

**National Institutes of Health (NIH)  
Office of the Director  
Office of Behavioral and Social Sciences Research**

**Advancing the Science of Aggression Across Species and Disciplines**

**June 14–15, 2023  
1:00–5:00 p.m. EDT  
Virtual**

***Key Highlights and Action Items***

This meeting aimed to support a better understanding of the gaps and opportunities in the science of aggression, an NIH-wide topic of relevance with implications across diseases and the life course. For this workshop, aggression was defined broadly as “interpersonal behaviors that aim to intentionally harm another individual.” Results from a Request for Information released earlier this year are [available online](#). The hub-and-spoke approach of this workshop was designed to better explore the central topic of aggression mechanisms by examining it from multiple disciplinary angles. The workshop aimed to foster cross-disciplinary dialogue; identify ways to support bidirectional communication between basic research and intervention development; and advance progress in prevention, assessment, and treatment.

**Key Points and Themes**

- Aggression is an innate behavior in both humans and animals. Engaging in aggression is rewarding, especially for winners, and the tendency to express aggression varies by individual and experience (i.e., repeated losing decreases the rewarding value of aggressive behavior). Human aggression is complex, and it is normative at some life stages. Reactive aggression is an impulsive, emotional act motivated by a threat or provocation; proactive aggression is a premeditated, cognitive act motivated by reward or other goals.
- Adaptive behaviors, including aggression, increase an individual’s evolutionary fitness but can become maladaptive if the environment changes. Evolution acts on proactive and reactive aggression separately because each has fundamentally different goals. Aggression-specific neural circuits may not exist, and aggressive behavior may instead result from interacting underlying processes (e.g., reward). These processes developed to support other adaptive behaviors, so targeting the reward center in a way that only reduces aggression is difficult. The reward of aggression likely increased evolutionary fitness in the past, but targeting that reward for treatment may reduce an individual’s adaptive capability and pro-social interaction, which puts them at risk of other mental health issues.
- Aggressive behavior is influenced by a constellation of biological, cognitive, social, and structural factors. However, a large majority of aggressive behavior is perpetrated by a small percentage of the population. This high-risk population should be the focus of research and intervention efforts given their outsized effect on public health and safety.
- Both genetic and environmental factors play a role in the risk for aggressive behaviors; parents pass on genetic vulnerabilities, but different children can evoke different parenting behaviors and feelings in the same parent. Researchers studying aggressive behavior in children and adolescents must determine how to capture real-world dimensions of aggression, assess aggression over the life span, and improve translation of clinical research to interventions.

- Callous-unemotional traits (a lack of empathy, shallow affect, lack of guilt or remorse, and lack of caring about performance) can be differentiated in individual children early in life and can identify children most in need of early intervention for aggression. The high prevalence of aggression during the toddler years suggests that aggression may have been selected for in evolutionary history; humans now must be socialized to reduce aggression. These factors are consistent with a gene–environment interplay process early in life and suggest the need for society to move away from punishment and toward positive socialization strategies.
- Parenting interventions have been successful in treating behavior problems, but approaches at the family-system level could include behavior therapy techniques for both the affected individual and their family members, which could help address some of the emotional dysregulation that underlies aggression as a developmental disorder. Treatments may need to change as an individual ages; aggression can have many influences beyond the family and home, particularly during adolescence.
- Sustained interventions likely would need to be implemented in broad, systems-level contexts across the life course. Prevention usually begins with universal strategies and then moves to selective strategies for the few who do not respond, and many people require increased support and improved access to resources. Clinicians often avoid diagnosing disorders of aggression, especially in children, out of fear of stigma, and they may offer ineffective treatments when evidence-based ones exist. However, even when evidence-based treatments are offered, they are time intensive and do not always consider the multiple challenges and demands on the lives of the families or may not be culturally tailored.
- The diversity of research foci and complexity of aggression make determining mechanisms difficult, particularly because research often considers only the individual level rather than the full social ecology. Aggression cannot be separated from the environment that influences it, and focusing only on individual or family levels misses larger, intertwined social contexts. Environmental factors, including stress and trauma, can change biology to increase or decrease aggression over time.
- One of the major challenges of the field of aggression research is to integrate complex human research with precise animal research and improve communication between researchers conducting each type of research. Complex subtypes of human aggression that map onto developmental patterns are difficult to replicate in animal models, and overlapping phenotypes are hard to separate in humans.
- Although aggression is an individual behavior, the rates vary depending on structural and social factors, which are under-researched. Many aspects of aggression are difficult to research in humans, and experiences that are risk factors in humans are challenging to study in animals, although researchers can develop creative ways to model these experiences in animals. The ecological validity of results from animal studies must be considered carefully.
- Implementation science approaches are needed to address issues around screening and intervention uptake among those most at risk. Areas of concern include stigma, feasibility, accessibility, and adaptability to ensure evidence-based treatments fit the realities of social and structural barriers.
- Significant social and political harms have been based on comparisons between animals and marginalized people, and generalizing animal data to humans risks oversimplifying or misinterpreting human behaviors. Researchers can use consideration of stigma and reporting laws to develop evidence-based disclosure policies that enhance participant and public trust. Even when data are objective, expert interpretation is required; algorithms are often biased. Effectively disseminating

accurate and accessible information about this type of research is difficult. Careful consideration of media outlets and emphasis on context can help, but even cautious comments can result in articles that misrepresent the science.

- Siloing of animal and human research, as well as within disciplines—both in academia and funding agencies—poses challenges to supporting research on aggression, as aggression can cut across many fields and disease states. One potential opportunity presented was to convene a representative coalition of scholars and community members to collaborate on defining aggression—particularly given the frequent conceptual overlap among domains—and reducing silos.
- Improving connection and collaboration could also help researchers determine how to design studies that are representative of the population of interest, including how to meaningfully incorporate NIH’s Sex as a Biological Variable policy. The roles of sex and gender (in humans) in aggressive behaviors, including the variations in type and context of female aggression, are understudied.
- More opportunities are needed to continue the dialogue between human and animal aggression researchers. Discussions should include how to best model complexities of human aggression and social context in diverse organisms. Objective taxonomies of behavior across humans and animals are needed.
- Breakout group discussions coalesced on the need for deeper conversations among siloed fields to develop ontologies, disseminate effective interventions, and develop more substantive considerations of broader contexts. Given that aggression research is relevant to the mission and focus of multiple NIH offices, centers, and institutes, continuing these discussions and collaborations is critical. In some cases, it has led to a lack of investment in aggression-related research relative to its impact on health and public health. Agencies in related fields, such as education and justice, could be included in such collaborations to reach other contexts in which aggression occurs. Meeting organizers emphasized both the difficulty and importance of bringing together different perspectives in this meeting and encouraged participants to continue the collaborative interdisciplinary discussions that occurred throughout the meeting. A continued focus on interdisciplinary and multilevel work, as well as bidirectional translation between basic and applied research, is needed to advance the field.