

Research Summary: Effectiveness of a School-Based Executive Function Intervention for High School Students with ASD

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Executive functions (EF) are the set of thinking skills that allow us to successfully set goals, make plans, wait for what we want, organize information, and be flexible. These skills are critical to doing well in school, at work, and living on our own. However, EF problems can be a real challenge for autistic individuals and can have a major impact in everyday life. People with ASD have much to contribute to society, including unique perspectives, knowledge and skills, but are often prevented from doing so because of EF weaknesses. As adults, many are lonely or do not have productive ways of sharing their gifts, because EF problems get in the way. Autistic teens leaving high school and their families often report “falling off a cliff” when they lose many school and social supports. Adolescence is a crucial time to target these EF skills because they are in high demand, and this is a time when young people have gained the language, conceptual, and self-reflective capacities to explore, understand, and apply EF skills. The EF skills of flexibility, planning, organization, and problem-solving are key skills for treatment (Hume, Loftin, & Lantz, 2009) because they are common problems (Hill, 2004), interfere with school (Gobbo & Shmulsky, 2013) and everyday life (Pugliese et al., 2015, Pugliese et al., 2016), and can improve when taught directly (Kenworthy et al., 2014; Pugliese & White, 2014).

This study tested whether the new high school version of *Unstuck and On Target (UOT)*, called *UOT: Flexible Futures*, can improve EF skills in autistic teens. *UOT: Flexible Futures* was developed for, and with input from, autistic youth to target skills they need the most. Parents, teachers, and autistic self-advocates also helped with the development of this program, in which teens learn how to use and apply a flexible problem-solving process to wide-variety of daily challenges. Specific skills targeted through *UOT: Flexible Futures* include celebrating neurodiversity, understanding personal EF strengths and weaknesses, self-advocacy, flexibility, compromising, goal-setting, and planning skills to prepare for a successful transition to adulthood.

UOT: Flexible Futures is designed to be taught by non-specialist teachers in high schools to reach a broad range of autistic teens, including those who cannot access specialized clinic care (Cidav et al., 2013). For this study we were interested in three questions:

1. Can teachers effectively deliver the *UOT: Flexible Futures* program in schools?
2. Do youth and their parents like the *UOT: Flexible Futures* program?
3. Does the *UOT: Flexible Futures* curriculum improve EF skills and real-world behavior?

To answer the third question, we tested *UOT: Flexible Futures* against services typically given to students with autism, called “treatment as usual” (TAU). We predicted that students receiving *UOT: Flexible Futures* would show gains in EF skills measured by: parent, student, and teacher report; direct testing of EF; and observations of the students’ EF skills in the classroom.

Eight schools in the DC metro area and 49 high school students with autism (8 girls) between the ages of 14-20 (average age 16) participated in this project. Teachers in the *UOT: Flexible Futures* group were provided with a short training along with program materials, and were given the freedom to deliver the program in the easiest way possible for their school (for example, as a class or during homeroom or lunch period). Parents also had two trainings. Students in the TAU group received their usual IEP accommodations, if applicable, in addition to autism-specific teaching supports and planning/studying supports. Four schools were randomly assigned to the *UOT: Flexible Futures* group (29 students) and four schools to the TAU group (20 students). We measured EF skills and adaptive skills before the students received the intervention and after the intervention was completed. Importantly, we kept our study staff unaware of which students were in each group to remain unbiased in our ratings of students.

We measured EF skills in several different ways. First, students completed commonly used problem solving and planning tasks with evaluators. Students also completed the Executive Function Challenge Task (Kenworthy & Anthony et al., 2014) with the evaluators, which consists of several collaborative activities that challenge the

teens to be flexible and planful in a social context. Second, students, parents, and teachers reported on students' EF skills in their daily lives through rating forms. Third, a member of the evaluation team observed each student in the study during a regular academic class at school on behaviors related to EF: flexibility, planning, organization, negativity, and work completion. Adaptive behavior was assessed through parent report.

To answer whether teachers could deliver *UOT: Flexible Futures* effectively in schools, we observed them on two occasions. All teachers were observed to be delivering the correct lesson content and were able to finish teaching the entire curriculum. They were confident, positive, organized, and used the visuals and materials. Students were observed to be engaged and participated throughout the observations. All teachers reported that each lesson could be conducted easily and 95% of teachers noted that each lesson was helpful in the students acquiring new skills.

To answer whether parents and students liked *UOT: Flexible Futures* and thought it was important, we asked them to rate the program across a variety of areas. Most teens (88%) said they would recommend the *UOT: Flexible Futures* program to other teens. All teens (100%) said they were more flexible after *UOT: Flexible Futures* and 72% said they were better at planning. Teens used skills at home (92%), school (92%), with parents (76%), and friends (68%). This is what they had to say about *UOT: Flexible Futures*:

- *"I know how to manage my time better. I am working on getting faster so I have more free time."*
- *"I learned to recognize when I'm being inflexible, so I can change my behavior before it affects my reputation."*
- *"It helped me to keep my peer's reputation of me high, as well as helping me earn my teacher's respect."*
- *"I learned that it's fine to be different from others and that my life matters."*

Parents were also satisfied with *UOT: Flexible Futures* and learned new skills during parent trainings. 95% reported *UOT: Flexible Futures* helped their child, 100% said they learned new skills, and 70% said their child's flexibility and planning skills got better. This is what parents said about *UOT: Flexible Futures*:

- *"He has needed less help to complete school work tasks. Things got done without me even knowing!"*
- *"This year the independence has shown through. I almost never got asked to help with projects, grades, teacher miscommunication. Maturity in trying to set, complete and handle his own tasks and goals has been greatly improved (noted by teachers as well)."*
- *"He's/we're more flexible in how we deal with changes; he's improving in understanding why parents require certain things to happen on a scheduled basis and adjusting when changes are needed."*

To answer whether *UOT: Flexible Futures* improved EF and real-world behavior, we compared group change in two ways:

1. We compared whether students within each group changed from the beginning to the end of the study
2. We compared whether the *UOT: Flexible Futures* group changed more than the TAU group

When we compared whether students within each group changed from the beginning to the end of the study, students in the *UOT: Flexible Futures* group demonstrated medium- to large-sized improvements on most of the measures:

- **Direct EF testing:** They increased their flexibility, problem-solving and planning skills on both cognitive tests and social problem-solving challenges
- **Classroom EF behaviors:** when observed, they also got better in school at starting work on their own, staying on task, planning, changing tasks, flexibility, organization, and showing less negativity
- **Questionnaires:** They and their parents noted improved real-world planning and flexibility skills. Parents also said their teens improved in broader daily living skills including those needed to care for themselves and to successfully interact with others.

In comparison, the TAU group only improved on self-reported flexibility and parent-reported planning/organization skills from the beginning to the end of the study.

When we compared the two groups, we found that the *UOT: Flexible Futures* group improved **more** than the TAU group on our social flexibility and planning task, observations of EF classroom behaviors, and parent-reported daily living skills with medium- to large-sized effects.

Here are the takeaways from the study:

- Teachers liked the *UOT: Flexible Futures* program and were able to teach it well
- Autistic teens and their parents also liked *UOT: Flexible Futures* and noticed positive changes from participating in the program
- *UOT: Flexible Futures* looks like it improves planning, flexibility, goal-directed behavior, classroom behavior, and independent living skills in autistic teens
- These results suggest that autistic teens may be more available to learn in the classroom and have an easier time at school and at home after participating in the program

There is much still to be done. This was a small study and although the results are promising, *UOT: Flexible Futures* needs to be tested with more students. Teachers also noted that the program might be helpful for students with EF problems who don't have autism. A future research study could include students with attention deficit hyperactivity disorder and emotional difficulties that interfere with learning, in addition to autistic students. Finally, our team is currently preparing the research edition of *UOT: Flexible Futures* for publication so that it can be used more broadly, including in future research studies.

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