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FELLOWSHIP

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### PROJECT

## The Neural Mechanisms of Blushing

I am interested in understanding how self-conscious emotions such as shyness, embarrassment, shame, and guilt contribute to children's social decision-making. A hallmark of self-conscious emotions is blushing – reddening of the face in response to social attention, which occurs when we think about what others think of us. My research was the first to examine blushing in children and to show that, although quickly appearing and disappearing, a child's blushing may reflect social sensitivity and attunement to others; prolonged blushing is involved in the development of psychopathology. Blushing, thus, plays an important role in child socio-emotional development. Recently, the physiological and hormonal mechanisms and neuropharmacology of blushing have started to be unveiled. Interestingly, no neuroimaging study on blushing in humans has been done so far. Therefore, it is currently unknown how blushing and related self-conscious emotions arise on the neural system level in humans. Recently, together with colleagues, I developed a paradigm to evoke blushing in adolescents while measuring their brain activity in a MRI scanner. To do so, we first recorded participants while they were taking part in karaoke and sang difficult songs. We then played back these embarrassing videos to them while we simultaneously measured their brain activity and blushing (blood flow and skin temperature increases) in the scanner. By comparing viewing self vs. other in an embarrassing situation, we aim to identify, for the first time, the neural correlates of blushing. We hypothesized that we will find greater activation in the brain areas involved in interoception and mentalization in relation to the occurrence and duration of blushing. Furthermore, we will establish which neural processes characterize prolonged vs. transient and adaptive blushing. During my stay at Wissenschaftskolleg zu Berlin, I will spend time writing a manuscript of this study, which will form the basis for my future interdisciplinary work on blushing and self-conscious emotions.

### Recommended Reading

Nikolić, Milica, Lisa van der Storm, Cristina Colonesi, Eddie Brummelman, Kees Jan Kan, and Susan Bögels (2019). "Are Socially Anxious Children Poor or Advanced Mindreaders?" *Child Development* 90, no. 4: 1424–1441. <https://doi.org/10.1111/cdev.13248>.

Nikolić, Milica, Mirjana Majdandžić, Cristina Colonesi, Wieke de Vente, Eline Möller, and Susan Bögels (2020). "The Unique Contribution of Blushing to the Development of Social Anxiety Disorder Symptoms: Results from a Longitudinal Study." *The Journal of Child Psychology and Psychiatry* 61, no. 12: 1339–1348. <https://doi.org/10.1111/jcpp.13221>.

Nikolić, Milica, and Tom Roth (2021). "A Comparative Glance on Self-Conscious Emotions: A Commentary on Kret et al. (2020)." *Neuroscience and Biobehavioral Reviews* 129: 154–156. <https://doi.org/10.1016/j.neubiorev.2021.07.031>.

## Red in the Face: The Science behind Blushing

Blushing—an involuntary reddening of the face in response to social attention—appears with various social emotions, such as embarrassment, shyness, shame, or guilt. Darwin was the first to systematically observe blushing. He concluded that blushing—“the most human of all human expressions”—occurs when we think about what others think of us. In this context, blushing communicates to others that the blusher recognizes that they committed a violation of a social norm and that they care about others’ opinions of them, thereby appeasing others and minimizing others’ negative evaluation and disapproval. Blushing is universal and a part of everyday life with which many of us can readily cope. It seems beneficial to blush in front of others, yet, many people who often blush consider blushing highly discomforting and undesirable and some even develop a blushing phobia. How is blushing beneficial and distressing at the same time?

In this talk, I will discuss this puzzle of blushing by focusing on two aspects of blushing: the observer perspective and the actor perspective and the functions blushing serves for each of them. The talk will give an overview of empirical studies (1) looking at blushing as a social signal that increases observers’ cooperation and trust; and (2) showing that blushing motivates social avoidance rather than cooperation in the actor. I will explore the possible reasons why blushing is beneficial for social relationships, yet costly for the blusher. Finally, I will discuss the nature of blushing and the physiological and psychological processes that it involves. To this end, I will present my current Wiko project, in which we looked at the neural substrates of blushing.

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### PUBLICATIONS FROM THE FELLOWS' LIBRARY

Nikolic, Milica (Oxford,2020)

The unique contribution of blushing to the development of social anxiety disorder symptoms : results from a longitudinal study

<https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1813333971>

Nikolic, Milica (Malden, Mass.,2019)

Are socially anxious children poor or advanced mindreaders?

<https://kxp.k10plus.de/DB=9.663/PPNSET?PPN=1813331499>