

Epigenetic Changes Associated with Transgenerational Trauma: Characterization, Mechanisms, and Therapeutics

Elisabeth Kac, OMS II^{1*}, Qian Qi, OMS II^{1*}, and Rebecca Ryznar, PhD²

(1) Rocky Vista University College of Osteopathic Medicine, Englewood, CO 80112, USA

(2) Department of Biomedical Sciences, Rocky Vista University College of Osteopathic Medicine, Englewood, CO 80112, USA

*Co-first authors

INTRODUCTION

- Transgenerational trauma: enduring psychological and physiological effects of parental trauma transmitted to offspring
- Affects emotional, behavioral, and health outcomes via psychosocial and biological pathways
- Emerging evidence highlights epigenetic and biological contributions to trauma transmission

OBJECTIVE

The purpose of this review is to explore how acute, chronic, and complex forms of trauma are transmitted across generations, with a focus on epigenetic mechanisms and parenting behaviors

METHODS

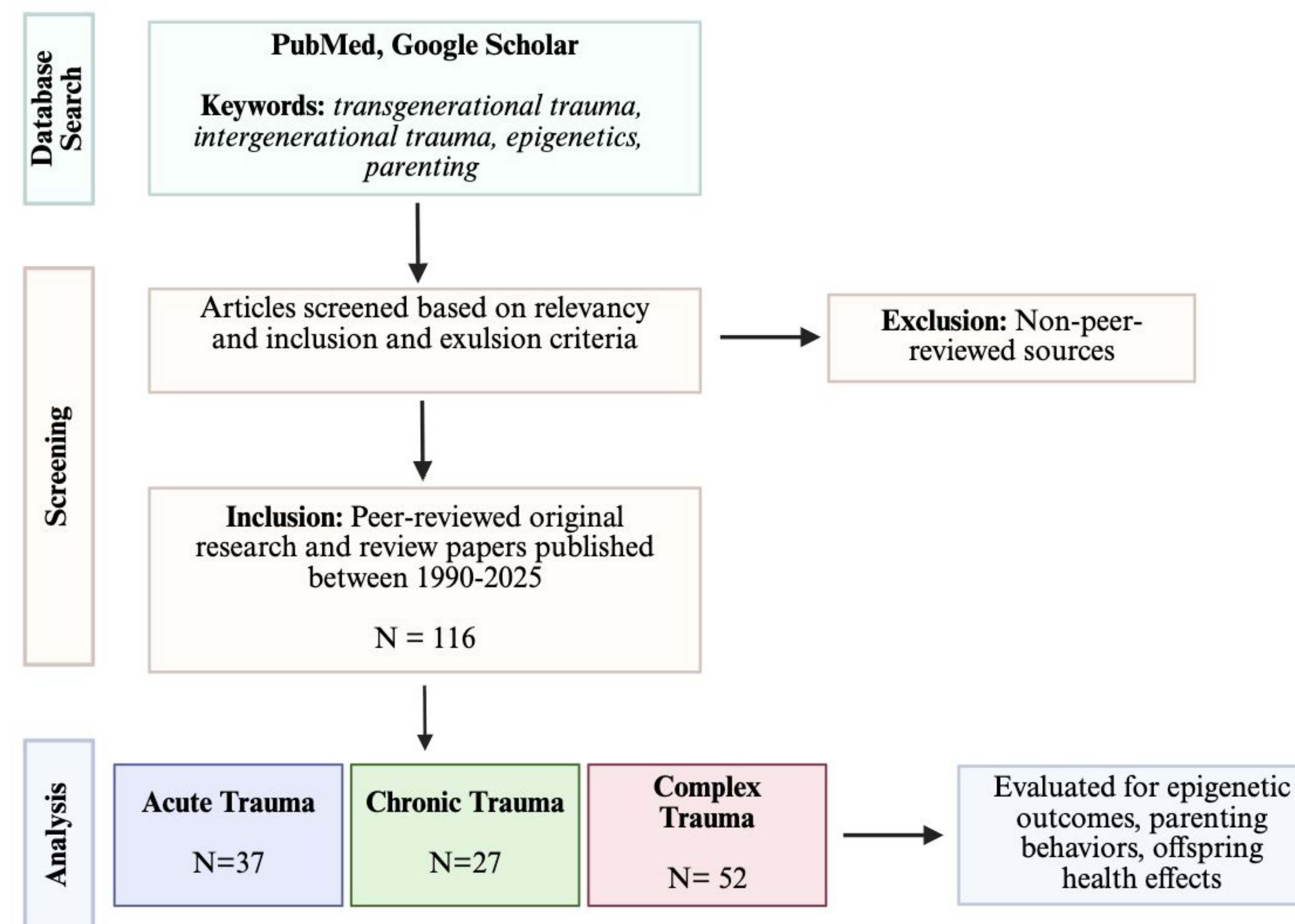


Figure 2. Methods flowchart summarizing article selection and analysis process.

DISCUSSION/CONCLUSION

- Methylation of genes like NR3C1 and FKBP5 in hypothalamic-pituitary-adrenal (HPA) axis were noted
- These changes were linked to increased vulnerability to post-traumatic stress disorder, anxiety, and depression
- Traumatized parents often experienced psychological distress that disrupted caregiving which may amplify transgenerational transmission through parenting
- Prevention remains to be the most important therapy for transgenerational trauma though other therapies have been reported as effective (Fig. 4)

Limitations: Small sample size, inconsistent trauma definitions, and few longitudinal or diverse cohorts. Replication is needed to confirm gene-specific findings.

Future Directions: Future research should clarify causal pathways to guide potential interventions that can break the cycle of trauma transmission.

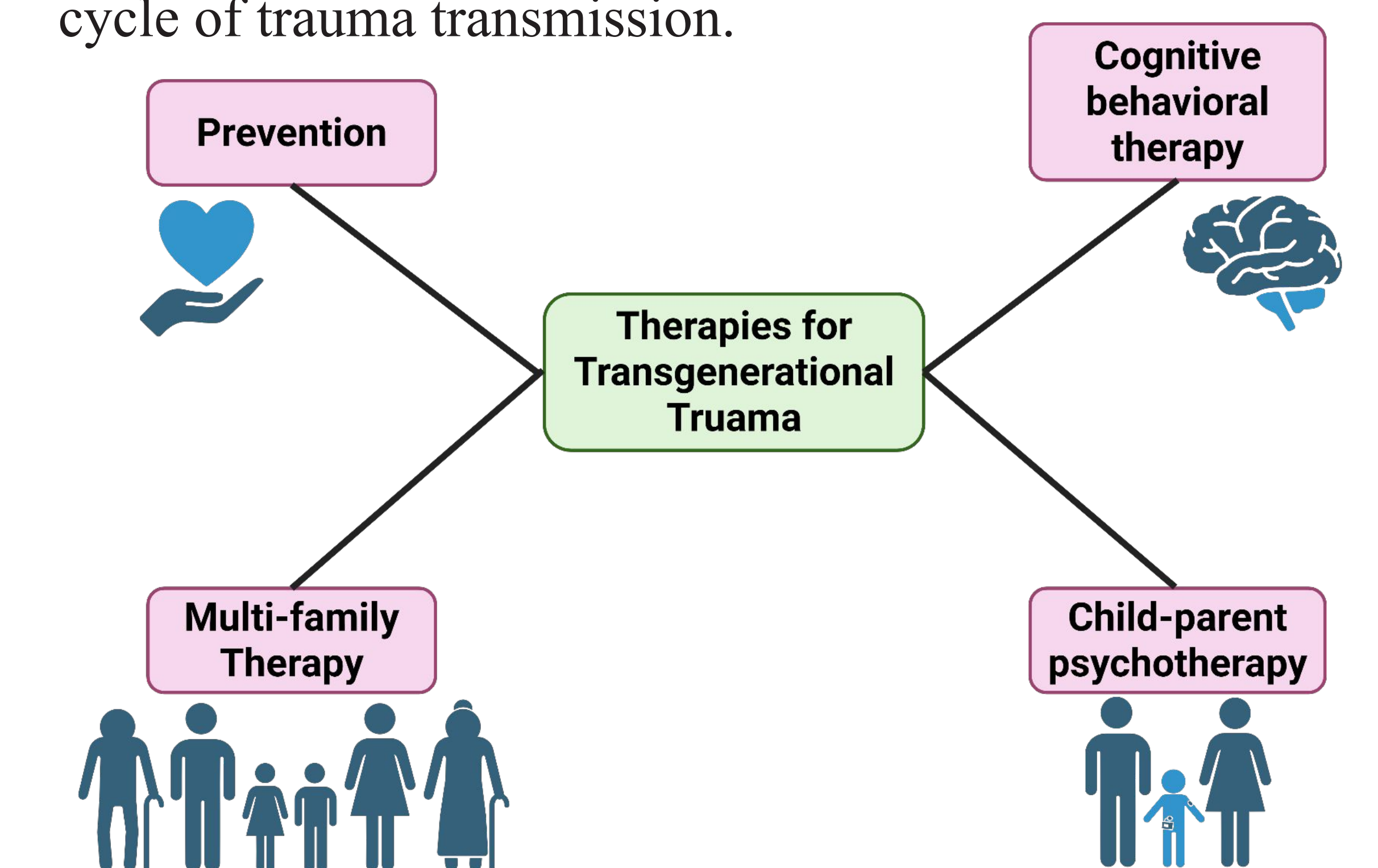


Figure 4. Therapeutic strategies for transgenerational trauma

REFERENCES

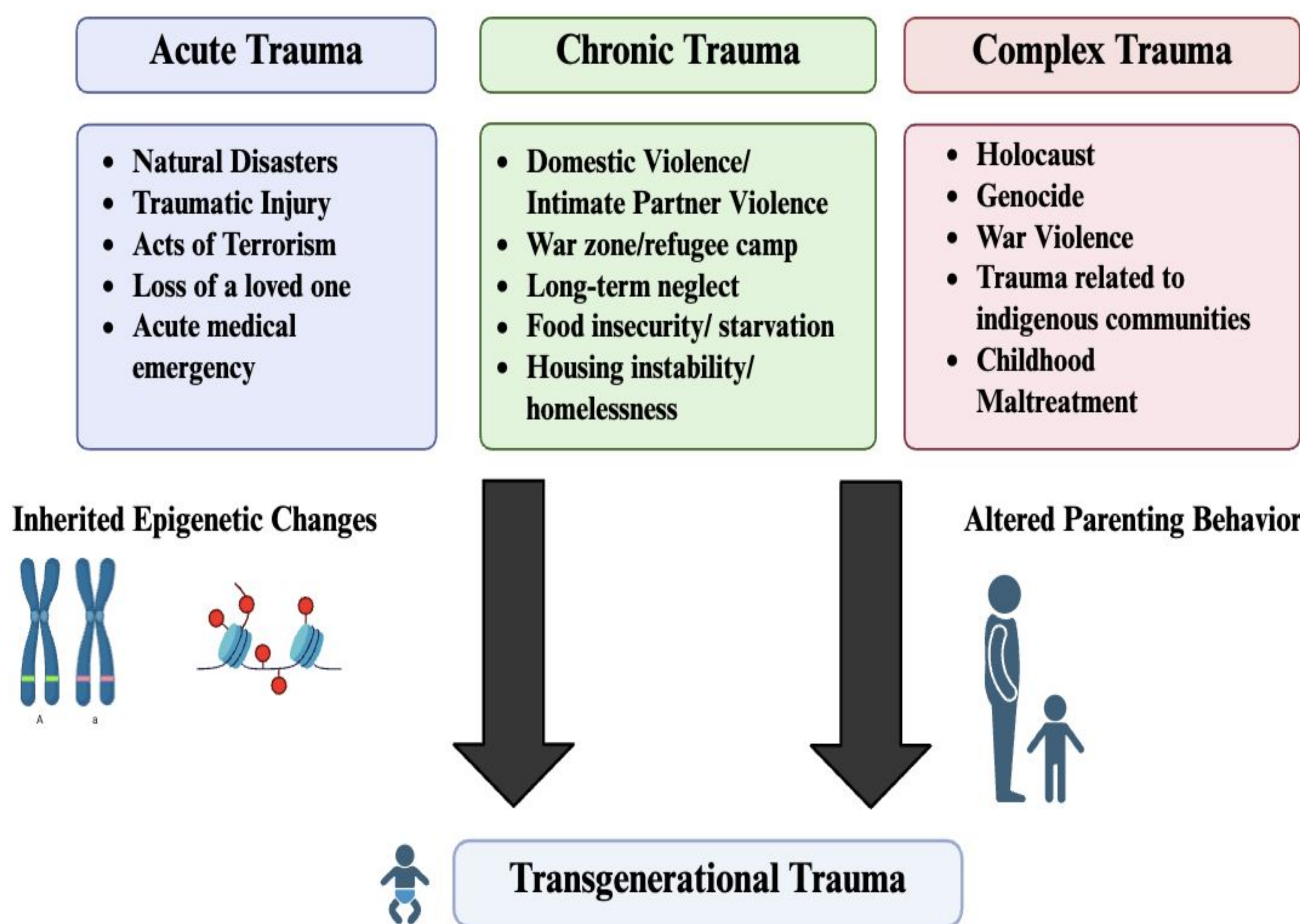


Figure 1. Acute, chronic, and complex trauma contribute to transgenerational trauma through inherited epigenetic changes and altered parenting behavior.

RESULTS

Epigenetic Pathways Across Trauma Types

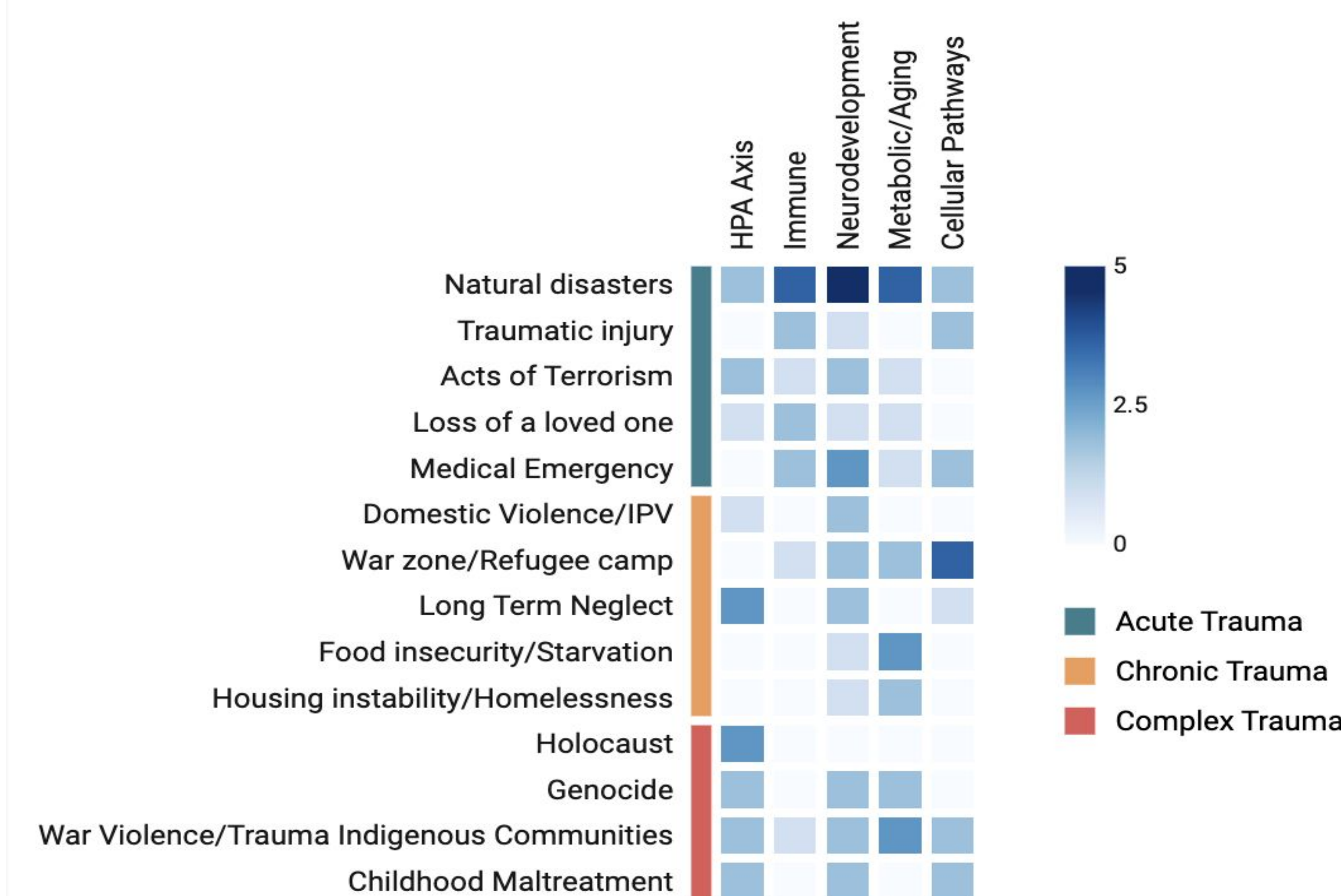


Figure 3. Heat map summarizing the number of studies implicating major biological pathways in relation to trauma exposure. Darker shading indicates stronger evidence, with values representing frequency counts derived from the literature review.