Attachment 7: Innovation Statement (one-page limit): Upload as “Innovation.pdf”.

Summarize how the proposed research is innovative. State how the research challenges

existing paradigms or provides new paradigms, technologies, evidence-based diagnoses,

and/or applications for ASD. Investigating the next logical step or an incremental

advancement on published data is not considered innovative.

Up till now most of the management of the cognitive behavioral impairments of children affected by autism was mainly dealt with psychoeducational methods and some pharmacotherapy. The success of these methods is very limited if any. Hence, many of these children are not able to achieve even minimal levels of independence, thus being a financial and mainly an emotional burden on their immediate relatives and caretakers.

Studying tDCS neurostimulation for treating cognitive deficits, motor dysfunction and aggression in neurodevelopmental disorders is highly innovative. We are the first to suggest using tDCS as a therapy that can directly affect major deficits cognitive, behavioral and motor deficits in model mice that can be tested and scrutinized for its efficiency. The even more groundbreaking element of our proposal is to study the molecular and metabolic mechanisms that underly the tDCS effects in correlation to the cognitive, behavioral and motor effects that are related to neurodevelopmental disorders.

The advantage of neurostimulation techniques such as tDCS is that it is a wearable device, and that it has functional specificity. Both features are an enormous advantage for autistic children. Children can wear these devices on their heads while they are practicing and being taught. Although, there are some studies that suggested that given the beneficial features and advantages of tDCS it can be of use in neurodevelopmental disorders, we suggest a completely new approach of looking into metabolic and molecular parameters. The understanding of the metabolic effects of tDCS entails a remarkable advantage. First, it will provide a readout assay for its efficiency that will enable its optimization. For example, the efficiency of stimulation parameters is hard to judge by using merely subjective behavioral outcome, and a more objective endophenotype such as measuring a metabolite is much easier and straightforward. Measurements of such metabolites can be extended later on to human studies using functional imaging approaches that can measure metabolites, or simple dynamic blood tests. In addition, the novelty of studying the accompanying metabolic changes and the ignited molecular processes has the potential to suggest a pharmacological co-therapy that will augment the tDCS effects by manipulating the relevant molecular and metabolic pathways. Enabling augmentation of neurostimulation using a directed pharmacological approach is also a truly innovative element.