

From Prenatal/Newborn Health to Adolescent Sensitivity to Antisocial Behavior?

Abstract

Belsky and Pluess (2009) have argued that prenatal stress enhances children's susceptibility to environmental influences. Prenatal stress increases the chances of low birth weight (LBW) and prematurity (Lockwood & Kuczynski, 2001). Both LBW and prematurity have been studied as developmental risk factors for antisocial behaviors (AB), especially LBW (Tzoumakis & Cale, 2019). However, LBW *per se* is not a reliable proxy for fetal or newborn health. Tzoumakis and Cale (2019) report mixed findings on the LBW-externalizing links. The present study sought to develop a greater understanding of these developmental relationships. Using data from the Crime Causation Study (Glueck & Glueck, 1950; $N = 1000$), it tested whether perinatal health predicted both AB and adult arrests, mediated by trait sensitivity, including IQ, low self-control, and difficult temperament as controls. It also sought to assess whether the links from trait sensitivity to AB/adult arrests were moderated by family environment quality. Findings from a path analysis provided evidence that perinatal health was unrelated to trait sensitivity, AB, or number of adult arrests. Thus, no evidence of mediation effects was found. In addition, no moderation effects were found by family quality on trait sensitivity (either teacher reported or psychiatric assessments) in predicting AB/adult arrests. These findings – at least in part – challenge previous work (Greven et al., 2019; Liu et al., 2004; Piquero & Tibbetts, 1999; Pluess et al., 2020; Raine, 2002).

Literature Review

Trait Sensitivity & Environments

Aron & Aron (1997) have provided evidence in support of sensory-processing sensitivity as a psychological trait, usually confounded with inhibition, negative emotionality, or even internalizing problems. However, sensitivity is a more basic trait that depending on environmental experiences can lead or not to adult inhibition, negative emotionality (Aron et al., 2012), psychopathologies (Greven et al., 2019) or childhood externalizing behaviors (Slagt et al., 2018). Using an evolutionary framework, Belsky (1997) argued that inter-individual differences in responsiveness to the environment, would be the result of "bet hedging" against environmental unpredictability. Belsky and Pluess (2009) reviewed evidence showing that by "nature" some children are more influenced by "nurture". Trait sensitivity in child and adolescence is characterized by ease of excitation, low sensory threshold, and aesthetic sensitivity (Lionetti et al., 2019; Pluess et al., 2018).

Perinatal Health & Sensitivity

Albeit the mechanisms are still unknown, there is some promising empirical evidence, paired with theoretical reasoning (Belsky & Pluess, 2009) connecting prenatal stress to increased trait sensitivity in childhood (Hartman & Belsky, 2018) and adulthood (May et al., 2023). On the other hand, prenatal stress enhances the odds of poor perinatal health outcomes, such as premature birth, fetal growth restriction, pregnancy complications, and low birth weight (Lockwood & Kuczynski, 2001; Lu & Halfon, 2003).

Perinatal Health & Antisocial Behavior/Crime

Prospective and retrospective criminological studies have shown links between low perinatal health and youth problem behaviors, as well as adult violent behavior (Jackson & Vaughn, 2018; Piquero & Tibbetts, 1999; Pratt et al., 2006; Raine, 2002). However, a recent narrative review of the low birth weight-AB nexus was not conclusive (Tzoumakis & Cale, 2019). This might be because low birth weight *per se* is not a reliable proxy of perinatal health (Damhuis et al., 2021).

Trait Sensitivity & AB

Belsky (1997) argued that some children would be predisposed to be affected by parental coercion and others to be more affected by supportive experiences, in terms of the development of externalizing behavior. However, Slagt et al. (2018) showed that the kindergartners high in trait sensitivity were more responsive to changes in both supportive and coercive parenting styles over time, but the same was not true for the negative emotionality temperamental trait. There is a lack of studies in criminology examining the relationships between trait sensitivity and antisocial behavior development.

Hypotheses

It was expected that (see Figure 1)

Perinatal health risks would positively predict **trait sensitivity** in adolescence

Trait sensitivity in adolescence (risk factor) would positively predict **antisocial behaviors** in adolescence, particularly when youth experienced **poor family environment quality** (moderation of link)

Trait sensitivity in adolescence (risk factor) would positively predict **criminal behavior** in early adulthood, particularly when youth experienced **poor family environment quality** (moderation of link)

Perinatal health risks would directly positively predict **antisocial behaviors** in adolescence and **criminal behavior** in early adulthood

Perinatal health risks would be mediated by **Trait sensitivity in predicting both antisocial behaviors** in adolescence and **criminal behavior** in early adulthood

Controls: **Verbal IQ, Difficult Temperament, and Low Self-Control**

Methods: Sample & Procedures

The present study used data collected as part of the Crime Causation Study from **1,000** low-income and working-class White boys (at **T1**, $M = 14$ years old) from Boston (Glueck & Glueck, 1950): **500 delinquent** (institutionalized) and **500 non-delinquent boys** matched on IQ, age, ethnicity, and area of residence. Follow-ups included Time 2 (**T2**) between 1948 and 1956 and Time 3 (**T3**) between 1954 and 1963.

Methods: Measures

Perinatal health. Sum of 5 items, dichotomous variables from medical records: **instrumental delivery, abnormal pregnancy, low birth weight/prematurity** (< 6 lbs), **adolescent father**, and **teenage or late pregnancy** (>36 years old).

Time 1 - Trait Sensitivity. Two scores, (1) 8 teacher-rated dichotomous items, summed: **Nervousness, Suggestible, Fearfulness, Dreaminess, Sensitiveness, Unsocialness, Shyness, and Restlessness**; and (2) 5 T1 psychiatrist-rated dichotomous items, summed: **Sensitive, Somewhat Sensitive, Aesthetic, Conscientious, and Introversion as Method of Conflict Resolution**.

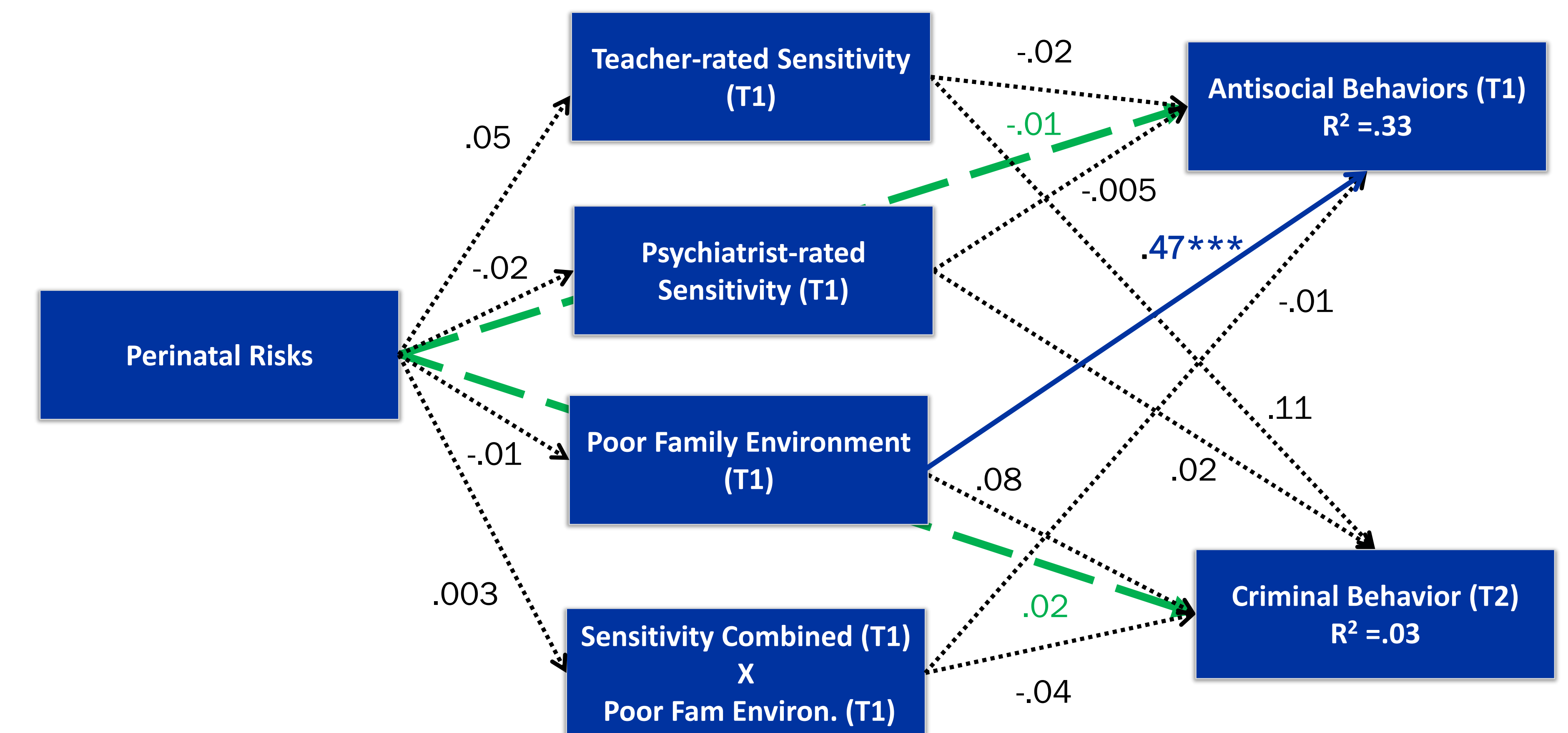
Time 1 - Poor Family Environment. Six domain scores, dichotomous items, summed: (1) **ineffective discipline** (10 items), (2) **high stress** (4 items), (3) **poor attachment/bonding** (3 items), (4) **low expectations** (3 items), (5) **poor cohesion** (1 item), and (6) **low supervision** (3 items). The six domain-specific risk scores were added up to form an aggregated family risk score.

Time 1 - Antisocial behaviors. Eight dichotomous items assessing deviance and externalizing habits/behaviors based on researcher interviews with the boys: **Drinking habit, truancy, stealing habit, violent temper, car theft habit, impulse stealing habit, delinquent peers, and grade retention** (at least one grade repeated).

Time 2 - Criminal behavior. Official criminal records for the delinquent sample were retrieved. **Number of arrests from age 17 to 25 years old** were collected and added up to form a continuous measure of number of arrests, ranging from 0 to 14 arrests.

Controls. **Verbal IQ:** Verbal Weschler-Bellevue Intelligence test scores. **Difficult Temperament:** an observed risk score was created by adding up 3 risk indicators (psychiatrist-rated stubbornness and aggressiveness at T1, and extreme restlessness as a newborn from medical records). **Low Self-Control:** an observed risk score was created by adding up 8 psychiatrist-rated traits (e.g. Adventurous, Egocentric, Not intellectual, Not conscientious). **Crime prior to age 17 years old:** dichotomous variable indicating active criminal status prior to age 17 years old (i.e., convicted).

Results: Path Model



Note. Standardized coefficients are shown in Figure; *** $p < .001$, ** $p < .01$, * $p < .05$. Standardized coefficients of control variables for Antisocial Behaviors: **Verbal IQ** ($\beta = .06^*$), **Difficult Temperament** ($\beta = .17^{***}$), and **Low Self-Control** ($\beta = .25^{***}$). Standardized coefficients of control variables for Criminal Behavior: **Verbal IQ** ($\beta = -.06$, $p = .15$), **Difficult Temperament** ($\beta = .02$, $p = .59$), **Low Self-Control** ($\beta = .09^*$), and **Crime prior 17 years old** ($\beta = .006$, $p = .90$).

Table 1: Descriptive Statistics

Variable/Propensity risk scores	n	M	SD	Min–Max
Perinatal health risks	994	0.87	0.92	0–5
Teacher reported sensitivity	1000	0.82	1.19	0–8
Psychiatric assessment sensitivity	1000	1.97	1.13	0–5
Poor family Environment	1000	12.6	3.9	3–21
Antisocial behaviors	999	2.35	1.76	0–8
Criminal Behavior	438	3.79	4.05	0–13
Verbal IQ	1000	5.40	1.48	1–8
Difficult Temperament	1000	0.79	0.76	0–3
Low Self-Control	1000	2.32	1.13	0–6

Discussion

- Control variables absorbed all the variance in the outcomes: **hypotheses were not supported by the data**
- Perinatal risk did not predict either outcomes. Some previous studies only found evidence for violence (Raine et al., 1997)
- Self-control was the only variable that predicted both antisocial behaviors and criminal behavior. Perhaps the key path specification from perinatal health risks to the outcomes is through self-control or poor family environment
- Despite the large effect of poor family environment (even larger than self-control) on antisocial behaviors, there was no interaction with trait sensitivity, which was unexpected
- In the delinquent sample, poor family environment at T1 did not predict criminal behavior at T2 (number of arrests)
- Limited information on prenatal and newborn variables (dichotomous indicators) might have affected the results: limited variance
- The risk scores for trait sensitivity tapped traits that do not exactly match the sensitivity construct albeit theoretically and empirically related (e.g. shyness, fearfulness), which might also have affected the results