotheses about adaptation to environmental factors that drew upon systematic data collection.

Understanding population variation in skin pigmentation

The concept of race, in the sense of delineating identifiable human populations, dates to at least the sixteenth century, and draws upon an even longer tradition relating variation in physical appearance to psychological and moral characteristics. Connections among ideas about Africa, black skin and slavery date back at least as far as the ninth century (Goldenberg, 1997). In 1646, the English physician and philosopher Sir Thomas Browne, puzzling over the question of the origins of black-skinned people, argued against extant positions that it was caused by exposure to the sun or that it was the curse of God upon the descendants of Noah's son, Ham (Browne, 1646). Ham's descendants were not only cursed with black skin but also with 'eternal slavery' (Goldenberg, 1997). Ham's son, Canaan, was condemned to endless servitude (according to the Bible, *Genesis*, 9: 25), which has been widely interpreted to refer to slavery (Lee, 2003). Goldenberg (1997) points out that a version of this curse is found in societies wherever black slavery is institutionalised: it is, he argues, a justifying myth for the practice. While Burgess (1839/2009) produced cogent arguments against these particular biblical explanations of the origins of black skin, he could find no satisfactory explanation of his own, other than to observe, as Browne did, that it is inherited from one generation to the next. The eighteenth century brought attempts at anatomical explanations, with hypotheses about excess of dark bile or black fluids that flowed through the body from the brain (Gates, & Curran, 2021).

Describing in detail the distribution of variation in skin pigmentation offered one route to explaining its causes (Barsh, 2003). Chaplin (2004) constructed a detailed map based on a combination of measures: skin reflectance (spectrophotometry); ultraviolet radiation (UVR) levels from NASA satellite data; environment variables including average air temperature, average rainfall, number of days without snow on ground, length of frost-free period. The data suggested to Chaplin an explanation of variation of skin pigmentation in terms of maintaining a balance between foliate destruction due to exposure to high levels of ultraviolet radiation (UVR) and the risk of vitamin D deficiency caused by low levels of UVR. Nevertheless, Barsh (2003) reminds us that we do not know whether patterns of UVR have changed over time, nor do we know when variation in skin pigmentation evolved.

Genetic research methods offer an alternative approach. A combination of genome analysis and measures of variation in skin pigmentation – genome-wide association studies (GWAS) – reveals a complex picture of the evolution and distribution of such variation (Crawford et al., 2017). One of the complexities inherent in this research is the mass migration across continents that has taken place over numerous generations. Because we have no historical data going back far enough in time – no equivalents to fossil records or radiometric data – we can only speculate about its evolution, for example whether our forebears had lightly pigmented skin under a coat of dark hair as do our primate relatives, and possibly were able to develop more melanin pigment on face and hands as an adaptation to climate conditions (Jablonski, 2006).

A similar difficulty holds for explaining the origins of transient changes in facial colour such as the blush. There are speculations that the behavioural concomitants of many blushes – gaze shifts, head lowered, shrinking from contact – resemble appeasement displays in other species, where they are characteristic of submissive behaviours that are commonly observed following misdemeanours that might result in aggression against the guilty party or their social exclusion from the group (Keltner, & Buswell, 1997). The smile and attempt at smile control characteristic of embarrassment might be analogous to the ‘silent bared-teeth display’ found in many primate species (van Hooff, 2013).

Among humans, the blush can be thought of as a signal of appeasement or a nonverbal apology, all

the more effective because of its involuntary nature. Maibom (2010) argues that human shame and non-human submissive behaviour can be construed as separate branches of an evolutionary tree that can be traced to a common emotion that she labels 'proto-shame'. One of the advantages of postulating a common ancestor is the emphasis on the inherently social nature of shame, which is ultimately concerned with the individual's standing in the social hierarchy rather than with committing specific acts of wrongdoing; shame entails the involvement of the whole self in contrast with guilt, which is about specific acts. I return to shame and the blush in a later section.

Rather than pursue speculation, it would be productive, and possibly yield insight into the blush's communicative function, to investigate differences in its cultural meanings that might be associated with its relative visibility in different populations. Explaining variation in skin complexion was facilitated by systematic observation, the development of sophisticated measurement techniques, and hypotheses framed in terms of physiological processes. It was also associated with the abandonment of teleological explanations based on established belief systems. Research into blushing has not been subject to an equivalent level of detail, although there has been progress in the development of measurement techniques and empirical tests of hypotheses about the role of the sympathetic nervous system in increasing blood flow under particular conditions (Drummond, 2013).

Universality of the blush

The physician Thomas Burgess (1839/2009) published a monograph on blushing in which he presented three arguments for the universality of the blush: anatomically there is no difference among different 'races'; they do not differ in the capacity to experience emotions; finally, and more specifically, observations show reddening in cicatrices of dark skins in situations that would be expected to elicit a blush in light-skinned peoples. He concluded that 'when a true born Negro blushes, his cheeks become darker still than natural' (Burgess, 1839/2009, p. 32). Burgess also argued that the subjective experience of blushing served a valuable function as a guide to conduct. The intra-individual aspect of the blush is an important topic but is not pursued here when concentrating on its relative visibility.

Burgess presented little evidence in support of his claim of universality. In contrast, Darwin (1872/1999), who was familiar with Burgess's work, initiated cross-cultural enquiries, asking correspondents across the world whether peoples with dark skin pigmentation blush. He concluded, as Burgess had done, that blushing, whether or not there is any change of colour, is common to most, probably to all, of the races of man (Darwin, 1872/1999, p. 319). For example, a Mr Forbes writes, in reply to Darwin, of the Aymara Indians of Bolivia, 'that from the colour of their skins it is Impossible that their blushes should be as clearly visible as in the white races [nevertheless] under such circumstances as would raise a blush in us, there can always be seen the same expression of modesty or confusion; and even in the dark, a rise in temperature of the skin of the face can be felt, exactly as occurs in the European.' (Darwin, 1872/1999, p. 317). Darwin concluded that the evidence points to heightened blackness – 'an increased supply of blood in the skin seems in some manner to increase its blackness' (Darwin, 1872/1999, p. 318). He also cites Burgess's example of the colouring of cicatrice in emotion in support of the universality of the blush. It was important to Darwin to show that it is universal. His book on the expression of emotions followed closely upon *The Descent of Man, and Selection in Relation to Sex*, published in 1871, where he stressed the similarities between humans and great apes, arguing that they have a common ancestor (Browne, 2014). That the blush seemed quintessentially human posed a particular challenge to his thesis and led him to frame an explanation in terms of self-attentional processes, attention 'originally directed to personal appearance, in relation to the opinion of others ...the same effect being subsequently produced, through the force of association, by self-attention in relation to moral conduct' (Darwin, 1872/1999, p.324). This explanation has influenced more recent accounts of the blush, including an intriguing empirical demonstration by Drummond and Mirco (2004) that the cheek that is being stared at while performing an embarrassing task shows a larger increase in cheek temperature relative to the unobserved cheek. However, self-attention might not be sufficient to trigger a blush. Other people's attention to us might make us angry or fearful. Mandeville (1732/1988, p. 66) accounts for a woman's blush that she does so 'because she has room to fear, that she is, or, if all was known, should be thought of Contemptibly'. Schoenfeldt (2004) quotes Lodowick Bryskett's conclusion that blushing is caused by

‘the minde finding that what is to be reprehended in us, cometh from abroad [spelling in original Bryskett source, dated 1606]. O’Brien (2012, p. 113) proposes that the perception of potential threat induces a state of self-consciousness, in the sense of taking another’s perspective on the self, of ‘being aware that one is up for evaluation’, a phrase that captures something of the phenomenology of the blush and relates to Castelfranchi and Poggi’s (1990) claim that for a woman to blush in a situation like the one Mandeville describes, it is not necessary that the judgment is true, only that she believes that it is reasonable for her critics to make that judgment.

Recent empirical psychological research into skin colour variation in blushing has reported cross-cultural differences in self-report data. Analysis of self-descriptions of the expression of embarrassment provided by participants from five countries found that 55% of British participants reported blushing in recollections of embarrassing incidents whereas only 25% of darker-skinned participants from Greece (25%) and 21% from Spain did so (Edelmann, 1990). In a US interview study, Simon and Shields (1996) reported that 77% of black participants had noticed facial warmth but not a change in skin colour when they blushed, compared to 11% of white participants. They were also less likely to nominate a change in colour as evidence that they were blushing or that this was something that others commented upon when identifying blushing. There were no differences related to skin colour in reported frequencies of blushing or latency and duration of a typical blush.

Drummond and Lim (2000) collected physiological data from their participants in addition to self-reports of the experience of blushing. Facial blood flow was monitored continuously throughout the experiment with a pulse transducer (photoplethysmograph) attached to the forehead; a surface thermistor attached to one cheek measured facial warmth. Participants completed two tasks – a challenging mental arithmetic task; singing aloud a nursery rhyme while making animal noises. No differences between lighter and darker-skinned students were obtained in the vascular measures: both groups blushed during the embarrassing task. There were differences, however. Fair-skinned participants reported greater self-consciousness and more intense blushing than dark-skinned participants in the singing task. In addition, there were significant interactions between vascular responses and self-reports on the task. Among the fair-skinned participants, self-consciousness and

self-rated blushing correlated significantly with measures of pulse amplitude and facial temperature; blushing correlated with pulse amplitude but not with temperature. None of these correlations was significant among the dark-skinned group. The researchers suggested that the fair-skinned participants may have learned to recognise the early signs of blushing from feedback from others who notice and comment on their colouring. This is the only study to have incorporated both psychological and psychophysiological measures in its design. However, there is a potential confound in the study in that the participants were not all Australians differing in ethnic background: the dark-skinned sample had recently come to Australia from Malaysia and Singapore to take a tertiary-level degree at university.

Adopting a different, language-based approach, Casimir and Schnegg (2002) surveyed native speakers of languages from countries across the world about the colours they associate with particular emotions. Ninety-eight of 135 languages surveyed associated a colour term with emotion. Of these, 80% associated shame with red and 10% with black. Associating red with shame occurred in populations with fair complexions; those with darker complexions associated black with blushing while those with darkest complexion had no colour association with shame. Their findings are consistent with Darwin's conclusions. The findings of the empirical studies suggest the value of pursuing research into the experiences of light and dark skinned participants, extending it to members of populations varying in skin complexion.

'Passing'

Research has paid little attention to variation in complexion *within* an indigenous population. Yet there can be considerable individual variation in skin pigmentation within a given population; for example, dark-skinned women tend to have relatively lighter skin than their male peers (Jablonski, 2006, p. 88). This variation has facilitated the phenomenon of 'passing', particularly in societies where there can be ambiguity about the race to which a person belongs, where, for example, a lighter-skinned African-American can successfully pass as white. Passing has a long history and the motivation for attempting to do so varies with time and culture, whether it is to escape from slavery, to avoid the deprivations of institutionalised segregation, or to access the economic, social and political advantages enjoyed by the population one aims to join (Hobbs, 2014). It can be a permanent

change, or tactical to escape particular circumstances before reverting to the original group. Its emotional aspects of are explored in a 1929 novel, *Passing*, by the African-American writer, Nella Larsen (1891-1964). One of the two central characters in the novel – Clare – successfully passes within the white community as white although she retains emotional and social ties with the black community in Harlem into which she was born. The other main character – Irene – can also pass for white. The text is explicit that both women blush, and they do so in the kinds of social situations where a blush might be expected. These blushes occur in social situations where a character is conscious of being the object of another's close attention; a past humiliating and unresolved episode is recalled; someone guesses the character's hidden motivation for doing something. Examples are 'feeling her color heighten under the continued inspection, she slid her eyes down (Larsen, 1929, p. 11); "'You want to go to a Negro dance because so many white people go?" A pale rose-color came into Clare's ivory cheeks' (p. 79).

This phenomenon raises the question of where one might draw a line in the nature of the blush between members of the same population who happen to vary in level of melanin. It seems improbable that natural variation within a given population produces individuals who blush and those who don't or for whom the blush serves different functions depending on its degree of visibility. It also raises the question of potential differences in how the blush is experienced before and after passing, a question that has not been explored.

Blushing with shame

Another major theme in historical accounts of the blush is its connection with shame. For example, the King James Bible of 1611 has: 'Were they ashamed when they had committed abomination? nay, they were not at all ashamed, neither could they blush' (*Jeremiah*, 8:12) and 'O my God, I am ashamed and blush to lift up my face to thee' (*Ezra*, 9:6). The belief that the blush reveals the blusher's shame and that those who do not blush are incapable of experiencing this emotion is longstanding, as is its extension to those populations whose skin pigmentation renders the reddening invisible. Coeffeteau (1621/2021) wrote 'wee blush' whenever he means 'we feel shame'. In

contemporary times, Konotey-Ahulu (2003, p. 59), explains that in his tribal language (Krobo, in south-east Ghana), ‘I blushed’ is rendered ‘shame killed me’.

Iyengar (2005) cites historical and literary evidence from the sixteenth and seventeenth centuries that blushing was synonymous with shame, that ‘those who cannot be seen to blush, cannot experience shame’ (Iyengar, 2005, p. 103). This is a significant claim, since shame is fundamentally linked with honour, moral worth and the individual’s standing in society. This belief that dark-skinned people cannot feel shame makes a convenient, self-serving justification for racism and the notion of racial hierarchies, and for the acceptance of slavery and its nefarious practices, including the transportation of slaves in appalling living conditions, denial of freedom, deindividuation and subjection to extreme forms of punishments.

The capacity to blush is also associated with trust, and failure to blush with untrustworthiness. Darwin (1872/1999, p. 317) quotes Humboldt’s remark that ‘how can those be trusted, who know not how to blush’. de Waal (2019) also associates the blush with trust, arguing that we are more likely to trust those who cannot hide their emotions: the involuntary nature of the blush is a prime example of this. An experimental study by Thorstenson et al. (2020) found that a redder face influenced perceivers’ judgments of the sincerity of an apology and increased the likelihood of forgiveness for a transgression. Trust, like shame, is fundamental to society, essential for negotiations, exchanges and, more generally, interdependence among people.

Burgess (1839/2009, pp. 24-25) argued that the ‘true blush’ has a moral cause: ‘The Creator endowed man with the peculiar faculty of the internal emotions exhibiting themselves... [the blush] serves as a check on conscience... the dread of shame, or of being made *blush* hereafter for past conduct, will serve as a moral restraint’ [emphasis in original]. Knowing that a blush will be seen by others serves to deter the individual from engaging in the kind of conduct that would potentially trigger involuntary reddening. Burgess’s account assigns a central role to the blush’s visibility to others, and he argues, as his thesis obliges him to do, that it must be discernible even in people with dark pigmentation. An analogy to the dread of shame appears in Hawthorne’s novel, *The Scarlet Letter*, first published in 1850, where Hester Prynne, a woman convicted of adultery, is sentenced to wear a badge displaying

the letter 'A'. The badge stigmatises her in the eyes of the Puritan community and fear of the stigma serves as a deterrent to the community to committing shameful acts (Hawthorne, 1850/1920). The badge is analogous to the visible blush, an unwanted sign to others that one has fallen short.

It is worth noting that Burgess distinguished among 'races' or 'species' on the basis of skin colour and asserted that these races could be ordered in terms of intellectual development from the 'Caucasian' at the peak to the 'Negro' at the bottom. This followed a long tradition of distinguishing among the races and postulating a hierarchy on cognitive and moral grounds, with Africans at the bottom, from Linnaeus's classification in 1735 of *Homo africanus* to the claims made by philosophers including Hume, Voltaire, and Kant (see Jablonski, 2021, for a detailed history). More recently, there has been social Darwinism and the eugenics movement, and controversies within psychology about claims for ethnic group differences in intelligence (Jensen, 1969; Herrnstein & Murray, 1994).

Darwin refers to shame along with shyness and modesty in the title of his chapter on blushing. His data collection by means of correspondence was influenced by the association between shame and the blush. He enclosed in several letters a copy of a questionnaire that could be more widely circulated by their recipients, and in the questionnaire about emotions, he explicitly asked them whether shame is a cause of blushing. An example of this appears in the copy of the questionnaire sent in November 1867 to Julius van Haast, who was a geologist working in New Zealand, 'Does shame excite a blush, when the colour of the skin allows it to be visible?' (Darwin Correspondence Project, 2021).

Is the blush specific to shame?

There were alternatives to associating the blush specifically with shame. The ambiguity of the blush is a common theme in English-language literary treatments, for example in the sixteenth century dramas written by Shakespeare and Dekker, the misinterpretation of a blush – whether it shows modesty, chastity, innocence, virtue or bashfulness on the one hand, or guilt or falseness on the other – is a frequent trope, contributing to plot development (Iyengar, 2005). In the nineteenth century, the novelist George Eliot wrote in *Daniel Deronda* that the blush 'is no language: only a dubious flag-signal which may mean either of two contradictories' (Eliot, 1876/2020): A blush can be interpreted in different ways. She does not spell out the contradictories, but is not alone in suggesting that a blush

has more than one meaning (O'Farrell, 1997). On the basis of analysis of literary episodes, O'Farrell proposes the dual nature of the blush: it reveals something about the internal life of the blusher; it is a conventional response to a social predicament that does not necessarily tell us anything about the blusher's internal life. Thus, it is appropriate to blush when congratulated or praised because a degree of modesty is the social norm in these circumstances. Nevertheless, the difference may be more apparent than real, given that the revelation of self is feared because of its potential social consequences.

The association of the blush with romantic love also has a long history. In Milton's *Paradise Lost* (Book 8, lines 611-620), Adam asks the angel Raphael whether heavenly spirits express their love for one another physically, to which the angel replies 'with a smile that glowed/Celestial rosy red, love's proper hue'. This response has been interpreted as a blush. Its cause can be analysed in various ways. Is it Adam's mention of love, given that the blush is widely associated with romantic love, whether talking or thinking about a lover or about the potential for love, or being quizzed about a possible partner, or the presence of a lover or someone who is desired, and so on? Or is it something inherent in the nature of the topic, which is taboo in many societies and not something to be talked about in certain company, for example in the presence of a religious figure? Is it something personal to Raphael, something revealed about him that he would prefer not to be known? Alternative readings are possible and must take into account differences between 1667, when Milton's poem was published, and today, and also between this form of literature with its particular conventions and what was thought more generally about the blush during that time in that society.

Contemporary psychological accounts of causes of the blush are more likely to refer to embarrassment and the 'modesty or confusion' reported by Darwin's correspondent, Forbes (Darwin, 1872/1999, p. 317) than to shame. Buss (1980, p. 129), for example, regards the blush as 'the hallmark of embarrassment' in his analysis of types of social anxiety. Nevertheless, embarrassment in its contemporary sense of fluster, discomfort and self-consciousness in social situations only acquired this meaning in English during the nineteenth century, and the term does not appear in Darwin's chapter.

The nature of the relationship between shame and embarrassment is unresolved in psychology (Crozier, 2014). The seriousness of a transgression seems relevant to the distinction. It is difficult to believe that Hester Prynne feels embarrassed rather than shame by the exposure of her adultery to her Puritan community, although one can envisage communities where a woman accused of adultery would be embarrassed as opposed to ashamed. Humour and smiling too are associated with embarrassment but not with shame. Miller (1996) disagrees that embarrassment is a weak form of shame and proposes instead that it meets the criteria to be considered as a basic emotion in its own right. Another position is that the emotion labelled shame might encompass a set of related emotions, including embarrassment, that have in common self-consciousness and concerns about one's reputation and acceptance by others (Crozier, 2014). It is a question worthy of investigation why the blush has now become identified with embarrassment rather than shame. Nevertheless, the blush is less securely located in accounts of embarrassment than are other elements of the display such as gaze aversion, lowered head, smiling and attempts at smile control. There are arguments against equating the blush with embarrassment. Keltner and Buswell (1997) argue that it is not specific to embarrassment, while Ekman (2003) claims that its invisibility in dark-skinned people means that it cannot qualify as a basic sign of embarrassment. One way forward is to construe the blush as an arousal response triggered by the sudden apprehension of a potential social threat, the threat being to reputation in the eyes of others and possibly rejection by others. The autonomic response that is triggered may be initiated before the threat information is fully processed. The emotional state that is evoked may be labelled in different ways at different time periods and in different cultures; the nature of the causes and the consequences for the blusher and the group will play a part in labelling,

The blush as communication

Some current theorising emphasises the functions served by the visible blush. Empirical studies compare observers' reactions to faces that either do or do not display a blush in various contexts to show that the manipulation in appearance influences evaluation of the individual displaying the blush. The nature of the circumstances affects whether the evaluation is more positive or more negative. A

blush after a social transgression can serve a remedial function but in an ambiguous situation it can create a negative impression of the blusher, signifying intentionality (de Jong et al., 2003).

There is evidence (de Jong, & Dijk, 2013) that the visible blush can serve a social function, and there are several reasons why this might be so. It can be beneficial in forestalling aggression. It enables a group to cope with an incident that might otherwise disrupt an encounter. It points to a benign explanation for conduct that might otherwise cause offence. It provides an opportunity for forgiveness of wrongdoing to be shown. It upholds the values of a group when one of its members communicates that they acknowledge those values, admit to wrongdoing and apologise for it. It is all the more effective in these achievements because it is involuntary and uncontrollable: it is an 'honest signal' (Maynard Smith, & Harper, 2003). Nevertheless, the fact of its potential social value is not sufficient to conclude that this is its primary function or that it has evolved to fulfil this function. Shivering with fear is visible and can influence observers in desirable ways (elicit comfort or protection) or undesirable ways (soldier showing cowardice or unreadiness to fight), yet there can be a satisfactory physiological explanation of this phenomenon.

What is the relevance for this functional account of blushing while one is alone and no signal is required? This question has been controversial throughout the history of thinking about the blush (Hart, 2005), and its study raises obvious problems for scientific examination. An historical example is provided by Mandeville (1732/1988), who describes a woman blushing when she overhears criticism of herself; she does so even though she is in a different room, cannot be seen and her critics do not know that she can hear them. A possible explanation of this is that a response that is evoked in the presence of others can also be evoked if an audience is imagined. One might blush when hearing oneself mentioned on a radio program, conscious of the audience 'out there'. We have little relevant evidence. One empirical report suggests that blushing when alone is unusual but not unknown. Shields et al. (1990) found that 8 per cent of their interviewees reported that being alone increased the likelihood of blushing compared with 52% who said it decreased and 40 per cent reporting that it had no effect.

In summary, empirical research shows that the visible blush has communicative value. It tells others something about the blusher, as early writers claimed about the blush of shame, although the messages conveyed were also thought by other writers to be ambiguous. Empirical studies show that interpretation of the blush does depend on context (de Jong, & Dijk, 2013), but we have little evidence of the implications of its signal value in societies where people have dark skins that make the blush less visible.

Cultural variation and discernibility of the blush

It is worth asking how cultural norms and practices influence understanding of the blush, and considering the role of discernibility in this. We might expect cultural variation in different aspects of blushing, beginning with general understanding of what a blush is, the kinds of inferences that observers make, and blushers' understanding of the consequences of a blush. The empirical evidence provided by Drummond and Lim (2000) is suggestive; self-reported self-consciousness and embarrassment were greater among light-skinned participants than among those with darker skins but this difference did not correlate with variation in physiological measures. They also provide suggestive findings that the experience of feedback from the visible blush facilitated fair-skinned participants' ability to recognise their blushing. More generally, the researchers hypothesised that the differences in self-reports were influenced by cultural factors, and this ought to be followed up.

There might be variation in the kinds of situations that trigger a blush. The kinds of social predicament that can give rise to embarrassment vary across cultures (Imahori & Cupach, 1994; Miller, 1996). This variation could influence the judgments that observers make about the causes of the blush in different cultures, guided by their own understanding of the nature of social predicaments, and this could be compounded if blushing responses were less visible and even assumed to be absent. The occurrence of a blush too can itself create or amplify a social predicament, which would be less likely if the blush was not visible.

The discernibility of the blush was central to the meaning of the blush for Burgess and for historical accounts from biblical times; Iyengar (2005, p. 107) suggests that sixteenth-century moral

philosophers would argue that ‘an invisible blush is equivalent to a non-existent one’. How would a blush be different if it was undetectable by others, even though the blusher is still aware of the physiological change? It would still have value, alerting the blusher to the likelihood of threat and allowing information-processing resources and time to manage the potential predicament through escape, acknowledgement of wrongdoing, apology or justification.

There may be differences in emotional valence. In our society, many people find their blushing unwelcome, and it is the reactions of others that they particularly dislike, rather than the act of blushing itself (Shields et al., 1990). It is also evident, for example, in erythrophobia, or fear of blushing, that involves negative beliefs about the consequences of blushing (Drummond et al., 2020) and leads many to seek medical treatment, whether psychological interventions to reduce their anxiety about blushing (Capozzoli et al., 2013) or surgical treatments in an attempt to curb the physiological reaction at source (Smidfelt, & Drott, 2011). However, we lack evidence on how widely these negative attitudes are shared, and whether they would be found in those societies where the blush is less discernible.

There might be cultural differences related to gender and age. We have some data. Shearn et al. (1990) provide evidence of a significant statistical interaction on a photoplethysmograph measure of cheek temperature involving gender, with temperature greater among women than men in a task designed to produce embarrassment (there were no gender differences in other physiological measures). Observers were also more likely to judge women participants to be blushing, but only when the cheek photoplethysmograph measure was at its peak. Drummond and Su (2012) replicated the physiological findings, where blood flow was measured by a laser Doppler flow probe located on the right side of the forehead. Gender accounted for 8.7 per cent of changes in blood flow; women also scored significantly higher on self-report measures of Blushing Propensity (Leary, & Meadows, 1991) and fear of negative evaluation. On the other hand, two experimental studies (Nikolić et al., 2019; 2020) found no gender differences in measured blushing (via photoplethysmograph and thermometer sensors in each study) among children aged between 4 and 12 years performing an embarrassing task. We lack equivalent studies from other cultures, although there is considerable

cultural variation in gender norms, roles and practices, including in covering of the face and body.

There can be variation within a single country over time. For example, McDaniel (2003) conducted systematic content analyses of references to shyness in American self-help books published between 1950 and 1995, and identified gender and ethnicity-related shifts in understanding of shyness as a problem within one country during that period. Blushing is a frequent response in shyness (Zimbardo, 1986), and an equivalent study of the blush would be of interest.

Only a few isolated studies address age differences in blushing, reviewed by Stegge (2013), but none investigating other cultures. Adolescence is a peak period for embarrassment and possibly blushing in Western societies (Miller, 1996) but this may not be the case in other societies where the transition from childhood to adult is organised differently overall and for each gender.

Conclusions

Historical evidence suggests that we ought to be wary of assuming that a blush means the same in all societies and in all eras. The ambiguity of the blush and its association with romantic and sexual themes that are found in English-language literary accounts alert us to variation in meaning. We find historical evidence of the influence of cultural context in the identification of the blush with shame. Burgess's belief that God had given humankind the capacity to blush to deter us from evil presumably leads to a different conception of blushing than someone who regards it as a by-product of making a social *faux pas*, wearing the wrong tie at a formal dinner, perhaps. In the course of his voyage on HMS Beagle, Darwin encountered 'savage & wild,' naked Fuegians (Nichols, 2004, p. 170) who did not share the shame that would accompany nakedness in the England of his time. There has been a shift in thinking about the blush from an emphasis on shame toward one on embarrassment, but it is unclear what has caused this shift or whether there have been equivalent changes in other languages and societies, particularly those where the blush is relatively less discernible.

Over time there has been a move away from claims that people of dark complexion do not blush, and hence cannot experience shame, to acceptance that they do blush – although it might take the form of darkening of the face – and that they do experience shame. However, there is a paucity of systematic

studies that investigate the potential implications of variation in discernibility. In particular, there is a large gap in empirical research in that, to my knowledge, we have no studies of blushing undertaken within a dark-skinned population where blushers, observers of the blush, and researchers are all members of the same indigenous population. Darwin's pioneering data collection was obtained from Westerners based overseas, not from the indigenous inhabitants themselves. We do not know whether or how well participants in such studies would detect the blush and how this might impact on the meanings of a blush. In the absence of such studies, it is difficult to draw conclusions about the meanings and functions of the blush in different populations.

That a blush is discernible in all human populations by their members is not implausible. For example, there is empirical evidence of cross-cultural differences in the processing of facial information and in the cues used to discriminate among faces (Blais et al., 2021). There is evidence that Westerners' ability to distinguish among faces from China, Japan and Korea may be due to lack of exposure to these faces, for example, neural networks trained on large samples have significantly higher detection rates than human participants have (Wang et al. 2018).

In conclusion, speculation about the implications of variation in skin pigmentation for the visible blush and emotional experience persisted for centuries. Darwin collected data in the late nineteenth century and concluded that people of dark skin do blush. Recent research has developed techniques to measure the blush that has added to our understanding of individual differences in blushing.

Nevertheless, there has been little research into the meanings of a blush to the indigenous population in those societies where dark complexion is the norm, or how variation in complexion within a society impacts on the blush.

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