Background and relevance

Early adulthood is a key stage in the development of antisocial behavior. Various studies suggest that during this developmental period, many young people desist from antisocial behavior, even if they showed an early childhood-onset, a factor that has often been associated with various negative life outcomes and continuous patterns of severe antisocial behavior. Still, a small group of youth with an early onset persists in antisocial behavior into early adulthood. Although it is evident that these developmental differences arise, up to now we do not understand well *why* and *how* they arise. One way to start answering these complex scientific questions is by studying neural functional mechanisms that are expected to differentially characterize these persistent and desistant developmental groups in early adulthood, compared to young adults who resist antisocial behavior throughout the lifespan. Understanding these mechanisms can guide development of better interventions. This is critical because persistent antisocial behavior is hard to treat and costly for individuals, victims, and society at large.

Hence, to gain a better understanding of the involved neural functional mechanisms, we reviewed the empirical literature and propose a neurocognitive social information processing model for early onset persistent and desistent antisocial behavior in early adulthood. In the review, we focused on important developmental tasks in early adulthood, such as gaining and using knowledge, skills, and self-understanding to balance between environmental constraints and one's personal goals. Given that antisocial can be highly heterogeneous even within developmental groups, we also consider whether these neurocognitive mechanisms of interest are associated with a more dimensional measure of antisocial tendencies: psychopathic personality traits.

Key findings and hypotheses

Understanding the self: self-evaluation

In terms of self-evaluation, we considered how young adults with different developmental trajectories might evaluate their self-concept. Although few studies have examined these kind of self-appraisals in antisocial populations, there are some indications that young adults with persistent antisocial tendencies show less self-concept clarity than typically developing peers. At the same time, they have an equally positive self-concept and recruit similar brain areas (e.g. mPFC) during self-evaluations. When we looked at the more dimensional measure of psychopathy, we observed that young adults with higher levels of psychopathic traits evaluated their self-concept as being more negative when they considered their prosocial behavior (compared to evaluations of their physical appearance).

Understanding the self through social feedback

How we evaluate ourselves is also influenced by social feedback that we receive from others. In young adults with persistent and desistent trajectories, processing feedback of

others on self (regardless of valence) is associated with enhanced reactivity in the insula. This could signal that young adults with prior antisocial experiences may interpret neutral and more ambiguous situations as more hostile and indicative of rejection and hence more salient and self-relevant.

Protecting yourself by retaliation

One way to protect our self-image is by retaliation, for instance by showing aggression in response to social feedback that we receive from others. Young adults with a persistent antisocial trajectory are less likely to adjust their responses based on the type of feedback they receive, compared to those with desisting or resisting trajectories. And individuals with a desistent trajectory show less aggression and more activity in cognitive control areas such as the ACC and dorsal striatum after they receive positive feedback – which hints at a neurocognitive mechanism that can help explain why they manage to desist from antisocial behavior. As of yet, however, it remains unclear whether such differences arise due to deficits in the ability to control behavior, or due to differences in motivation to control and adjust behavior.

Updating your self-concept and goals

People can choose to protect their view of themselves after they receive social feedback, but also to use the feedback to update their self-concept and goal representations. This helps them to increase their self-control and self-efficacy in future social situations. Based on recent research in typically developing young adults and on psychopathic traits, we propose that young adults who show high levels of psychopathic traits might have different goals than those with lower levels of psychopathic traits (e.g. having a self-image that is realistic instead of one that is positive). Another possibility is that youth with higher levels of psychopathic traits have more difficulties and/or less motivation to update their goals and self-concept.

Learning how behavior may benefit self and others

People often learn about differences between their goals and outcomes through external social feedback, but more commonly, they rely on internal monitoring to assess whether their actions achieve the desired results. As they mature, typically developing young adults get better at evaluating their own actions and adapting to social contextual demands. However, early evidence suggests that individuals with antisocial tendencies or high levels of psychopathy may struggle with this type of learning. Further research is needed to confirm these findings.

Recommendations for future research:

Based on our review of the literature, we also recommend several directions for future research:

1. As a field, we need to study differences (in stability) between – and changes within – antisocial developmental pathways through (intensive) longitudinal research and trial-based analyses.
2. To gain a better understanding of antisocial behavior, we need to consider the complex interaction between characteristics of the social context, the antisocial response and individual characteristics to understand the neurodevelopment of antisocial behavior – by merging large datasets within consortia, and through targeted mechanistic fMRI studies.
3. By investigating psychopathic trait dimensions we can shed more light on why some individuals with antisocial tendencies show different social information processing and behaviors than others.

The full review paper and more detail description of our findings and recommendations can be found here: https://www.frontiersin.org/journals/human-neuroscience/articles/10.3389/fnhum.2023.1100277/full?__readwiseLocation

Inspiration for my research and personal future directions

One of the things that stood out to me when I started doing research on antisocial behavior a few years ago, was the limited focus in research on internal, self-related social information processing, even though hypotheses regarding their importance have been formulated almost 25 years ago. Moreover, I found it surprising that few researchers focused on the transition from adolescence into early adulthood, despite evidence that this developmental period is perhaps equally important to understand the (dis)continuation of antisocial behavior throughout the life course. I learned a lot during my PhD project, from the data we collected in young adults with different antisocial developmental trajectories, but also by collaborating with researchers from different disciplines. My goal for the current review paper and poster was to integrate all the knowledge I gained during my PhD with this knowledge from different disciplines (e.g. developmental/clinical/social psychology, developmental cognitive and affective, neuroscience, criminology, etc.) into a coherent framework and suggest future directions to further advance our understanding of antisocial behavior.

As I mentioned earlier in this blog, persistent antisocial behavior is quite difficult to treat. Therefore, I expanded my research line to not only focus on understanding why and how antisocial behavior arises, but also on developing effective interventions for this population. What I have learned from the research presented here is the importance of developing intervention strategies that support young people and give them control, based on their own motivation and long-term goals. Therefore, I also try to actively involve them and other relevant stakeholders in the design and research process. Apart from this transdisciplinary approach, I also collaborate with researchers from different disciplines to examine how innovative technologies and methodologies such as Virtual Reality and Artificial intelligence can be used to boost the effectiveness of interventions for

externalizing behaviors such as antisocial behavior and substance use (e.g. make interventions more appealing, more resemblant of real-life situations, and to personalize the form and content of interventions, etc.) in an ethical way. For more information about this research line, see https://convergence.nl/healthy-start/tacklng-juvenile-delinquency-and-addiction/ and figure 3).