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Intergenerational Transmission of Aggression: Physiological Regulatory Processes

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Abstract

Children who grow up in aggressive households are at risk of having problems with physiological regulation, but researchers have not investigated physiology as a mechanism in the intergenerational transmission of aggression. In this article, we posit that physiological regulation, particularly during stressful interpersonal interactions, may shed light on sensitivity to conflict, It can also inform our understanding of associations between childhood exposure to aggression in families of origin and aggression against partners in adolescence or adulthood. In support of this model, we highlight findings showing that childhood exposure to family aggression relates to physiological regulation across the life span, and that reactions to physiological stress concurrently relate to aggression against intimate partners. Emerging evidence from research on biological processes during stressful interpersonal interactions raises questions about what is adaptive for individuals from aggressive families, particularly as past family experiences intersect with the challenges of new relationships.

Keywords

intergenerational transmission; aggression; physiology; family; couple

Children who grow up in aggressive families are more likely to be aggressive in the families they create as adults (1, 2). Intergenerational transmission, as this phenomenon is known, refers to experiencing aggression in one's family of origin—either witnessing aggression between one's parents or directly receiving aggression from one's parents—as a risk factor for future aggression toward intimate partners or one's own children. The phenomenon features links across developmental stages from childhood to late adolescence or adulthood, and from relationships in one's family of origin to those in one's family of procreation or to dating partners. Intergenerational transmission initially included only behaviors that are physically injurious but now also encompasses emotional aggression.

Data on intergenerational transmission give rise to two seemingly discordant conclusions: Whereas risk-focused conclusions indicate that children growing up in aggressive homes are more likely to be aggressive adults, resilience-focused conclusions indicate that most such individuals are not aggressive toward loved ones (3). Self-regulatory processes have been

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implicated in intergenerational transmission (4) and may be crucial to understanding vulnerability versus resilience. Since researchers have focused on affect, cognition, and behavior, in this article, we highlight physiological self-regulatory processes, particularly in the contexts of relationships.

We propose that growing up in an aggressive home creates biologically based sensitivities to emotionally charged interpersonal situations that may underlie the intergenerational transmission of aggression. Our model is grounded in research about intergenerational transmission and other regulatory systems, chronic stress and biological dysregulation, and the role of early parenting in physiological processes. We present a time-lagged and bidirectional model between physiology and aggression, and present evidence for links between exposure to family aggression and physiology during childhood, adolescence, and adulthood. We conclude by highlighting the complexities of interpreting atypical physiology within the joint context of family history and ongoing important interpersonal relationships.

Intergenerational Transmission and Regulatory Processes

Social learning (5) and cognitive and affective process models (6, 7) commonly explain intergenerational transmission and represent different, albeit not contradictory, viewpoints. Although much research (8, 9) identifies behaviors, attitudes, and emotions as underlying mechanisms between aggressive, nonnurturing families and children's risk for mental health problems, fewer studies examine behavioral and emotional disruptions to determine who is likely to perpetuate aggression toward loved ones. In these prospective, longitudinal studies, problems in regulatory processes can be seen in both parents and youth, span developmental stages, and occur in salient relational contexts. For example, in one study, 17-year-olds who had more aversive family discussions were more likely to communicate aversively with their romantic partners and to be in physically aggressive relationships at age 23 (10). In another study, family-of-origin abuse during early childhood was linked to negative interactions between parents and their 13-year-olds, the quality of children's friendships in midadolescence, and observed conflict and aggression with partners in young adult couples (11). In a two-decade investigation, parents' dysregulated emotions predicted sons' dysregulated emotions, which linked to conflicts in sons' later romantic relationships (12).

We propose a multigenerational model for physiological self-regulatory processes in the context of close relationships. We offer conflict sensitization, a theory used primarily to explain the cognitive and emotional consequences of family aggression during childhood (6, 7, 13), to identify the physiological patterns associated with intergenerational aggression. Conflict sensitization posits that perceived threat from exposure to high conflict during childhood is associated with reactivity to conflict, which can be experienced as arousal, anger, anxiety, or the desire to avoid confrontation. Anticipated and perceived threat, conflict reactivity, and unsuccessful efforts to resolve conflict may be associated iteratively with later physiological reactivity during tense interpersonal situations; these processes also putatively set the stage for aggression in romantic relationships or in the families created by the children who have witnessed the conflict. However, relatively little is known about how family aggression primes physiological reactivity in a way that increases risk for aggression in the next generation.

Next, we summarize ways that hostile family environments during childhood create vulnerabilities in biological stress systems that, along with emotional and behavioral response capabilities, leave young adults ill-equipped for emotionally charged relationships. We describe how adverse family environments change physiological stress systems and how such physiological adaptations can contribute to conflict sensitivity. Physiology undoubtedly works in concert with cognition, emotion, and behavior in these processes, yet is distinguishable from other response systems. Physiology can provide information about internal states that is distinct from what is observed or what people report. Physiological responses also reflect moment-to-moment changes in response to specific salient interpersonal stimuli.

Physiological Regulation

Living in an aggressive family typically means experiencing repeated and chronic adverse events that, over time, can result in both overactivation and underactivation of stress response systems, particularly hypothalamic-pituitary-adrenocortical (HPA) axis responses and autonomic nervous system (ANS) reactivity (9). Generally, an adaptive response to threatening circumstances, including family aggression, features short-term, moderate mobilization of energy, attention, and heightened cardiovascular response followed by a return to homeostasis (14). Repeated activation, albeit protective in the short term, can have long-term costs. The body's frequent efforts to adapt to stress can lead to inefficient turning on or turning off of stress responses, resulting in either persistently elevated systems (e.g., chronic hypertension or slower cardiovascular recovery) or down-regulated systems (e.g., attenuated HPA response) through a process called allostasis (15).

Cortisol, a commonly used index of the HPA axis, follows a distinct diurnal trajectory, peaking 20 to 30 minutes after awakening to ready the body to function and then declining through the day. Cortisol also is produced approximately 15 to 20 minutes after a stressor is introduced and recovery generally occurs shortly thereafter. Repeated exposure to aggression may sensitize the HPA axis, resulting in persistently high basal levels or heightened cortisol response to subsequent stressors (16). Alternatively, because chronically elevated cortisol can be damaging, the body might down-regulate cortisol activity, resulting in blunted stress responses and flattened diurnal patterns. Attenuated diurnal trajectories signify aberrant HPA functioning, but it is challenging to characterize an effective and efficient cortisol response to immediate stressors. And although cortisol activity is seen as meeting the demands of a particular environmental event, both high and low cortisol can be adaptive depending on the nature and meaning of the event for an individual (17).

Chronic activation of the ANS occurs as a result of repeated adverse events and is also concomitant with later aggression. Activation of the sympathetic nervous system (SNS) is conceptualized as fight or flight responses, leading to increases in heart rate, cardiovascular output, and electrodermal activity, thereby shifting metabolic resources to threat. Activation of the parasympathetic nervous system, the rest and digest response, slows physiological activity after the fight or flight response, and is indexed through vagal tone. Considerable research shows that repeated and prolonged activation of the SNS and ineffective recovery are associated with emotional and physical illness (9, 18–20). However, data are less

conclusive about whether poorly modulated ANS responses to family aggression carry over into conflict with other people and are exhibited in overly sensitive behavioral reactions—either increased hostility or withdrawal.

Development and Physiological Processes

Children learn to modulate stress primarily from their caregivers, and those early experiences can influence later emotional and physiological regulation (21). Supportive, responsive caregiving in early childhood apparently buffers elevations to mild stressors in the neurobiological stress systems of maturing children, which protects the developing brain and contributes to later resilience. Alternatively, punitive, aggressive caregiving creates stressful environments and fails to help children modulate their biological stress responses, which together lead to heightened and less regulated physiological activity (9). These physiological responses interact with children's internal representations and expectations about conflicts, emotion regulation, and social competencies.

Models of stress responsivity become more complicated during adolescence and young adulthood as parental influences in stress modulation wane and relationships outside the family gain prominence. How do the foundations for stress responsivity established at earlier developmental stages prime reactions to new relationships? How malleable—positively and negatively—are earlier patterns to the emotional valence of new relationships? Are overt behaviors coherent with physiological stress reactivity or do some individuals learn to modulate their behaviors even in the face of high emotional or physiological reactivity? Although early stressful and threatening experiences are linked to dysregulated basal levels as well as dysregulated reactions during evaluative tasks with strangers (e.g., the Trier Social Stress Test; 18, 19), little is known about reactions during domain-specific situations (e.g., stressful encounters with family members or intimate partners).

Growing up in aggressive households can lead to problems with physiological regulation during interpersonal conflict, and such regulatory difficulties may result in later perpetration of aggression in close relationships. Figure 1 depicts concurrent associations between aggression and physiology (paths 1, 2, and 3), continuity across time in physiological regulation (paths 4, 5, and 6), and well-established behavioral links in aggressive relationships (paths 7, 8, and 9). The time-lagged and bidirectional links between aggression and physiology (paths 10–15) further show how physiology may serve as a mechanism in the transmission of aggression.

In the remainder of this section, we describe how physiology is modulated by relationships and then summarize the paths that researchers have studied (black arrows): exposure to family aggression and physiological reactions during childhood (path 1) and adolescence (path 10), exposure to family aggression and physiological activity during adulthood (path 11), and intimate partner aggression and concurrent physiological activity during adulthood (path 3). We focus on physiological reactions to stress in the context of meaningful interpersonal relationships, aiming to highlight studies that help us understand the role of under-the-skin phenomena in the intergenerational transmission of aggression.

Family-of-Origin Aggression and Child and Adolescent Physiology (Paths 1 and 10)

Paths 1 and 10 examine the physiological responses of children and adolescents exposed to violence during interpersonal challenges at various developmental stages. For example, the cortisol responses of 7-month-olds from homes with punitive parenting or aggression between parents rose when the infants were exposed to emotionally challenging tasks (22). The cortisol reactivity of kindergarten-aged children from homes with marital conflict declined during simulated arguments between the parents (23), although individual differences also played a role: The cortisol levels of preschoolers with inhibited temperaments who were exposed to aggression were higher, while the cortisol levels of preschoolers with dominant temperaments were marginally lower (16). In support of attenuation hypotheses, the cortisol output of adolescents who had been exposed to many incidences of family aggression was generally lower during laboratory-based discussions of topics that produced conflict between parents and children (24). However, unexpectedly, attenuated cortisol in youth exposed to violence was apparently protective, perhaps signaling a filtering out of adverse environmental stimuli (17), whereas heightened cortisol was a risk for psychological problems. In terms of the SNS, children exposed to high marital conflict who also reported high levels of self-blame or perceived threat had greater cardiovascular reactivity (25).

Parents' aggression also disrupts physiology during children's interactions with their peers. The vagal activity of children exposed to aggression between their parents rose in response to provocation by peers, suggesting they were hypervigilant to subtle interpersonal negativity (26). Girls with chaotic or coercive father-daughter relationships had elevated cortisol levels when they discussed problems with a friend (27). These studies suggest physiological priming from family to nonfamily interactions that might portend disrupted physiology in later relationships.

Family-of-Origin Aggression to Adult Physiological Functioning (Path 11)

Aggression in children's families of origin poses risks for dysregulated psychobiology in adulthood, as evidenced in altered daily patterns as well as heightened and attenuated HPA reactivity to commonly used paradigms such as stressful speech and arithmetic tasks (19). Yet, generalizability to interpersonal situations is unknown. In one exception, simulated conflict with a neighbor elicited attenuated cortisol in young adults who had experienced much family conflict (28).

Relationships in families of origin influence physiological sensitivity in interactions with romantic partners. In a study of maternal sensitivity during childhood, less sensitive caregiving was prospectively linked with greater increases in electrodermal activity during arguments with romantic partners, even controlling for relationship quality and socioeconomic factors (29). In another study, wives' retrospective reports of aggression in their families of origin related to their own and their husbands' heightened cortisol activity during an argument, which we interpreted as enhanced risk detection (30). In addition, current interpersonal experiences apparently interacted with adverse family history in regulating physiology: The combination of family-of-origin aggression with partners' observed hostility during the argument moderated the direct effect of family-of-origin

aggression—husbands' cortisol was heightened, whereas wives' cortisol was attenuated, perhaps signaling disengagement from aversive discussions with partners.

Couples' Conflict Discussions and Physiological Responses (Path 3)

Physiology and aggression against intimate partners are connected contemporaneously in adulthood. As contrasted with findings linking general aggression to hypoarousal (e.g., low resting heart rate, low reactivity to electrodermal activity; 31), aggression with romantic partners typically is associated with heightened physiological arousal when measured during discussions between couples that involve conflict. Males who are low to moderately violent against their spouses generally show autonomic hyperreactivity during arguments with their spouses; only severe batterers, characterized by more generalized antisocial traits, show hyporeactivity during arguments (32). In this study, assessing physiology during personally relevant conversations beyond the standardized anger-induction task clarified this distinction in batterer subtypes. Similarly, young adults' aggression in dating has been linked to heightened ANS activity during arguments (33), and intimate partner aggression in young couples expecting a child was associated with heightened physiology during baseline and also during recovery periods. These examples of heightened physiology before, during, and after arguments indicate aroused states that could prime or maintain prolonged conflict (34).

Although arguments generally evoke heightened cardiovascular and cortisol reactivity (35), the behaviors during the argument (36), couples' history of conflict, and gender interact in complex ways. Marital criticism observed during arguments related to heightened HPA activity for husbands; for wives, the relation between observed criticism and heightened HPA emerged only when they also reported past physical and emotional aggression (37).

Conclusions and Next Steps

As with the variability seen in research on physiological regulation, exposure to family aggression was associated with both heightened and dampened physiology. In line with allostatic theory (15), heightened physiology was more evident when the challenging interpersonal situation was somewhat *novel* (e.g., involving a friend; 26, 27, or a romantic partner; 29, 30), as contrasted with attenuated physiology when recreating *repeating* family battles (e.g., adolescents engaged in conflicts with their parents; 24). Heightened physiological reactivity in emotionally charged situations with salient others presumptively supports conflict sensitization in individuals who have been exposed to violence. Yet a missing piece is whether atypical physiology, either heightened or attenuated, indicates helpful or harmful behaviors (e.g., intensified vigilance, effortful regulation of emotions, withdrawal, or conflict escalation), and why physiological reactions translate into different behaviors for different individuals.

Although physiology is implicated as a possible mechanism in the intergenerational transmission of aggression, some of the paths outlined in Figure 1 still need to be explored. Researchers have not yet determined that physiological regulation in an interpersonal context either predicts later aggression (paths 13, 14, or 15) or mediates intergenerational pathways (e.g., paths 10 and 15, 1 and 13, or 1 and 14). Although the gold-standard test of mediation from childhood to adulthood involves prospective, longitudinal, multigenerational

data, such studies take resources and time. To move the field forward, we also need shorter studies (e.g., paths 13 and 15) to generate an amalgamated corpus of data. Furthermore, the pathways outlined in Figure 1 are within one person. In romantic relationships, two individuals—each with his or her own family histories and physiological patterns—influence one another. Physiological arousal is linked between two people in close relationships and the impact of such ties depends on the context of the relationship (38).

What Constitutes Aberrant Physiological Stress Reactions?

We must be careful when assuming which physiological reactions are helpful or harmful, and consider physiological adaptation within the environmental context in which it occurs. Children's plasticity in their physiological responsiveness enables them to match their responsiveness to the environmental demands with which they are raised, which may be evolutionarily adaptive. High physiological responsiveness may be costly metabolically but also may be adaptive if environmental conditions are dangerous. Purported indices of dysregulation, such as attenuation, may be functionally significant within a given context (24, 30). Attention to the paradoxes surrounding stress hormones indicates that, even in response to acute stressors, neither increases nor decreases in stress hormones are linked uniformly to desirable or undesirable outcomes; instead, they depend on history and individualized meanings ascribed to each stressor (17). Moreover, according to biological sensitivity to context theories (39), individuals who are highly sensitive to the environment thrive in nurturing contexts but are vulnerable in negative contexts. Thus, high HPA reactivity, associated with openness to environmental stimuli, may be adaptive with supportive adult partners, whereas low HPA, possibly blunting environmental stimuli, may be adaptive for those who continue to experience aggression in adult relationships.

Determinants of Physiological Reactivity

We should consider additional potential moderators and mediators when making sense of physiology and family aggression. Contextual variables to consider include the severity and chronicity of family aggression, as well as its co-occurrence with other adversities (20). Individual variables, such as depression, and antisocial and risky behaviors (2, 40), are potential mediators in light of their association with family aggression and dysregulated physiology. Microlevel analyses are needed to address the interplay among cognitions, emotions, and physiology (e.g., how appraisals about threat and rejection influence physiological responses). Lastly, physiological coregulation between family members (41) and cross-partner influences (36, 42) during stressful interactions contribute to the dynamic and multidetermined nature of physiological reactivity.

Naturally Occurring and Intentional Points of Intervention

A more nuanced version of Figure 1 would also depict points of discontinuity in aggression transmission along with potential intervening factors. For example, supportive relationships with parents (43) and with romantic partners (44) may disrupt the intergenerational transmission of aggression, perhaps preventing dysregulation or providing corrective interpersonal contexts in which to acquire self-regulation. As children grow up and select their friends and dating partners, and ultimately create their own families, they enter into new relationships in which physiological response patterns are either matched or unmatched

to early family relationships. Little is known about what transpires when individuals from aggressive households bond with nonaggressive, nurturing partners. What are the consequences for individuals and relationships of maintaining old patterns of physiological regulation versus developing new physiological reactions that are more consistent with current interpersonal contexts? Naturally occurring shifts in children's networks of relationships provide reparative opportunities for normalizing biological reactions. Biological regulation may also be malleable through structured interventions with parents (e.g., increasing parents' nurturing and synchronous interactions while lessening their frightening behavior was associated with more typical cortisol activity in at-risk children; 45). Identifying factors that interrupt unhealthy associations between family aggression and physiology—through naturally occurring events and planned interventions—will inform our understanding of resilience.

More generally, those studying intergenerational transmission need to consider risk and resilience as dynamic and integrated with larger developmental processes. Although early childhood is recognized as a developmentally sensitive period, little attention has been directed to other potentially critical periods (e.g., adolescence) in shaping physiology. Much is still to be learned about when and under what conditions children's physiology is more vulnerable to parents' aggression, and how such vulnerability intersects with typical biological development. The physiological reactions discussed here are best interpreted in the larger context of many response systems (cognitive, behavioral, and emotional) and general biopsychosocial development.

Nonetheless, attention to physiology can inform and expand theoretical models of the intergenerational transmission of aggression and guide efforts to promote pathways of resilience. Research examining physiological reactions during interpersonal interactions can capture subtle relational sensitivities that may contribute to the intergenerational transmission of aggression. Advances in technologies for measuring physiology, including mobile equipment to assess heart rate and electrodermal activity outside the laboratory, increase the feasibility of capturing ongoing physiology. The high costs to individuals, families, and society associated with the intergenerational transmission of aggression make such research a priority.

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References

1. Berlin LJ, Appleyard K, Dodge KA. Intergenerational continuity in child maltreatment: Mediating mechanisms and implications for prevention. Child Development. 2011; 82:162–176.10.1111/j.1467-8624.2010.01547.x [PubMed: 21291435]
2. Ehrensaft MK, Cohen P, Brown J, Smailes E, Chen H, Johnson JG. Intergenerational transmission of partner violence: A 20-year prospective study. Journal of Consulting and Clinical Psychology. 2003; 71:741–753.10.1037/0022-006X.71.4.741 [PubMed: 12924679]
3. Kaufman J, Zigler E. Do abused children become abusive parents? American Journal of Orthopsychiatry. 1987; 57:186–192.10.1111/j.1939-0025.1987.tb03528.x [PubMed: 3296775]

4. Jouriles EN, McDonald R, Mueller V, Grych JH. Youth experiences of family violence and teen dating violence perpetration: Cognitive and emotional mediators. Clinical Child & Family Psychology Review. 2012; 15:58–68.10.1007/s10567-011-0102-7 [PubMed: 22160838]
5. Patterson, GR. Coercive family process. Eugene, OR: Castalia Publishing Co; 1982.
6. Cummings EM, Davies PT. Emotional security as a regulatory process in normal development and the development of psychopathology. Development and Psychopathology. 1996; 8:123–139.10.1017/S0954579400007008
7. Grych JH, Fincham F. Marital conflict and children's adjustment: A cognitive-contextual framework. Psychological Bulletin. 1990; 108:267–290.10.1037/0033-2909.108.2.267 [PubMed: 2236384]
8. Margolin G, Gordis EG. The effects of family and community violence on children. Annual Review of Psychology. 2000; 51:445–479.10.1146/annurev.psych.51.1.445
9. Repetti RL, Taylor SE, Seeman TE. Risky families: Family social environments and the mental and physical health of offspring. Psychological Bulletin. 2002; 128:330–366.10.1037//0033-2909.128.2.330 [PubMed: 11931522]
10. Andrews JA, Foster SL, Capaldi D, Hops H. Adolescent and family predictors of physical aggression, communication, and satisfaction in young adult couples: A prospective analysis. Journal of Consulting and Clinical Psychology. 2000; 68:195–208.10.1037/0022-006X.68.2.195 [PubMed: 10780119]
11. Linder JR, Collins WA. Parent and peer predictors of physical aggression and conflict management in romantic relationships in early adulthood. Journal of Family Psychology. 2005; 19:252–262.10.1037/0893-3200.19.2.252 [PubMed: 15982103]
12. Kim HK, Pears KC, Capaldi DM, Owen LD. Emotion dysregulation in the intergenerational transmission of romantic relationship conflict. Journal of Family Psychology. 2009; 23:585–595.10.1037/a0015935 [PubMed: 19685993]
13. Davies PT, Woitach MJ. Children's emotional security in the interparental relationship. Current Directions in Psychological Science. 2008; 17:269–274.10.1111/j.1467-8721.2008.00588.x
14. Hostinar CE, Sullivan RM, Gunnar MR. Psychobiological mechanisms underlying the social buffering of the hypothalamic-pituitary-adrenocortical axis: A review of animal models and human studies across development. Psychological Bulletin. 2014; 140:256–282.10.1037/a0032671 [PubMed: 23607429]
15. McEwen BS, Stellar E. Stress and the individual: Mechanisms leading to disease. Archives of Internal Medicine. 153:2093–2101.10.1001/archinte.1993.00410180039004 [PubMed: 8379800]
16. Davies PT, Sturge-Apple ML, Cicchetti D. Interparental aggression and children's adrenocortical reactivity: Testing an evolutionary model of allostatic load. Development and Psychopathology. 2011; 23:801–814.10.1017/S0954579411000319 [PubMed: 21756433]
17. Shirtcliff EA, Peres JC, Dismukes AR, Lee Y, Phan JM. Riding the physiological roller coaster: Adaptive significance of cortisol stress reactivity to social contexts. Journal of Personality Disorders. 2014; 28:40–51.10.1521/pedi.2014.28.1.40 [PubMed: 24344886]
18. Repetti RL, Robles TF, Reynolds B. Allostatic processes in the family. Development and Psychopathology. 2011; 23:921–938.10.1017/S095457941100040X [PubMed: 21756442]
19. Taylor SE, Way BM, Seeman TE. Early adversity and adult health outcomes. Development and Psychopathology. 2011; 23:939–954.10.1017/S0954579411000411 [PubMed: 21756443]
20. Essex MJ, Shirtcliff EA, Burk LR, Ruttle PL, Klein MH, Slattery MJ, Armstrong JM. Influence of early life stress on later hypothalamic-pituitary-adrenal axis functioning and its covariation with mental health symptoms: A study of the allostatic process from childhood into adolescence. Development and Psychopathology. 2011; 23:1039–1058.10.1017/S0954579411000484 [PubMed: 22018080]
21. Gunnar M, Quevado K. The neurobiology of stress and development. Annual Review of Psychology. 2007; 58:145–173.10.1146/annurev.psych.58.110405.085605
22. Hibel LC, Granger DA, Blair C, Cox MJ. Intimate partner violence moderates the association between mother-infant adrenocortical activity across an emotional challenge. Journal of Family Psychology. 2009; 23:615–625.10.1037/a0016323 [PubMed: 19803598]

23. Davies PT, Sturge-Apple ML, Cicchetti D, Cummings EM. The role of child adrenocortical functioning in pathways between inter-parental conflict and child maladjustment. Developmental Psychology. 2007; 43:918–930.10.1037/0012-1649.43.4.918 [PubMed: 17605525]
24. Saxbe DE, Margolin G, Shapiro LAS, Baucom BR. Does dampened physiological reactivity protect youth in aggressive family environments? Child Development. 2012; 83:821–830.10.1111/j.1467-8624.2012.07152.x [PubMed: 22548351]
25. El-Sheik M, Harger J. Appraisals of marital conflict and children's adjustment, health, and physiological reactivity. Developmental Psychology. 2001; 37:875–885.10.1037/0012-1649.37.6.875 [PubMed: 11699760]
26. Katz LF. Domestic violence and vagal reactivity to peer provocation. Biological Psychology. 2007; 74:154–164.10.1016/j.biopsycho.2005.10.010 [PubMed: 17118516]
27. Byrd-Craven J, Auer BJ, Granger DA, Massey AR. The father-daughter dance: The relationship between father-daughter relationship quality and daughters' stress response. Journal of Family Psychology. 2012; 26:87–94.10.1037/a0026588 [PubMed: 22182338]
28. Luecken LJ, Kraft AJ, Hagan M. Negative relationships in the family-of-origin predict attenuated cortisol in emerging adults. Hormones and Behavior. 2009; 55:412–417.10.1016/j.yhbeh.2008.12.007 [PubMed: 19470368]
29. Raby KL, Roisman GI, Simpson JA, Collins WA, Steele RD. Greater maternal insensitivity in childhood predicts greater electrodermal reactivity during conflict discussions with romantic partners in adulthood. Psychological Science. 2015; 26:348–353.10.1177/0956797614563340 [PubMed: 25576344]
30. Arbel R, Rodriguez A, Margolin G. Cortisol reactions during family conflict discussions: Influences of wives and husbands' exposure to family-of-origin aggression. Psychology of Violence. (in press). Advance online publication. 10.1037/a0039715
31. Lorber MF. Psychophysiology of aggression, psychopathy, and conduct problems: A meta-analysis. Psychological Bulletin. 2004; 130:531–552.10.1037/0033-2909.130.4.531 [PubMed: 15250812]
32. Babcock JC, Green CE, Webb SA, Yerington TP. Psychophysiological profiles of batterers: Autonomic emotional reactivity as it predicts the antisocial spectrum of behavior among intimate partner abusers. Journal of Abnormal Psychology. 2005; 114:444–455.10.1037/0021-843x.114.3.444 [PubMed: 16117581]
33. Murray-Close D, Holland AS, Roisman GI. Autonomic arousal and relational aggression in heterosexual dating couples. Personal Relationships. 2011; 19:203–218.10.1111/j.1475-6811.2011.01348.x
34. Feinberg ME, Jones DE, Granger DA, Bontempo D. Relation of intimate partner violence to salivary cortisol among couples expecting a first child. Aggressive Behavior. 2011; 37:492–502.10.1002/ab.20406 [PubMed: 21830223]
35. Robles TF, Kiecolt-Glaser JK. The physiology of marriage: Pathways to health. Physiology and Behavior. 2003; 79:409–416.10.1016/s0031-9384(03)00160-4 [PubMed: 12954435]
36. Laurent HK, Powers SI, Laws H, Gunlicks-Stoessel M, Bent E, Balaban S. HPA regulation and dating couples' behaviors during conflict: Gender-specific associations and cross-partner interactions. Physiology & Behavior. 2013; 118:218–226.10.1016/j.physbeh.2013.05.037 [PubMed: 23711564]
37. Rodriguez A, Margolin G. Wives' and husbands' cortisol reactivity to proximal and distal dimensions of couple conflict. Family Process. 2013; 52:555–569.10.1111/famp.12037 [PubMed: 24033248]
38. Timmons, AC.; Margolin, G.; Saxbe, DE. Physiological linkage in couples and its implications for individual and interpersonal functioning: A literature review. Journal of Family Psychology. (in press)Advance online publication. http://dx.doi.org/10.1037/fam0000115
39. Boyce WT, Ellis BJ. Biological sensitivity to context: I. An evolutionary-developmental theory of the origins and functions of stress reactivity. Development and Psychopathology. 2005; 17:271–301. doi:10.10170S0954579405050145. [PubMed: 16761546]

40. Serbin LA, Karp J. The intergenerational transfer of psychosocial risk: Mediators of vulnerability and resilience. Annual Review of Psychology. 2004; 55:333–363.10.1146/annurev.psych.54.101601.145228

41. Saxbe DE, Margolin G, Shapiro LA, Iturralde EM, Rodriguez AR, Ramos MC. Relative influences: Patterns of HPA axis concordance during triadic family interaction. Health Psychology. 2014; 33:273–281.10.1037/a0033509 [PubMed: 23914815]

42. Fitz PAT, Slep AMS, O'Leary KD. Couple-level analysis of the relation between family-of-origin aggression and intimate partner violence. Psychology of Violence. 2012; 2:139–153.10.1037/a0027370

43. Thornberry TP, Henry KL, Smith CA, Ireland TO, Greenman SJ, Lee RD. Breaking the cycle of maltreatment: The role of safe, stable, and nurturing relationships. Journal of Adolescent Health. 2013; 53:S25–S31. doi:org/1l.1016/j.jadohealth.2013.04.019. [PubMed: 24059936]

44. Conger RD, Schofield TJ, Neppl TK, Merrick MT. Disrupting intergenerational continuity in harsh and abusive parenting: The importance of a nurturing relationship with a romantic partner. Journal of Adolescent Health. 2013; 53:S11–S17. doi:org/10.1016/j.jadohealth.2013.03.014. [PubMed: 24059934]

45. Bernard K, Hostinar C, Dozier M. Intervention effects on diurnal cortisol rhythms of Child Protective Services–referred infants in early childhood: Preschool follow-up results of a randomized clinical trial. JAMA Pediatrics. 2015; 169:112–119. doi:10:1001/jamapediatrics.2014.2369. [PubMed: 25436448]

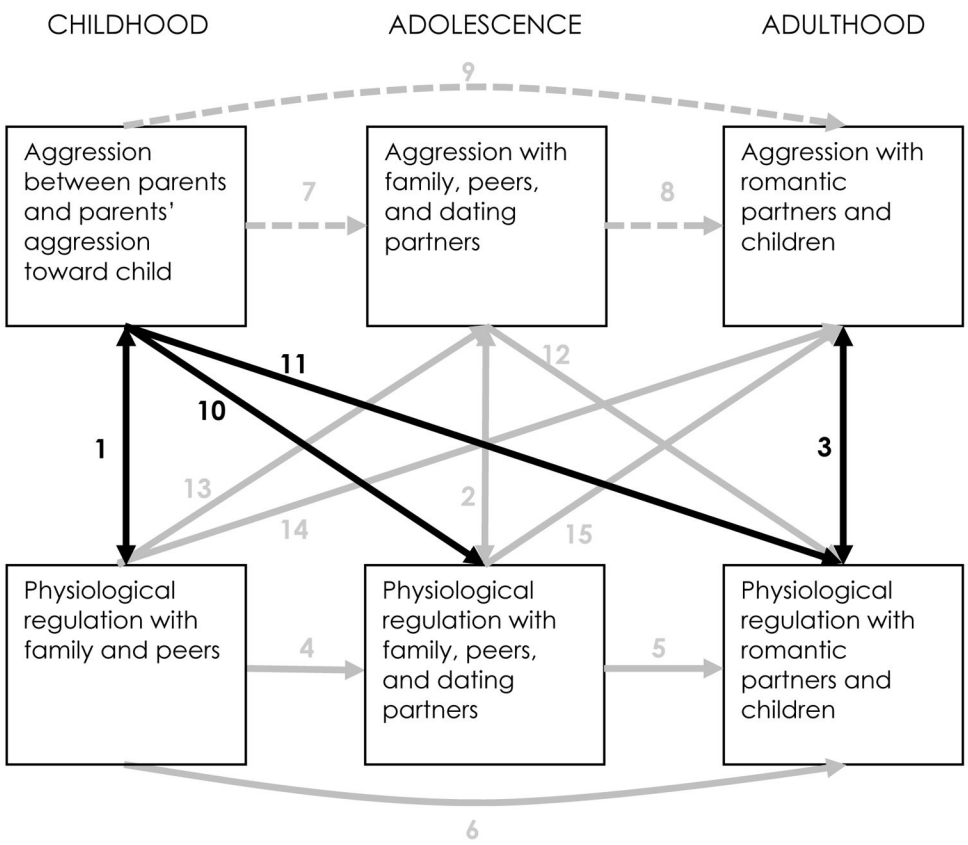

Figure 1. Conceptual model of physiological regulation in interpersonal contexts

as a mechanism in the intergenerational transmission of aggression. Paths 1, 2, and 3 represent concurrent associations between aggression and physiology. Paths 4, 5, and 6 represent continuity in physiology over time. Paths 7, 8, and 9 (dashed gray paths) represent well-established behavioral links in the continuity of the intergenerational transmission of aggression. Paths 1, 3, 10, and 11 (black paths) are associations between aggression and physiology that are represented well in the literature and thus described in the text. Paths 4, 5, 6, 12, 13, 14, and 15 (solid gray paths) represent links to be investigated to identify physiological processes underlying the intergenerational transmission of aggression.