Cumulative contextual risk at birth and adolescent substance initiation: Peer mediation tests

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ABSTRACT

Background: Children who experience multiple adversities, such as prenatal exposure to drugs and poverty, early in development are at increased risk for the early initiation of alcohol and cigarette use. However, studies that examine potentially malleable processes associated with substance use initiation in the context of exposure to cumulative stressors are scant. This study examined associations between cumulative contextual risk at birth and initiation of alcohol and cigarette use in adolescence, testing childhood peer marginalization and peer aggression and behavior problems as mediating mechanisms. Analyses further adjusted for fearfulness/inhibition and hyperactivity/distractibility to determine if the hypothesized mediating mechanisms were significant after accounting for temperamental characteristics associated with substance initiation.

Methods: Participants were 6190 adolescents from the Northern Finland Birth Cohort 1986 Study. Data were collected on cumulative contextual risk (parent reports), substance initiation (adolescent reports), childhood peer processes and behavior problems (teacher reports), and temperamental characteristics (teacher reports). Novel discrete-time survival mediation analysis was conducted to test the hypothesized mediating mechanisms.

Results: Initial analyses showed that the associations between cumulative contextual risk and both alcohol and cigarette initiation were mediated by childhood peer processes and behavior problems; however, the indirect effects became statistically non-significant after adding the temperament variables, which themselves predicted substance initiation.

Conclusions: Targeting peer processes may not be an effective way to interrupt pathways leading from early contextual risk to substance initiation. Instead, early screening and intervention efforts to delay substance initiation may need to be tailored to the individual temperamental characteristics of targeted participants.

1. Introduction

Although declining, rates of adolescent alcohol use and cigarette smoking remain elevated worldwide, even among very young adolescents (Degenhardt et al., 2008; Johnston et al., 2016). This is a concern because, compared to later onset, early-onset alcohol and cigarette use (around age 13 or younger) increases the risks for adverse consequences (Chen et al., 2008; Grant and Dawson, 1998). Identifying malleable risk processes leading toward early-onset alcohol and cigarette use among at-risk adolescents can guide screening and intervention efforts to delay substance initiation. However, analyses of such processes must account for potential confounds to distinguish causal factors from markers of risk. This study analyzed data from a large Finnish birth cohort to examine cumulative contextual risk at birth in relation to alcohol and...
cigarette initiation in adolescence, and tested childhood peer margin-
alization and peer aggression as mediating mechanisms, while ac-
counting for general problem behaviors and adjusting for tempera-
mental characteristics.

Early contextual risk factors, such as prenatal exposure to drugs
(Richardson et al., 2013), often co-occur with other risk factors in
the environment, such as being born into poverty and from a teenage
mother. According to the cumulative risk hypothesis (Rutter, 1979;
Sameroff et al., 1987), rather than the severity of any particular con-
textual risk factor, it is the presence of many such factors that increases
the likelihood of difficulties among children. This approach assigns unit
weighting to each indicator, represented as a dichotomous variable
capturing the presence versus absence of risk. The indicators are then
summed into a count variable that indexes the total number of equally
weighted risks to quantify the overall burden of risk for each individual.
The cumulative risk approach has the advantage of providing a para-
monic representation of co-occurring risks and has obtained con-
siderable support over the years (Evans et al., 2013). An earlier analysis
from the current project found that a measure of cumulative contextual
risk at birth was a positive predictor of adolescent substance use (Mason
et al., 2016), consistent with prior studies (Newcomb and Felix-Ortiz,
1992; Ostatzewski and Zimmerman, 2006). Whether such risk predicts
alcohol and cigarette initiation is uncertain and the extent to which
developmentally salient processes in childhood might mediate these
long-term associations has not yet been examined. An important cri-
tique of the cumulative risk approach has been that the mechanisms of
effects are understudied (Evans et al., 2013).

During the early elementary school years, peer interactions take on
increased importance. Key developmental tasks for children during this
time period involve learning how to develop and maintain positive peer
relationships. However, difficulties with peer socialization, such as peer
aggression and peer marginalization, have adverse consequences for
children (Parker and Asher, 1987), including substance use (Hawkins
et al., 1992). Children involved in aggression as perpetrators and/or
victims are more likely, compared to children who are not so involved,
to display a range of socio-emotional adjustment problems (Haynie
et al., 2001; Kumpulainen et al., 1998). There is evidence that various
contextual risk factors positively predict peer aggression (e.g., poverty
and having a teenage mother; Nantel-Vivier et al., 2014; Romano et al.,
2005) and that the number of contextual risks is associated positively
with aggressive behavior (Stoddard et al., 2012), consistent with the
cumulative risk hypothesis. The majority of studies examining risk
factors for peer marginalization have addressed psychological char-
acteristics, such as cognitive deficits (Dodge et al., 2003; Southam-
Gerow and Kendall, 2002). Social context also plays a role in peer
marginalization (Mikami et al., 2010), but the degree to which cumu-
lative contextual risk at birth predicts children’s experiences of being
marginalized from their peers is unclear. Moreover, whether peer ag-
gression and peer marginalization, both of which have links with
adolescent substance use (Moore et al., 2014; Sullivan et al., 2006),
might serve as mediating mechanisms linking cumulative contextual
risk at birth with substance initiation is unknown.

Peer difficulties often co-occur with disruptive behavior problems in
children (Powers et al., 2013). Links between cumulative contextual
risk and substance initiation may have less to do with peer aggression
and peer marginalization than with behavior problems, consistent with
the expectations of general deviance perspectives (e.g., Jessor and
Jessor, 1977). Childhood behavior problems are predicted by con-
textual risks (January et al., 2017; Slopen et al., 2014) and predict
adolescent substance-related outcomes (Hawkins et al., 1992); thus, it is
important for tests of peer mediation processes to consider childhood
problem behavior as an alternative or additional mediating mechanism.

Temperament also is an important consideration (Cloninger et al.,
1993). Temperamental characteristics refer to relatively stable in-
dividual differences in reactivity and self-regulation (Rothbart et al.,
2000). In the context of peer relationships, two dimensions of
temperament can influence children’s interactions with their peers:
feefulness/inhibition and hyperactivity/distractibility. Fearful/In-
hibited temperament is a pattern of response in unfamiliar situations
showing signs of distress, anxiety, or wariness. As these patterns of
behavior become recognizable by peers, fearful/inhibited children tend
to be rejected from social activities because they are not viewed as
desired playmates (Rubin et al., 2002). Hyperactivity/Distractibility is
characterized by high activity, low persistence, and high distractibility.
Children displaying such behaviors can be easily frustrated when they
cannot reach their goals and tend to use aggressive strategies to over-
come barriers (Berdan et al., 2008), which is viewed negatively by their
peers (Nijmeijer et al., 2008).

The aforementioned temperamental characteristics not only are
related to peer processes in childhood but also predict substance use in
adolescence (Creemers et al., 2010; Wills and Dishion, 2004). Because
temperamental characteristics may have broad consequences for peer
relationships and substance involvement, it is uncertain how hypothe-
sized developmental processes linking early cumulative contextual risk
with adolescent substance initiation through childhood peer factors
might change after adjustment for fearfulness/inhibition and hyper-
activity/distractibility. If these characteristics represent confounding
influences, then intervention efforts might be best directed toward early
identification of temperamental risk with referrals to tailored substance
use prevention programs (e.g., Palmgreen and Donohew, 2006).

This study used longitudinal data from the Northern Finland Birth
Cohort 1986 (NFBC1986) to examine the association of cumulative
contextual risk at birth with alcohol and cigarette initiation in adoles-
cence. It was hypothesized that the number of contextual risk factors
early in development would predict early-age substance use onset.
Analyses also tested childhood peer aggression and peer margin-
alization as mediating mechanisms, while considering intervening ef-
facts through childhood behavior problems. Results were expected to
show mediation through peer processes, even in the presence of a be-
havior problems pathway. However, observed mediation might reflect
confounding due to temperamental characteristics; thus, analyses were
extended to include fearfulness/inhibition and hyperactivity/distract-
ibility as covariates. Peer mediation processes might be attenuated in
the presence of the temperament variables. Finally, analyses included
gender as a covariate (e.g., McEachern and Snyder, 2012).

2. Material and methods

2.1. Data and participants

The NFBC1986, a population-based study of individuals born during
a one-year period in Finland, provided the data for this study. The
original cohort included 9432 children born alive, whose expected date
of birth fell between July 1, 1985 and June 30, 1986. Details regarding
the NFBC1986 data collection are available elsewhere (Hurtig et al.,
2007; Järvelin et al., 1993; Miettunen et al., 2014). Current analyses
used data collected at prenatal/birth, childhood, and adolescence. At
the study’s outset, mothers were provided a prenatal background
questionnaire at their first antenatal visit to the local prenatal clinic
(on average at the 12th gestational week), to be returned by their 24th
gestational week. Midwives and/or medical staff at the prenatal clinics
completed additional information on pregnancy and delivery. In
1993–1994, when children were 8 years old, a postal questionnaire
regarding school behavior and performance was provided to each
child’s homeroom teacher in the spring of their first year of school (92%
completion rate). In 2001–2002, participants were invited to a clinical
examination, during which the 15–16 year olds filled in a questionnaire
regarding eating habits, stress, sexual behavior, substance use and
mental well-being (76% participation rate). Written informed consent
was obtained from parents and assent from children. The NFBC1986
study was approved by the ethical committee of the Northern Os-
trobothnia Hospital District.
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