

Music and Inducing Trust as Monitored via Functional Near Infrared Spectroscopy

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Medical therapy suggests that music may increase interpersonal trust and cooperative intentions (Keen 2005; Saroyan 1990). The theoretical reasons and the underlying physiology of the music to trust relationship are, however, unknown (Juslin and Västfjäll 2008).

The objective of this study was to identify some of the underlying physiology of the music to trust relationship through functional neuroimaging, with the intention of introducing a preliminary physiology based theoretical understanding of the relationship. The neuroimaging was acquired during a trust game by recording changes in blood oxygenation measured from the frontal lobe by functional near infrared (fNIR) spectroscopy. fNIR is a field deployable and easy to use brain activity monitoring device that measures changes of oxy-hemoglobin (HbO₂) to deoxy-hemoglobin (HbR) within the cortex. The fNIR uses a lightweight headband with continuous wave light sources and optical sensors placed on the forehead (Ayaz et al. 2012). Figure 1 shows the fNIR system.



Figure 1. fNIR (courtesy of CONQUER at Drexel University)

<http://www.biomed.drexel.edu/fNIR/CONQUER/Welcome.html>

The results show that playing melodic classical piano music in the background while subjects were engaged in a trust game increased how much the subjects invested in the game by a ratio of almost 20%. Investing in others, and particularly in a trust game scenario, is typically considered as an indication of trust in the other player (Zak 2008). This observed behavioral change was associated with increased blood oxygenation levels in parts of the *right dorsal region of medial prefrontal cortex* (overlapping Brodmann Area 9 (Zysset et al. 2003)). As illustrated in the Figure 2, the numbered circles overlaid on the frontal view of a brain show the approximate position of the fNIR sensors, adapted from Ayaz et al. (2012). The turquoise circle shows the most pronounced change registered by these sensors when music is playing compared to when it is not. Regarding the functionality of the right dorsolateral prefrontal cortex, previous studies suggest it may be more active when subjects are requested to intentionally *inhibit* their intended behavior (Pliszka et al. 2006).

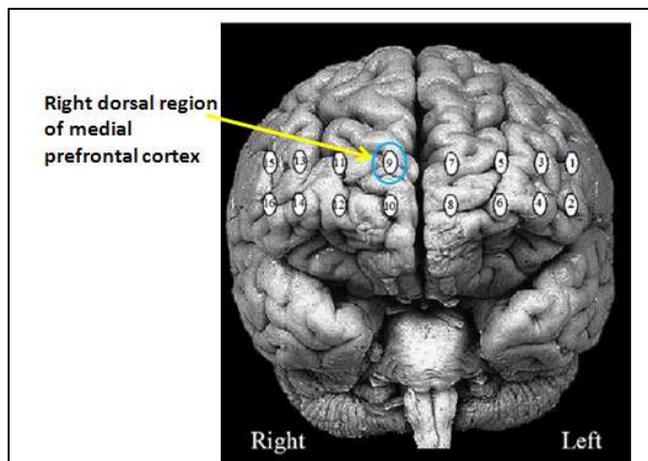


Figure 2. Areas of brain activity measured by fNIR and areas with significantly elevated blood oxygenation registered when music is playing.

To the best of our knowledge, we present the first study that reports the link between music and increased blood oxygenation in the right dorsolateral prefrontal cortex as well as the effect of music on observed trusting behavior. It would be too early to speculate on the theoretical implications of our preliminary finding as of yet, but our functional neuroimaging results might imply that *listening to at least certain types of music stimulates increased neurological activity in brain areas associated with some aspects of the self-referential decision not to partake in the behavior, and as such influence overall trusting behavior.*

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