

COLLEGE OF HUMANITIES,
ARTS, AND SOCIAL SCIENCES

Research Highlights 'Interview'



Self-Introduction

- Briefly introduce yourself, the department and school that you are in.

I am **Gianluca Esposito** from the Psychology Programme of the **School of Social Sciences**. I am the Principal Investigator of the Social Affective Neuroscience Lab and with Atiqah Azhari (my Ph.D student), we are investigating the neural mechanism of Synchrony. Learn more about our research at <https://blogs.ntu.edu.sg/sanlab/> and be the first to know our findings on twitter @SANLabNTU and/or Instagram @ntusanlab!

Elaboration

- Share with us what is your research project.

Synchrony refers to the rhythmic coordination of behavioural (e.g. reciprocal gazes and smiles) and physiological signals (e.g. similar brain activation patterns) between two people. Greater synchrony between two people when they engage in an activity together suggests that they are sensitive and attuned to each other's emotional states. In a recent study, we have investigated how parental stress influence mother/child synchrony. While we know that parenting stress reduces the quality of parent-child relationships, little is known of the mechanism by which this occurs, and whether this effect is observable in the brain. We investigated the effect of parenting stress on brain-to-brain synchrony of mothers and their preschool-age child when they engaged in a typical everyday activity of watching animation shows together. To do this, we used a neuroimaging device called functional Near-infrared Spectroscopy (fNIRS) in hyperscanning mode, which allows the brain activity of two people to be recorded simultaneously. An algorithm was then applied to get a measure of brain-to-brain synchrony.

- What inspired you to embark on this research project?

Even if many people study human development, there is still so little that we know about the brain mechanisms of parenting and child development. For instance, it is well-established that parenting stress reduces the quality of the parent-child relationship. Many studies have shown that when a parent is stressed, there is less reciprocal behaviours exchanged between parent and child but none have probed further to question why this is so. What occurs at the level of socio-cognitive engagement between a stressed parent and her child that diminishes the quality of the interaction and of the relationship? Employing neuroimaging methods might help uncover critical mechanisms by which parenting stress affects the parent-child relationship. This may lead to potential avenues for therapeutic intervention before the parent-child relationship deteriorates noticeably.

- **What is/are the most interesting finding(s) of this project?**

The effects of parenting stress can be seen at the brain level. Parenting stress affects brain-to-brain synchrony of mother and child when they are doing an activity as simple as watching animation shows together, even when there is no direct face-to-face interaction. Mothers with lower parenting stress show greater brain synchrony with their child in the left medial cluster of the prefrontal cortex, which is an area implicated in the ability to take the perspective of others. This suggests that mothers who are less stressed show more similar patterns of cognitive engagement with their child. To find out more, read our article here: <https://www.nature.com/articles/s41598-019-47810-4>.

- **How do you think your research can impact society?**

This finding emphasises the importance of the mother's mental well-being for optimal engagement with her child to occur. We found that parenting stress may diminish synchronised mother-child engagement at the cognitive level which suggests that it may be difficult for a stressed mother to attune to the emotional state of her child. This may in turn hinder the selection and reciprocation of appropriate behaviours when the mother is interacting with her child. From an intervention perspective, future research may look into applied techniques that may aid the matching of cognitive and emotional states of the stressed mother and her child.

Future Plans

- **Tell us about your future research plans and if you are looking for any research collaborators!**

We plan to look at the impact of parenting stress on father-child relationships too, as well as extend our investigation into active engagement such as the context of play.