The Interplay of Cognitive and Emotional Control in Autism Spectrum Disorder

Kaitlyn Tuvilleja

Abstract

Autism Spectrum Disorder (ASD) is a condition that affects how an individual interacts, communicates, learns, and behaves (National Institute of Mental Health). This can significantly impact two crucial areas for navigating our daily lives: cognitive and emotional control. The cognitive side aids decision-making and clear communication. They allow us to weigh various options logistically and predict the potential consequences of those decisions. The emotional side helps manage healthy relationships as these controls allow for attentive listening, clear communication, and disagreement navigation. Multiple studies delve into the interplay between cognitive and emotional control between individuals with ASD and typical adults (TYP) without ASD. By understanding how cognitive and emotional control affects individuals with ASD, we can create a society that is more accessible and enthusiastic to help.

Cognitive Control in ASD

Cognitive control is managing your thoughts, feelings, and actions to adapt to various situations (Miller and Cohen 2001). In terms of attention and planning, cognitive control aids an individual's mental organization of information. It also contributes to decision-making and how to make logistical choices and predict the consequences. For example, most individuals can switch between tasks or even multi-task. However, these controls can be inhibited by physiological and psychological factors. Brain structure and function abnormalities, such as neuroinflammation, oxidative stress, and gut-brain axis dysfunction are correlated to cognitive problems in ASD, such as depression and aggression. Even deficiencies in sensory perception, specifically visual processing, can contribute to the deficits of cognitive control in ASD (Al-Mazidi, 2023).

While TYP individuals use cognitive control subconsciously, individuals with ASD may find difficulties in using cognitive control abilities efficiently. Most individuals with ASD struggle with task-switching problems, which are theorized to be in coordination with a lack of behavioral control. To observe this, researcher Marjorie Solomon at the University of California, Davis conducts a study observing whether cognitive and emotional controls work together.

The study included children both younger and older than twelve years old. To examine cognitive control in ASD, participants were given the “Preparing to Overcome Prepotency” (POP) task. The POP task consisted of two easier and harder trials (i.e. requirement to inhibit a habitual response). Reaction times were slowed throughout each task for both ASD and TYP groups regardless of age. As more attempts were made, the TYP group eventually had more efficient performances. In contrast, the ASD group showed more difficulty in suppressing habitual responses as tasks continued (Fig. 1). These results suggest that children with ASD may have deficits in cognitive control, particularly in predicting responses. Further analysis shows that ASD children under 12, though a small difference, tend to make more inaccuracies than TYP children. This suggests a lack of cognitive control for ASD individuals may be more pronounced at earlier ages (Solomon et. al, 2008).

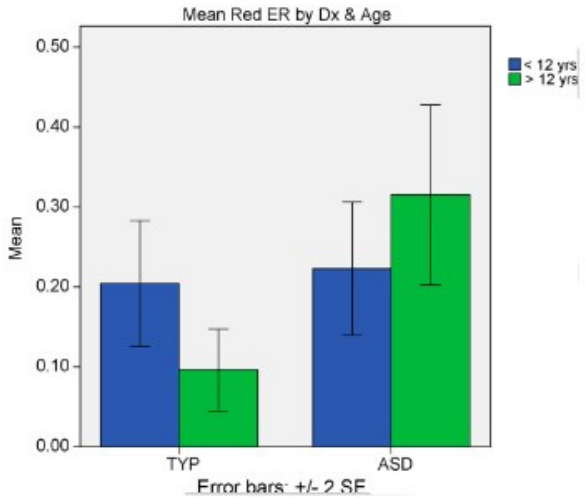

Figure 1. Inaccuracies with harder trials between ASD and TYP group across participants younger than 12 (blue) and older than 12 (green) by age range (Solomon et al.)

Emotional Control in ASD

Emotional control refers to the management of an individual's emotions. People with ASD often have strong emotions and struggle to control them, this is often referred to as emotional dysregulation. To put it into perspective, when placed in an overwhelming environment, TYP individuals may try to calm down, while individuals with ASD tend to react without a clear goal in mind (Ghanouni and Quirke., 2022). ASD individuals usually have trouble understanding their own emotions and struggle to adjust their behavior depending on the situation. Other factors such as bright lights and sounds can make it even more difficult for ASD individuals to handle their emotions, leading to potential shutting down or avoidance of certain situations (Mazefsky et al., 2013). This highlights the challenges individuals with ASD face. With the difficulty of comprehending emotions coupled with heightened sensitivities, interventions or therapies are crucial to support ASD individuals with navigating social situations and developing efficient coping mechanisms.

The Interplay Between Cognitive and Emotional Control

Researchers acknowledge that there may be interactions between systems managing cognitive and emotional control. The study involved a TYP group and an ASD group, both trained in cognitive reappraisal. Individuals with ASD are known to have trouble controlling their emotions. Researcher Richey and his team compared brains of ASD and TYP brain responses when they try to reinterpret situations in a more positive light to help regulate emotions, also known as reappraisal. During the fMRI brain scan, participants were shown pictures of faces and asked to develop positive or negative thoughts about those faces.

What the researchers found was that the ASD group had weaker activity in two regions of the dorsolateral prefrontal cortex (DLPFC) and the amygdala. The dorsolateral prefrontal cortex (DLPFC) was involved more with motivation and reward, especially for social stimuli (Fig. 2).

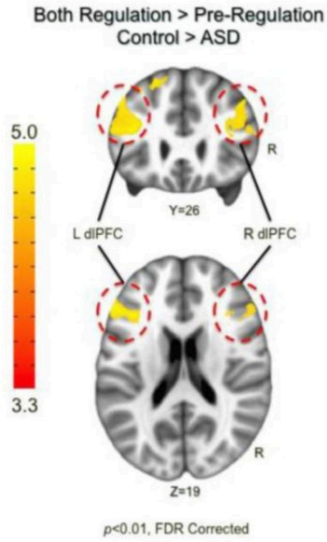

Figure 2. Highlighted right and left dorsolateral prefrontal cortex (dlPFC) in ASD participants (Richey et al.).

This explains why ASD individuals do not find social interactions or events as exciting or as rewarding as other people would since social events don't feel as rewarding to them. The amygdala, which was involved with suppressing negative emotions, isn't as active in ASD individuals. TYP individuals are shown to activate the amygdala more when presented with tasks that require suppressing negative emotions. This would explain why ASD individuals usually have difficulty calming down as the amygdala isn't as active as typical individuals (Richey et al., 2015). Despite the different brain region strengths, both groups had similar changes in their emotional responses, suggesting people with ASD might use different brain mechanisms to achieve emotional regulation (Richey et al., 2015).

Conclusions and Future Implications

Understanding how cognitive and emotional controls affect individuals with ASD is essential for developing effective interventions and fostering a more inclusive society. ASD individuals struggle with social interactions due to their differences in brain activity. Despite the challenges in cognitive and emotional control, individuals with ASD possess unique strengths and capabilities. Researchers can use this data to create techniques and therapies to support individuals with ASD. By acknowledging these differences and fostering an environment of support, we can empower individuals with ASD to thrive in all aspects of society.

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