

The Problem of Autism

Autism is a disorder of brain development that affects one percent of children. Its social impact is devastating. In autism, the brain is unable to process sensory information normally. As a result, these children are unable to respond adequately to stimulation and initiate social behavior towards family, friends, and peers. There is no effective medication for autism. The economic burden of this disease to affected families and indirectly to society is unbearable, reaching \$3.2 million per individual in the USA.

Teenagers with high-functioning autism are the most amenable to treatment. These children have difficulties with coordination, physical health, and sleep, and they suffer from anxiety and depression. They engage in restricted, repetitive interests and lack nonverbal communication skills. They are dissatisfied with their relationships, yet they have real motivation to succeed with them.¹ Their poor fitness, limited diets, and treatments with anti-psychotic drugs set them up for early onset of metabolic syndrome.² Metabolic syndrome consists of multiple risk factors, such as obesity, that greatly increase the risk for heart disease and diabetes.

Successful treatment outcomes for high-functioning autistic children would include relief of clinical symptoms, increased fitness, greater relaxation, better communication, and improved family and social life. We want to improve their fitness and quality of life, including management of their moods.

Solution – Biology is Not Destiny

Damaged brains can rewire themselves to regain function. Task-specific practice enhances recovery after stroke³ and even recovery for people with cerebral palsy—the major developmental disorder causing impaired movement.⁴ This recovery works in much the same way that intensive practice enhances skills for golf or tennis.

Based on this principle, in a small group of teenagers with high-functioning autism and Asperger's disorder, we will assess the impact of combined intensive aerobic exercise and meditation practice on mood, socialization, pre-diabetic indicators, sleep, and activity levels. We foresee that this pilot project will grow to benefit in many ways a large number of children with autism, and their caregivers, over a long period of time.

Exercise program

Fitness. As one aspect of their brain disorder, children with high-functioning autism have decreased balance, coordination, and running speed, and lack all motivation to exercise or play sports. As a result of their low physical activity, they have decreased flexibility, movement skills, muscular strength, and heart and lung endurance.^{5,6} Because we know that only aerobic exercise of high intensity can improve aerobic or muscular fitness in teenagers,^{7,8} we will motivate participants to exercise on treadmill equipment by providing cartoons to watch while using the equipment.

Mood and socialization. We predict that our exercise program designed to improve aerobic fitness and muscle mass will also lead to better mood stabilization, less

disruptive behavior, and better quality of life and socialization for children with high-functioning autism. For example, a preliminary study of a swimming program for autistic children showed clear social improvements that were maintained afterwards.⁹ Aerobic exercise also improves executive functions in children generally, especially for those doing poorly.¹⁰

Meditation training

A demonstration of the benefits of meditation for autistic disorder was published this year.¹¹ A clinical trial used a variant of *mindfulness-based therapy* (MBT) that was adjusted for the high-functioning autism spectrum and named *MBT-AS*. Results of this mindfulness-meditation training were reductions in depression, anxiety, and rumination, and an increase in positive emotions.

In mindfulness meditation, participants learn to identify phenomena occurring in the present moment (bodily sensations, thoughts, feelings) and accept them just as they appear. This kind of meditation may be effective for autism for two reasons. First, lack of brain synchrony may be responsible for the disrupted sleep patterns and stress reactions in these children. Meditation promotes an integrated mind. Second, while children normally develop empathy and a sense of self by mirroring the actions of others in their own brain, children with autism lack this function and so are unable to create self-consciousness and, by extension, consciousness of others. Mindfulness meditation fosters self-awareness and feelings for others.

Strategy

1. **Planning and design (2 months).** We will develop a training program for these participants. This will include testing out a range of motivators to exercise and selecting components of the MBT-SA as described in the instruction manual used for the clinical trial, followed by staff selection and staff training. We will hire a meditation instructor already trained in Mindfulness-Based Stress Reduction.
2. **Recruitment.** We will partner with the Special Needs Network of Los Angeles to recruit 4 adolescents to the study.
3. **Baseline evaluation (1 month).** To evaluate mood and socialization we will give the participants two questionnaires: the Beck Depression Scale, and a Quality of Life scale. To evaluate activity level and amount of sleep, participants will wear Fitbit monitoring devices, which are economical and unobtrusive. To measure pre-diabetic conditions, we will draw blood and test for fasting blood sugar and hemoglobin A1c, which is a marker of average blood sugar level over the previous month.
4. **Exercise and meditation (3 months).** For the intensive aerobic exercise, participants will use a treadmill, stair stepper, or elliptical machine, motivated by the reward of watching cartoons or anime or playing Wii games while exercising.
5. **Individualization.** We will offer an individualized approach as needed for each participant.

6. **Program evaluation (1 month).** To evaluate the success of our program, we will re-administer the two questionnaires, the Fitbit activity-and-sleep measuring instrument, and the blood tests.
7. **Dissemination.** The Special Needs Network of Los Angeles will work with us to disseminate results.

Organization and Leadership

Rancho is one of the largest comprehensive medical centers and is world-renowned in the field of medical rehabilitation, ranked by U.S. News & World Report as one of America's "Best Hospitals" for rehabilitation in 2012–2013.

The Rancho Wellness Center has been managing programs of this nature for many years. The Center provides a wide variety of innovative wellness experiences, including a gym that is well-equipped and adapted to our population's needs, cardio equipment, and multiple areas that have classes such as dance, Pilates, and meditation. The programs are run by enthusiastic therapists and other members of the Wellness Center. Monthly membership averages 200 active members, with about 900 visits per month.

Rancho's patients have the highest level of disability and the lowest socioeconomic status of those at any rehabilitation facility in the nation. Outpatients live in diverse cultural communities, the majority being Hispanic. This is an important target population for programs to improve children's the quality of life.

The director of this proposed project will be neurologist Mindy Aisen, the Chief Medical Officer of Rancho. Dr. Aisen has extensive leadership, healthcare, and research experience, including CEO of the Cerebral Palsy International Research Foundation; Director of Technology Transfer and Director of Rehabilitation Research and Development at the Department of Veterans Affairs; and Associate Professor of Clinical Neurology at Cornell University Medical College. Recent appointments include board elected positions to the American Society of Neurorehabilitation Foundation, American Society for Experimental Neuro-Therapeutics, and member of the NIH Council for the National Institute of Child Health.

Budget

The requested grant of \$25,000 will cover the following costs:

- Physiotherapist / occupational therapist (\$80/hr):
—\$240 per week for 12 weeks times 4 children: \$11,520
- Activity and sleep monitoring equipment and analysis: \$4,000
- Project director: \$3,000
- Meditation instructor: \$2,400
- Psychological evaluations: \$2,000
- LAREI management costs: \$2,080

Impact

Depending on the outcomes of this small demonstration project, Rancho Los Amigos may make available “wellness” programs for adolescents with autism, funded by private donors and membership fees for our Wellness Center. Further, depending on the outcomes, we will seek funding for conducting a large, definitive clinical trial to establish the feasibility of these new methods or new types of services. Being grounded in medical evidence, the results of our programs may lead to a major change in the way everyone should approach clinical care and educational programs for this population. As a long-term result, we expect to see improvements in fitness and emotional health for all persons with autism, and a corresponding decrease in caregiving costs, especially for low income families and ethnically diverse communities.

Reference List

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