Fostering Resilience to Adverse Childhood Experiences Among Adolescents: Investing in Social Brain Development in the Age of the COVID-19 Pandemic

Sara B. VanBronkhorst, MD, MPH, and Cristiane S. Duarte, PhD, MPH

Social experiences are central to developing resilience to adverse childhood experiences (ACEs). Disruptions to social interactions during the COVID-19 pandemic may compromise resilience, or the ability to psychologically adapt to ACEs, by blunting social brain development. This is especially concerning for children with access to limited resources. Drawing from evolutionary psychology and resilience research, we understand that the development of the social brain —a complex network of brain regions involved in social behaviors—is shaped by life experiences throughout childhood. Adolescence is a sensitive period of brain development during which rapid and lasting attunement of the brain to the environment occurs.[1] Therefore, to counter potential negative effects of the COVID-19 pandemic on resilience to ACEs among vulnerable adolescents, interventions should focus on promoting social brain development through positive social experiences. Critically, this effort will support youth who are economically marginalized, and/or racially and ethnically minoritized. Not only are these adolescents highly exposed to ACEs and to discrimination-based social rejection, they often lack access to resources that foster resilience.[2] Individual, family, and community level interventions can promote trajectories toward resilience by facilitating supportive relationships, providing access to social resources, and promoting social cohesion by reducing experiences of social rejection.

The social brain has evolved to play an important role in resilience to threat. Social behaviors enhance species' survival by coordinating a collective, group response to predators. Across species, animals use social behaviors to survive threats. Fish form social organizations and construct shelter systems specialized to protect one another. Musk oxen, when approached by wolves, form a circle to protect their most vulnerable, with horns facing outward and their calves sheltered in the center. Humans have developed complex social brains that underlie psychological processes of empathy and perspective taking to strengthen group cohesion. Across multiple levels of human social domains—from pair-bonds and family units, to larger communities—a sense of belonging can encourage group members to aid one another when encountering threat.

Central in the neurobiology of the social brain is the ancient oxytocin system.[3] Oxytocin-like molecules emerged over 600 million years ago in the shared ancestors of modern vertebrates and invertebrates. The oxytocin system promotes resilience in several ways. It supports the development of social bonds across the lifespan through feelings of joy and meaning in response to positive social behaviors. Oxytocin also interacts with the hypothalamic-pituitary adrenocortical (HPA) axis to modulate the stress response. When a person engages in social behavior in the context of a threat, the oxytocin system reduces their stress response. This process is referred to as the social buffering of stress.[4] Lower stress levels, in turn, are associated with indicators of resilience, including better long-term physical and mental health. The oxytocin system may also promote resilience and healing through its anti-inflammatory and antioxidant effects in response to threat.[5] Importantly, however, the development of the oxytocin system and its ability to buffer stress and promote resilience depends on a person's life experiences during development.[4] ACEs and other experiences of social rejection are associated with deficits in social functioning, lower oxytocin levels, and changes in HPA axis functioning.[6]

Additionally, ACEs are associated with reduced volumes in brain regions involved in social cognition, including the amygdala and the medial prefrontal cortex.[7,8] There is increasing evidence, however, that positive social relationships—including with parents, therapists, friends, teachers, and neighbors—can provide a powerful buffer to these effects of ACEs.[9] Furthermore, during adolescence, the brain undergoes rapid synaptic pruning and becomes highly attuned to the environment. Therefore, as a sensitive period in brain development, adolescence may represent an important window of opportunity during which these positive experiences can provide lasting effects.

In designing interventions to promote resilience to ACEs during or in the aftermath of the COVID-19 pandemic, it will be important to consider how the ongoing social disruptions may affect social brain development of some adolescents more than others. Families who are marginalized and minoritized may be disproportionately impacted by these social disruptions. These families are most likely to have remote as opposed to in-person learning during the pandemic, and are least likely to have access to optimal technology for remote learning.[10] Remote learning also introduces new challenges to social relationships for adolescents with ACEs. For example, digital peer relationships can worsen bullying and social rejection, which tend to be more severe and relentless when occurring digitally. Finally, the policies and systemic factors that contribute to higher ACEs among marginalized and minoritized families also perpetuate inequities in access to social resources. These social resources include, for example, safe neighborhoods, well-staffed schools, and the financial resources needed for certain social experiences.

Ports of entry for interventions for restoring healthy adolescent social brain development following the disruptions from COVID-19 can occur across various social domains-from individual and family relationships to neighborhoods and cultural groups. Experiences in one social domain can have reverberations across other domains. On the individual level, therapists can aid adolescents in learning how to strengthen relationships. Interpersonal Psychotherapy for adolescents, for example, is an effective approach to depression that focuses on social relationships. On the family level, parents and siblings can be involved in relationship-focused therapy. Group attachment-based therapy is an example of an effective approach to improve parent-child interactions through psychoeducation and mutual support among family participants.[11] On the community level, school and neighborhood interventions can promote resilience. Legislation can be passed to require mental health curriculum in schools to promote resilience, as has been done in some states such as New York and Virginia. This curriculum can incorporate social-based programs. A range of evidence-based, creative, school-based interventions to improve social relationships have been shown to be effective. Examples of these programs include using drama and role-play to develop empathy and prosocial skills; video-games and virtual-reality to build perspective taking; direct relationship-building by pairing school-aged students with college students; and interventions to reduce bullying.[12,13] Operating within COVID-19 safety guidelines, afterschool programs that provide experiences of shared enjoyment and social cohesion such as art, drama, and sports, may be helpful.

We must also acknowledge that to create lasting inroads in the effort to promote resilience for those most exposed to ACEs, systemic changes are needed. From inequities in access to childcare, health, and mental health care, to policies that permit racial profiling and mass incarceration, to the social acceptance and infliction of identity-related aggressions, racism and discrimination can fundamentally impact resilience by reducing access to social resources and the critical experience of belonging. Proposed antiracism legislation, such as the Anti-Racism in Public Health Act, could fund programs that aim to support racial equity in healthcare and the legal system. Medical and educational institutions can prioritize recruiting people of color to leadership positions, require antiracism training for employees, and ultimately make these institutions more attuned to the needs of minoritized and low-income children. To

reduce segregation in schools, emphasis on improving the admissions process for top-performing schools could have considerable impact. Changes such as these, implemented across social domains, can lead to greater access to the life experiences of social connection and belonging that are needed for healthy social brain development.

In summary, social disruptions related to the COVID-19 pandemic may have reduced resilience among adolescents by impacting social brain development. However, we can counter these effects by providing opportunities for positive social experiences, improving equity in access to social resources, and by funding antiracism initiatives. Attention to social brain development during adolescence can promote lasting trajectories of resilience. This is our opportunity, like musk oxen, to invest in one another and to provide shelter for those exposed to ACEs by rebuilding a protective wall of positive social bonds.

Take Home Summary

Social brain development is critical for resilience to adverse childhood experiences (ACEs). Based in evolutionary psychology and resilience research, we describe an anticipated social impact of the COVID-19 pandemic on youth with ACEs and outline evidenced-based interventions to promote resilience.

References

1. Blakemore S-J, Mills KL. Is Adolescence a Sensitive Period for Sociocultural Processing? *Annu Rev Psychol.* 2014;65(1):187-207. https://doi.org/10.1146/annurev-psych-010213-115202
2. Strompolis M, Tucker W, Crouch E, Radcliff E. The intersectionality of adverse childhood experiences, race/ethnicity, and income: Implications for policy. *Journal of Prevention & Intervention in the Community*. 2019;47(4):310-324. https://doi.org/10.1080/10852352.2019.1617387
3. Caldwell HK. Oxytocin and Vasopressin: Powerful Regulators of Social Behavior. *The Neuroscientist.* 2017;23(5):517-528. https://doi.org/10.1177/1073858417708284
4. Hostinar CE, Sullivan RM, Gunnar MR. Psychobiological mechanisms underlying the social buffering of the hypothalamic–pituitary–adrenocortical axis: A review of animal models and human studies across development. *Psychol Bull.* 2014;140(1):256-282. https://doi.org/10.1037/a0032671
5. Carter CS, Kenkel WM, Maclean EL, *et al.* Is Oxytocin "Nature's Medicine"? *Pharmacol Rev.* 2020;72(4):829-861. https://doi.org/10.1124/pr.120.019398
6. Ellis BJ, Horn AJ, Carter CS, Van Ijzendoorn MH, Bakermans-Kranenburg MJ. Developmental programming of oxytocin through variation in early-life stress: Four meta-analyses and a theoretical reinterpretation. *Clin Psychol Rev.* 2021;86:101985. https://doi.org/10.1016/j.cpr.2021.101985
7. McLaughlin KA, Weissman D, Bitrán D. Childhood adversity and neural development: a systematic review. *Annual review of developmental psychology.* 2019;1:277-312. https://doi.org/10.1146/annurev-devpsych-121318-084950
8. Blakemore S-J. The social brain in adolescence. *Nature Reviews Neuroscience.* 2008;9(4):267-277. https://doi.org/10.1038/nrn2353
9. Bethell C, Jones J, Gombojav N, Linkenbach J, Sege R. Positive Childhood Experiences and Adult Mental and Relational Health in a Statewide Sample: Associations Across Adverse Childhood Experiences Levels. *JAMA Pediatr.* 2019;173(11):e193007. https://doi.org/10.1001/jamapediatrics.2019.3007
10. U.S. Department of Education IoES. *School Survey.* National Center for Education Evaluation and Regional Assistance; 2021.
11. Steele H, Murphy A, Bonuck K, Meissner P, Steele M. Randomized control trial report on the effectiveness of Group Attachment-Based Intervention (GABI©): Improvements in the parent-child relationship not seen in the control group. *Dev Psychopathol.* 2019;31(1):203-217. https://doi.org/10.1017/s0954579418001621
12. Evans CB, Fraser MW, Cotter KL. The effectiveness of school-based bullying prevention programs: A systematic review. *Aggression and Violent Behavior.* 2014;19(5):532-544.
13. Ingram KM, Espelage DL, Merrin GJ, Valido A, Heinhorst J, Joyce M. Evaluation of a virtual reality enhanced bullying prevention curriculum pilot trial. *J Adolesc.* 2019;71:72-83. https://doi.org/10.1016/j.adolescence.2018.12.006

About the Authors

Sara B. VanBronkhorst, MD, MPH, is an early career child and adolescent psychiatrist. She is pursuing research with the AACAP Junior Investigator Award through Columbia University at New York State Psychiatric Institute.

Cristiane S. Duarte, PhD, MPH, is a professor in the Division of Child and Adolescent Psychiatry, Columbia University at New York State Psychiatric Institute and Ruane Professor for the Implementation of Science for Child and Adolescent Mental Health (in Psychiatry) at Columbia University Irving Medical Center.

Dr. VanBronkhorst was supported by a grant from the National Institute of Mental Health (T32MH016434-41). Dr. Duarte was supported by a grant from the US National Institutes of Health: Office of the Director (UH3OD023328).

Disclosure: Drs. VanBronkhorst and Duarte have reported no biomedical financial interests or potential conflicts of interest.

Correspondence to Sara B. VanBronkhorst, MD, MPH; e-mail: sv2578@cumc.columbia.edu

This article was edited by Misty Richards, MD, MS.