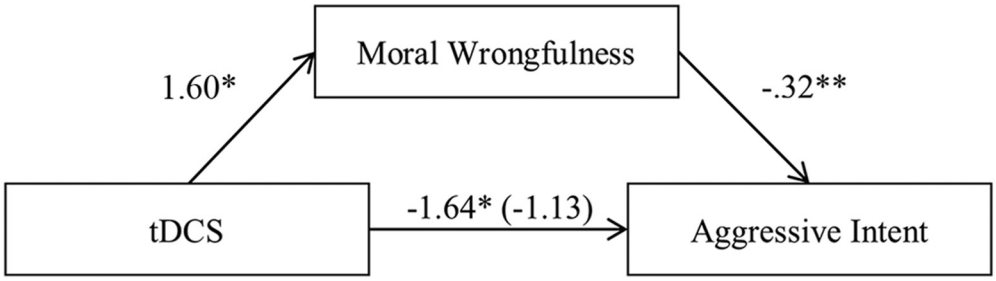

Figure 3. Bootstrapped mediation model documenting that perceptions of greater moral wrongfulness mediated the effect of anodal tDCS on reducing intentions to commit aggression. $*p < .05$, $**p < .01$. Extended data are presented in Figure 3-1, available at https://doi.org/10.1523/JNEUROSCI.3317-17.2018.f3-1.

DLPFC influences intentions to commit aggression, they do not negate the involvement of other prefrontal areas, such as the ventromedial and anterior prefrontal cortex, or of nonprefrontal areas, including the temporal cortex. Future studies using complementary noninvasive neurostimulation approaches, such as transcranial magnetic stimulation and high-definition tDCS, may elucidate the anatomical specificity of this effect and the complexity of the functional neuroanatomy of violent behavior.

There has been increasing discussion of biological interventions on antisocial and aggressive behavior in both children and adults (Gesch et al., 2002; Raine et al., 2015; Hübner and White, 2016). Our initial findings, which are limited to intentions to commit aggression and moral judgment, require extensive replication. Nevertheless, among other etiological mechanisms, the role of biological factors on the development of antisocial behavior, including aggression, has been increasingly acknowledged (Raine, 2002; Glenn and Raine, 2014; Latvala et al., 2015). It has been suggested that treatment programs will be improved by considering biological mechanisms that potentially regulate aggression (Beauchaine et al., 2008). Thus, it can be argued that further investigation of basic science trials on tDCS may potentially offer a promising new biological approach for reducing aggression, which is a major public health problem and a feature of a variety of mental disorders, including antisocial personality disorder, intermittent explosive disorder, conduct disorder, and borderline personality disorder (American Psychiatric Association, 2013).

Conclusion

Understanding the etiology of aggression and the development of new interventions are paramount to a public health approach to violence reduction (Butchart et al., 2004; Slutkin, 2017). This first known application of prefrontal tDCS to study intentions to commit aggression takes a modest step toward advancing knowledge about the neural mechanisms that regulate aggression. Findings provide experimental evidence for the role of the prefrontal cortex on both physical and sexual assault, and suggest how the brain may, in theory, be amenable to change using a noninvasive tool with transient and relatively minor adverse effects (Poreisz et al., 2007; Fertonani et al., 2015). Nevertheless, a stronger evidence base that includes more consistent findings, documentation of long-term beneficial effects, and a comprehensive effort to rule out potentially aversive side effects is required before this technique can be considered in practice to reduce the perpetration of aggressive acts.

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