A Dynamic Approach to Risk Factors for Maternal Corporal Punishment in Early to Middle Childhood

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Abstract

We investigated the utility of a dynamic approach to risk factors for early to middle childhood maternal corporal punishment. Archival data from Fragile Families and Child Wellbeing Study mothers ($N = 4,364$) were used to model the associations of several risk factors (maternal depression, maternal substance use, parental burden, child negative affect, and intimate partner violence victimization), repeatedly measured at child ages 1 and 3, with both the age 3 level of and age 3-9 linear change in corporal punishment. Unlike most previous research, we distinguished between two types of variation in risk factors, reflecting occasion specific fluctuations as well as their absolute levels. We concentrate herein on the potential role of *occasion specific variation* in the above risk factors at age 3 – variability that is not a carryover effect from a risk factor's past level. Mothers who reported perturbations of (i.e., occasion specific variation in) depression, substance use, parenting stress, and child negative affect between ages 1 and 3 reported higher age 3 corporal punishment. Yet age 3 to 9 change in corporal punishment was not successfully predicted. The results underscore the importance of considering occasion specific fluctuations in risk factors, alongside their absolute levels, in the development and prevention of corporal punishment.

Keywords: corporal punishment, risk factors, longitudinal, psychopathology, latent growth curve modeling, mothers

Introduction

Corporal punishment (CPUN; physical discipline that falls short of abuse) is both common and detrimental to children. A very high percentage of American parents use CPUN. For example, 87% of 3- to 7-year-old children in a representative sample of two-parent American families experienced physical parent-to-child aggression, the majority of which was CPUN (Slep & O’Leary, 2005). CPUN is also widely, if variably, used in countries across the world (Lansford et al., 2017). Illustrating its destructive potential, a recent meta-analysis of 75 studies found that CPUN was related to 13 of 17 forms of detrimental child outcomes studied, including low moral internalization, aggression, antisocial behavior, mental health problems, and impaired cognitive ability (Gershoff & Grogan-Kaylor, 2016). Given these consequences, understanding how and why CPUN develops is important to provide empirical input into the design of preventive interventions.

Evidence suggests that younger children experience especially high rates of CPUN and that there is much change in CPUN from early to middle childhood. That is, although a minority of parents hit their one-year-olds (MacKenzie, Nicklas, Brooks-Gunn, & Waldfogel, 2015), CPUN is much more widespread by early childhood (Straus & Stewart, 1999). Evidence from several studies points to corresponding steady declines in most parents’ reliance on physical discipline techniques (Lansford et al., 2009; Lorber & Slep, 2015; Straus & Stewart, 1999). Yet not all parents exhibit the same level of CPUN in the early childhood period – or use CPUN at all. Moreover, the normative linear decrease in CPUN may not be exhibited by all parents to the same extent.

We focus herein on how the development of CPUN from toddlerhood to middle childhood may be preceded by changes in parental (depression, substance use, and perceived parenting stress) and interpersonal (child negative affect and intimate partner violence victimization [IPV]) risk factors in infancy and toddlerhood. Our approach is an application of Sameroff’s (2010) unified theory of development – integrating the postulates of prior models of development (e.g., social-ecological, dynamic systems, transactional, and biological) – to the problem of CPUN. Briefly, in the unified theory of development, the individual is conceptualized as embedded in concentric layers of context, ranging from the more proximal (e.g., family members) to the more distal (e.g., community) context. At the center, the individual or self is a set of psychological (e.g., emotion; mental health) and biological (e.g., neuroendocrine) factors. Change is of central emphasis in the unified theory of development. The components of the individual are dynamic interactants, reciprocally influencing and/or moderating one another’s effects. So too are the individual and her/his context: S/he is both changed by and changing her/his environment, and such effects

are further influenced by one another. In the unified theory of development, the output of these processes can be both quantitative (e.g., growth in a pre-existing behavior) or qualitative (e.g., the appearance of a new behavior).

Sameroff's (2010) model is an overarching theory of development that applies across age groups and behaviors. Consistent with integrative, polytheoretical approaches to child maltreatment favored in modern child maltreatment research (Azar, 2002), it also accommodates micro-theories for specific relations among factors. We next briefly offer the theoretical bases for the potential roles played by maternal depression, substance use, parenting stress, child negative affect, and IPV victimization in CPUN.

As outlined by Dix and Meunier (2009), who integrated cognitive and affective perspectives on the role of depression in parenting, depressive symptoms may undermine skilled parenting via 13 specific social cognitive (e.g., self-oriented, short-term goals; negative causal attributions for child behavior) and emotion-related (e.g., low positive and high negative emotion) processes. Evidence suggests that CPUN is often an impulsive-emotional act (Lorber, O'Leary, & Slep, 2011). Depression-related biasing of goal processing toward self-oriented, short-term goals may in part explain the impulsivity noted in CPUN. Depression-related impacts on parental emotion may further explain the angry/dysphoric affect noted in CPUN. Depression may also sour child related cognitions, biasing parenting toward cognition-congruent parenting strategies (e.g., hostile responses to child behavior, such as CPUN, attributed to hostile intent). Aggressive parenting has been tied to such factors in several studies (e.g., Leung & Slep, 2006).

Parenting stress may influence CPUN via affective-psychobiological mechanisms. Noting its inconsistent conceptualization in the parenting literature, we define parenting stress as the perception of the parenting role as overwhelming, consistent with psychological theories of stress that emphasize the appraisal of environmental circumstances as beyond one's coping resources (Cohen, Gianaros, & Manuck, 2016). Stress is strongly associated with the experience of negative emotion and increases in cardiovascular activity (Cohen et al., 2000), each of which is implicated in CPUN and/or harsh discipline (e.g., Leung & Slep, 2006; Lorber & O'Leary, 2005).

Borrowing from Finkel's (2007) model of intimate partner violence, substance use (e.g., alcohol and recreational drug use) may predict an elevated level of CPUN by impairing cognitive processes that would otherwise attenuate the effect of aggressive-eliciting forces. Substance use has well documented immediate disinhibitory effects on behavior (Lane, Cherek, Pietras, & Tcheremissine, 2004; Lane, Cherek, Tcheremissine, Lieving, &

Pietras, 2005), which may degrade the substantial self-regulatory capacity thought to be required for effective (e.g., non-aggressive) discipline (Crandall, Deater-Deckard, & Riley, 2015).

In recognition of child effects on parenting (Bates, Schermerhorn, & Petersen, 2012), child negative emotionality may be an additional elicitor of CPUN. Negative child affect is a frequent situational precipitant of CPUN (Soltis, 2004), perhaps due to its well-documented ability to elicit negative parental emotion (Arnold & O’Leary, 1995; Lorber & Slep, 2005). Negative parental emotion is consistently implicated in CPUN (e.g., Lorber et al., 2011).

IPV may influence CPUN via a process known as spillover (Sturge-Apple, Davies, Cicchetti, & Fittoria, 2014). In spillover, behavior and experienced emotion related to interparental conflict is carried into the parent-child relationship. Residual negative parental emotion from aggressive episodes may be a particularly salient mechanism for the link of IPV and CPUN, given the well established role of negative parental emotion in CPUN and harsh/aggressive parenting noted above. Aside from spillover, shared risk factors for IPV and CPUN (e.g., genes and stressful life events) may also play a role in their association (Ganiban et al., 2007; Slep & O’Leary, 2009).

Several studies have documented the cross-sectional and longitudinal associations of CPUN, or parent-child physical aggression more broadly, with parental depression (e.g., Eamon & Zuehl, 2001; Kohl, Jonson-Redi, & Drake, 2011), substance use (e.g., Fuller et al., 2003; Lee, Perron, Taylor, & Guterman, 2010), parenting stress (e.g., Lee et al., 2010; Liu & Wang, 2015; Mackenzie, Nicklas, Brooks-Gunn, & Waldfogel, 2011), child negative emotionality (e.g., Day, Peterson, & McCracken, 1998; Gromoske & Maguire-Jack, 2012; MacKenzie et al., 2015), and IPV victimization (Jouriles, McDonald, Slep, Heyman, & Garrido, 2008; Murray, Bair-Merritt, Roche, & Cheng, 2012). These studies suggest that the *absolute levels* of such risk factors, either in past or present, are associated with CPUN.

By contrast, the role of risk factors’ dynamics (i.e., change) in CPUN is much less well studied. We concentrate herein on the potential role of *occasion specific variation* in the above risk factors – variability that is not a carryover effect from a risk factor’s past level (Cole, 2012; Hutton & Chow, 2014; Kenny & Zautra, 2001). In other words, the focus is on the change in a risk factor that occurs between two points in time, as opposed to the level of a risk factor at any given time. Certainly, each risk factor considered herein exhibits substantial stability, yet each also exhibits time limited fluctuations. For example, although the most, least, and intermediately depressed people tend to keep their rank order relative to one another over time, such stability is far from absolute (e.g., Kenny

& Zautra, 2001). There is some “reshuffling of the deck” over time, with some people becoming more depressed and others becoming less so.

From the perspective of Sameroff’s (2010) unified theory of development, such change in risk factors can be expected to influence both qualitative (e.g., appearance of a new behavior) or quantitative (e.g., increase in the level of a behavior) change in the parent-child relationship. To illustrate, a temporary increase in depressive symptoms in parents with no significant history of depression may make them irritable and sour their views of their children (Dix & Meunier, 2009), thus eliciting newly aggressive responses (qualitative change) to the inevitable challenges young children present to their parents in toddlerhood. It may also be an entry point into a coercive cycle (Reid et al., 2002) with the child that propels parents’ aggression into the future, causing a higher initial level and a sharper increase in CPUN than may otherwise have been observed given the parent’s historically low level of depression (quantitative change). Put differently, it may be both how depressed the parent is *in general*, as well as how depressed the parent is *now* irrespective of the past, that propels a parent toward high or increasing CPUN. We suspect that this logic generalizes to other parental or interpersonal risk factors as well.

Such associations remain largely unexplored in the CPUN literature. In the most relevant report, Turney (2011) isolated occasion specific variation in maternal depression at ages 1, 3, and 5 and short term change in CPUN, failing to find an association. Further, prior research has repeatedly found that occasion specific variation in harsh parenting and challenging child behavior are linked, likely reflecting reciprocal causation (Lansford et al., 2011; O’Leary, Slep, & Reid, 1999). Yet we are unaware of investigations of the link between *occasion specific variation* in parental depression or child negative affect and *long term change in CPUN*. Other studies have relevant findings, but did not specifically model CPUN or use designs that isolated occasion specific variation in risk factors. For example, Kim et al., (2010) studied IPV as a time varying covariate of harsh parenting (psychological and physical aggression composite) at ages 1, 2, and 3. However, these authors’ analytic methods did not allow them to determine how much of the time varying IPV-harsh parenting associations were driven by the substantial stability in IPV versus occasion specific variance. Moreover, their measure of harsh parenting did not specifically isolate CPUN. We are unaware of studies documenting the association of occasion specific variation in parental substance abuse and parenting stress in relation to long term change in CPUN.

Knowledge that occasion specific variation in risk factors is linked to CPUN would likely have important ramifications for preventive intervention. The authors of a recent meta-analytic review concluded that the evidence

of the effectiveness of preventive interventions for child maltreatment paints a gloomy picture (Euser, Alink, Stoltenborgh, Bakermans-Kranenburg, & van IJzendoorn, 2015). Universal prevention programs aside, existing interventions that prevent early CPUN are typically offered to parents based on risk factors measured at a single point in time (e.g., Zielinski, Eckenrode, & Olds, 2009). This practice is consistent with a historic focus on the absolute levels of risk factors in etiological studies of CPUN. Yet, if changes in risk factors are implicated in future CPUN, selecting parents for preventive intervention based on single point-in-time assessments of risk may inadvertently neglect some parents in need. Consider the hypothetical case of parenting stress. If change in parenting stress between age 1 and 3 predicts high or increasing CPUN, selectively offering an intervention at age 1 to mothers with high levels of parenting stress at that point would fail to include a group of women who will eventually be at risk – those whose parenting stress will eventually increase. More generally, if occasion specific fluctuations of a risk factor are predictive of CPUN, a preventive intervention may have a greater effect if it is offered to mothers experiencing change in that risk factor at the empirically indicated specific time(s) in their children's lives.

In the present study, we took a dynamic approach to risk factors for CPUN to clarify the role of occasion specific variation in parental depression and substance use, parenting stress, child negative affect, and IPV victimization. We focused on predicting both the age 3 level of CPUN and its growth from 3 to 9 years old. The dramatic normative child developmental transitions that occur in the first three years of life (e.g., developmental attainments of anger, physical aggression, the capacity to generate and recognize goal directed behavior, and independent locomotion), and the correspondingly large required adjustments in caregiving (Thompson, 2006), may make this a particularly sensitive period for parenting to be influenced by factors that are both directly and indirectly tied to the parent-child relationship. As a general developmental principle, during periods of transition and reorganization, behaviors are thought to be more prone to influence (Lewis, 2000). Thus, we reasoned that transient upward perturbations (i.e., occasion specific variation) in the risk factors would be associated with a higher level of and increases in CPUN over time. Transient, occasion specific effects would be reflected in a significant unique association of a risk factor at age 3 with CPUN, controlling for the risk factor's past at age 1. For comparison, we also investigated the associations of the absolute levels of each of these risk factors at ages 1 and 3 with CPUN.

Method

Participants

The present study used data collected in the Fragile Families and Child Well-Being Study (FFCWS; Reichman, Teitler, Garfinkel, & McLanahan, 2001), a longitudinal study of children born between 1998 and 2001 ($N = 4,898$ mothers) to primarily unwed mothers and fathers from twenty cities across the US with populations over 200,000. At baseline, maternal age ranged from 15-43 years ($M = 25.25$; $SD = 6.10$). Three fourths of mothers were not married and 36.4% of mothers were cohabitating with the biological fathers at baseline. The mean annual household income ranged from \$29,398 to \$31,994. As for education, 34.7% of mothers had not completed high school, 30.2% of mothers had completed high school, 24.3% of mothers had completed some college, and 10.7% of mothers, had completed college or graduate school. The ethnic breakdown of mothers was 21.1% Caucasian, 47.5% African American, 27.3% Hispanic, and 4.0% other.

Procedure

At baseline, mothers and fathers who had recently had a baby together were interviewed within 48 hours of the births. Follow-up interviews with the mothers were conducted by telephone when the focal child was approximately 1, 3, 5, and 9 years old, respectively. In addition, in-home interviews with the mothers and children were conducted at ages 3, 5 and 9. The Office of Population Research at Princeton University granted permission to use this database, and this study received approval via the authors' research ethics board.

Measures

As described in detail below, mothers provided reports of CPUN at ages 3, 6, and 9, and of depression, substance use, parenting stress, child negative affect, and IPV victimization at ages 1 and 3. We used latent measurement models wherever possible, each of which produced acceptable model fit (Table 1).

Corporal punishment. Five items from the Parent-Child Conflict Tactics Scales Corporal Punishment subscale (CTS-PC; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998) were administered to mothers during in-home interviews at ages 3, 5, and 9. The CTS-PC is a widely used measure of parents' perpetration of physical aggression against their children, with its validity suggested by significant interparental agreement and associations with other related constructs (Lee, Lansford, Pettit, Bates, & Dodge, 2012; Slep & O'Leary, 2007). Each item describes a physically aggressive parental behavior (pinched; slapped on the hand, arm, or leg; spanked on the bottom with bare hand; hit with hard object; shook). Items are rated on a 7-point scale ranging from (0) *never* to (6) *more than 20 times*, and represent the frequency of each behavior in the past year. To form CPUN scores for analysis at each wave, item averages were computed. CTS-PC items range from less to more extreme physical

discipline tactics. Parents who exhibit less extreme aggression (e.g., spanking) most often do not exhibit more extreme forms of aggression (e.g., shaking), although such behaviors clearly all fall within the domain of physical aggression. Thus, α is not reported per Lorber and Slep (2017), who demonstrated that the reliability of this measure is high over much of the range of corporal punishment despite the seeming paradox of its typically low alpha.

Depression. Mothers completed the Major Depressive Episode (MDE) subscale of World Health Organization Composite International Diagnostic Interview Short-Form (CIDI-SF) at the age 1 and 3 telephone assessments. The MDE subscale comprises 8 depressive symptoms (e.g., depressed/sad/blue for ≥ 2 weeks in row), scored present or absent in the last year (1/0). Kessler, Andrews, Mroczek, Ustun, and Wittchen (1998) report that the MDE short form has .90 sensitivity and .94 specificity judged against diagnoses of Major Depressive Disorder based on the full CIDI. Latent depression factors were formed at each wave using each of the 8 items as indicators of continuous depression factors. These latent depression factors, which exhibited significant longitudinal stability as reported in the Results section, were the focus of subsequent analyses.

Substance use. Maternal substance use in the last month was assessed at the age 1 and 3 telephone assessments using items derived from the Drug and Alcohol Dependence subscales of the CIDI-SF, which was validated against diagnoses based on the full CIDI (Kessler et al., 1998). All items available in the FFCWS data set at each age were used. The age 1 assessment included 3 items measuring substance use (excessive alcohol consumption, marijuana smoking, any “hard drug”). The age 3 assessment included 10 items measuring substance use (1 item measuring excessive alcohol consumption; 9 items measuring a range of drugs from sedatives to cocaine). All items were summed at each wave to reflect the overall level of substance use. Alpha is not reported as the measure functions as an additive index of substance use; individual “drugs of choice” varying among individuals and may thus not be highly correlated with one another. It is an “index score”; index scores composite across items but do not make assumptions about the relations among the items (Babbie, 2012). Age 1 and 3 substance use scores were positively associated ($r = .24, p < .001$).

Parenting stress. Mothers completed 4 items tapping burden experienced in the parenting role – a key facet of parenting stress – at the age 1 and 3 telephone assessments. The items were drawn from the Aggravation in Parenting Scale from the Child Development Supplement of the Panel Study of Income Dynamics (Mainieri & Grodsky, 2006). It exhibited adequate internal consistency and associations with constructs in its nomological net (e.g., spanking) in a prior report (MacKenzie et al., 2011) and exhibited significant longitudinal stability in the

present investigation. Parents rate their agreement with statements that reflect burden experienced in the parenting role (being a parent is harder than expected; feeling trapped by parental responsibilities; child care involving more work than pleasure; feeling tired, worn out, or exhausted from raising a family). Responses range from (1) *strongly disagree* to (4) *strongly agree*. Using the items as indicators, latent parenting stress variables were operationalized at each wave. These latent parenting stress factors, which exhibited significant longitudinal stability as reported in the Results section, were the focus of subsequent analyses.

Child negative affect. Age 1 and 3 negative affect was operationalized as latent variables based on mothers' reports. Mothers completed a short version of the Buss and Plomin (1984) EAS Temperament Survey for Children at the age 1 assessment during the core telephone assessment. Mothers completed items drawn from the age 2-3 and 1.5-5 versions of the Child Behavior Checklist family of instruments (CBCL; Achenbach, 2009) in the age 3 core telephone assessments. The validity of each measure has been previously demonstrated (Achenbach, 2009; Boer & Westenberg, 1994). Age 1 and 3 child negative affect factors scores were positively associated, as reported in the Results section.

Age 1. A 6-item version of the EAS was administered. The present analyses involved the 3 administered Emotionality subscale items ("Child often fusses and cries," "gets upset easily," "reacts strongly when upset"). Responses range from 1 = *not at all* to 5 = *very much*.

Age 3 negative affect. The EAS was not administered at age 3. Instead, 11 items from the CBCL were used as the indicator of a latent negative affect variable: "cries a lot," "easily frustrated," "gets too upset when separated from parents," "looks unhappy without good reason," "angry moods," "nervous, high strung, or tense," "screams a lot," "stubborn, sullen, or irritable," "sudden changes in mood or feelings," "temper tantrums or hot temper," and "whiny." Each behavior was rated from 0 = *not true* to 2 = *very true*.

Intimate partner violence. Maternal physical IPV victimization was assessed at each wave using selected questions from the Revised Conflict Tactics Scale (CTS2; Straus, Hamby, Boney-McCoy, & Sugarman, 1996). It is the most widely used measure of IPV and exhibits associations with constructs in its nomological net (e.g., O'Leary, Slep, & O'Leary, 2007). All items available in the FFCWS data set at each age were used. Two items (slap or kick; hit with fist or dangerous object) were administered at the age 1 and 3 assessments. Response choices ranged from 0 = *never* to 2 = *often*. Item averages were computed at each wave. Mothers' victimization by both the biological father of the target child and the current partner (where applicable) were included in the mother IPV victimization

composites. Alpha is not reported, following the logic presented for the CTS-PC (see also Shortt, Capaldi, Kim, & Owen, 2006). It can also be considered an index score (Babbie, 2012). Age 1 and 3 IPV victimization scores were positively associated ($r = .34, p < .001$).

Data Analyses

We carried out analyses in four phases. In Phase 1, we estimated latent measurement models via confirmatory factor analysis (CFA), where possible, to enhance the reliability of measurement of each predictor (Snyder & Stoolmiller, 2002). Latent variables were not estimated for substance use and IPV victimization as these are index scores (Babbie, 2012). In Phase 2, unconditional latent growth curves (LGC; Duncan, Duncan, & Strycker, 2006) were then fit to operationalize the age 3 level (intercept) of and age 3-9 linear change (slope) in CPUN. The third and fourth phases of analyses added predictors to the LGC models, respectively focusing on whether levels of (Phase 3) and changes in (Phase 4) the risk factors predicted the age 3 level of and age 3-to-9 linear change in CPUN. All analyses were conducted in a structural equation modeling framework using Mplus version 7 software (Muthén & Muthén, 1998-2012) with robust full information maximum likelihood estimation (FIML) to handle distributional nonnormality and make use of all available data (i.e., not just cases with complete data; Schafer & Graham, 2002). Benjamini and Hochberg's (1995) false discovery rate adjustment (FDR) to p values was used to protect against Type-1 error due to multiple hypothesis testing.

Missing Data

At age 1, $N = 4,364$ women had non-missing data on at least one study variable; the subsequent N s were 4,231 (age 3; 3% missing data), 4,139 (age 5; 5% missing data), and 3,681 (age 9; 16% missing data). Cases with missing data on a given predictor or outcome were included via FIML.

Results

Phase 1: Latent Measurement Models for Predictors

Parental depression. Using categorical factor analysis (Marcoulides & Schumacker, 2012) and the robust maximum likelihood (MLR) estimator, a latent mother depression factor was formed at ages 1 and 3 using each of the 8 CIDI-SF MDE items as dichotomous indicators of a continuous underlying depression factor. Categorical factor analysis with the MLR estimator requires numerical integration for which traditional indices of fit are not available. However, mean factor loadings were very high, as was the covariance between the latent factors, suggesting good fit. Standardized loadings ranged from .36 to .99 ($M = .89$), $ps < .001$. These latent depression

factors were the focus of subsequent analyses. There was substantial longitudinal stability in depression; $\beta = .53, p < .001$.

Parenting stress. A latent maternal parenting stress variable was operationalized at ages 1 and 3, using the 4 parenting burden items as indicators. Measurement structure was evaluated in structural equation models that simultaneously included all parenting stress factors, which were allowed to freely covary. Additional covariances (e.g., between residual variance terms of the same items at ages 1 and 3) were allowed but are not detailed here for ease of exposition. Maternal parenting stress measurement model fit the data well, $\chi^2 (15) = 112.95$, RMSEA = .04, CFI = .98, TLI = .96 (Table 1).

Standardized loadings ranged from .49 to .62 ($M = .54$), $ps < .001$. There was substantial longitudinal stability in parenting stress, $\beta = .67, p < .001$. These latent parenting stress factors were the focus of subsequent analyses.

Child negative affect. Age 1 and 3 child negative affect was operationalized as latent variables based on mothers' reports. Measurement structure was evaluated in a structural equation model that simultaneously included age 1 and 3 negative affect. The structure of each factor is described below. Additional covariances (e.g., between residual variance terms) were allowed but are not detailed here for ease of exposition. The child behavior measurement model fit the data well, $\chi^2 (75) = 395.92$, RMSEA = .03, CFI = .96, TLI = .95 (Table 1). Age 1 negative affect was significantly associated with age 3 negative affect, $\beta = .41, p < .001$.

Age 1 infant negative affect. The three administered EAS Emotionality subscale items were used as indicators of a latent infant mother-reported negative affect construct. The standardized factor loadings ranged from .50 to .70 ($M = .58$), $ps < .001$. This mother report age 1 negative affect factor was the focus of subsequent analyses.

Age 3 negative affect. A latent variable was operationalized with 11 negative affect items from the CBCL. Standardized loadings ranged from .35 to .68 ($M = .53$), $ps < .001$. This age 3 mother report negative affect factor was the focus of subsequent analyses.

Phase 2: CPUN Latent Growth Curve Models

An unconditional linear LGC model was estimated for CPUN. LGC models use structural equation modeling to form latent intercept (starting point) and slope (change) variables that can then be studied in relation to other variables. Intercept loadings were all set to 1. Slope loadings were set to 0 (age 3), 2 (age 5), and 6 (age 9) to (a) specify linear slopes, (b) locate the intercepts at age 3, and (c) express time in years since age 3.

The unconditional LGC model adequately fit the CPUN data, $\chi^2(1) = 10.90, p = .001$, comparative fit index (CFI) = 0.99, Tucker-Lewis Index (TLI) = 0.97, root mean square error of approximation (RMSEA) = 0.06, $N = 3,282$. The age 3 intercept was 6.19 ($SE = 0.09, t = 72.69, p < .001$). CPUN had a statistically significant negative mean slope ($M = -0.34, SE = 0.02, t = -19.55, p < .001$), indicating that it decreased on average from age 3 to 9. The intercept and slope variances were significant ($p < .001$), indicating that there was variability among parents in the age 3 level of and age 3-9 change in CPUN.

Phase 3: Do the Levels of Parental Risk Factors Predict CPUN?

The hypothesized predictors were added to the LGC models described above: maternal depression and substance use, parenting stress, child negative affect, and IPV victimization. Each predictor was independently studied in its own model in relation to the intercept and slope of CPUN. This approach is illustrated in Figure 1 (left panel). The CPUN slope and intercept are regressed on the latent parent depression factor at age 1. The CPUN slope is further regressed on the CPUN intercept. Thus, the prediction of CPUN slope from age 1 depression is a unique effect controlling for the CPUN intercept. It was important to isolate the variance in CPUN slope that was not associated with the CPUN intercept due to regression over time of extreme values of age 3 CPUN to the mean [slope-intercept standardized covariance (β) = $-.54, p < .001$]. Model fit was acceptable, as reported in Table 1.

Prediction of age 3 CPUN intercept. As hypothesized, the age 3 CPUN intercept was positively associated with the levels of maternal depression, substance use, parenting stress, child negative affect, and IPV victimization at ages 1 and 3 (Table 2).

Prediction of age 3-9 CPUN slope. In contrast to the hypotheses, the age 3-9 CPUN slope was not significantly associated with any of the predictors (Table 2).

Phase 4: Does Occasion Specific Change in Maternal Risk Factors Predict CPUN?

The next set of analyses built on the models in phase 1 and 2. However, the focus was on variance in each predictor at age 3 that was *not* shared in common with its past at age 1 (i.e., occasion specific variance or change). The approach is illustrated in the right panel of Figure 1. The CPUN slope is regressed on the CPUN intercept, both of which are themselves regressed on latent parent depression factors at ages 1 and 3. The paths from age 3 depression to CPUN intercept and slope are the respective tests for assessing the extent to which change (i.e., occasion specific variance) in parental depression from ages 1 to 3 is associated with the age 3 level of and age 3-to-9 linear change in CPUN.

Covariances among the depression factors (not pictured), representing the stability of depression, are also included in the model. Each of the other predictors was studied in relation to the CPUN intercept and slope following the above model (Table 3). Model fit was acceptable, as reported in Table 1.

Prediction of age 3 CPUN intercept. Controlling for their individual age 1 counterparts, age 3 maternal depression, substance use, and parenting stress, as well as child negative affect (i.e., occasion specific variance in the risk factors at age 3) predicted greater age 3 CPUN intercepts as hypothesized. The same was not true of age 3 IPV victimization (Table 3).

Prediction of age 3-9 CPUN slope. In contrast to the hypotheses, none of the age 3 predictors, controlling for their age 1 counterparts, were significantly associated with the CPUN slope (Table 3).

Discussion

The present investigation is distinct from the majority of prior research on risk factors for CPUN in its intentionally narrow focus on how *change* in risk factors relates to the level of and change in CPUN in early to middle childhood. We asked whether the age 3 level of CPUN, and its long-term change between ages 3 and 9, could be predicted from change between child age 1 and 3 in maternal depression, substance use, parenting stress, negative child affect, and IPV victimization. Mothers tended to report similar levels of depression, substance use, parenting stress, and negative child affect from child age 1 to 3. For example, children who frequently cried at age 1 were inclined to frequently cry at age 3. Yet, continuity in these risk factors was far from absolute. Each exhibited meaningful change that was related to age 3 CPUN. These findings suggest the value of isolating occasion specific variation in most of the above risk factors at age 3 – variability that is not a carryover effect from the risk factors' past levels – in predicting the early childhood level of maternal CPUN.

Notably, change in mothers' IPV victimization was the only hypothesized risk factor that did not predict higher age 3 CPUN. This finding may suggest that some mothers actively buffer their parenting against the effects of violent conflict with intimate partners, purposefully counteracting the influence of IPV victimization on CPUN. Alternatively, this statistically nonsignificant finding may be due to limitations of the IPV measure. The FFCWS was primarily designed to address conditions in the lives of unmarried parents, and as a result, does not include a rich measure of IPV victimization. Only two items were used to assess IPV victimization, thus construct coverage was limited and reliability was also very likely limited, as substantiated by lower than typical longitudinal stability of IPV compared to the results of other studies (e.g., Lorber & O'Leary, 2012). Although our findings suggest that

short-term perturbations in IPV victimization do not predict higher age 3 CPUN, it is possible that other studies using stronger measures would.

What our findings suggest is the relatively short-term potential ramifications of change of the risk factors we studied in setting the level of maternal CPUN in toddlerhood. Mothers who at age 3 were more depressed and stressed, used more substances, and whose children exhibited more negative affect than would have been predicted based on their levels at age 1 reported higher CPUN. The period between child age 1 and 3 constitutes the approximate entirety of toddlerhood (Kaneshiro, 2016). The dramatic normative child developmental transitions that occur in the first three years of life require correspondingly large adjustments in parenting (Thompson, 2006). Compared to children at other ages, toddlers are at elevated risk of physical and emotional parent-child aggression (Straus & Stewart, 1999). Parental aggression typically occurs in the context of parent-child conflict, which shows a normative increase in the toddler years and occurs as often as several times per hour (Biringen, Emde, Campos, & Appelbaum, 1995; Huang, Teti, Caughy, Feldstein, & Genevro, 2007; Klimes-Dougan & Kopp, 1999). This increase in conflict is likely driven in large part by normative increases in externalizing behaviors in this age range (e.g., physical aggression; Nærde et al., 2014) and normative increases in parents' beliefs that their children's behavior is intentional and controllable (e.g., Del Vecchio & O'Leary, 2008). Given these normative challenges, and the principal of heightened malleability during periods of transition and reorganization (Lewis, 2000), the toddler period may be a time when parenting practices are particularly susceptible to the disruptive influences of changes in risk factors such as depression, parenting stress, substance use, and child negative affect.

Our findings further suggest that long term change in CPUN is resistant to influence from the change in depression, substance use, parenting stress, negative child affect, and IPV victimization. Although changes in these risk factors between age 1 and 3 were largely associated with the age 3 level of CPUN, they did not predict growth in CPUN from age 3 to 9. There are several plausible explanations for these findings. First, once the initial level of CPUN is set in the toddler period, deviations from its well-known and pervasive normative decline in the preschool to middle childhood period (Lansford et al., 2009; Lorber & Slep, 2015; Straus & Stewart, 1999) may only be produced by factors that are more proximal. Based on short-term longitudinal studies (i.e., daily diaries) showing that child behaviours are powerful proximal antecedent of negative parental emotion (Aunola, Tolyanen, Viljaranta, & Nurmi, 2013; Gassman-Pines, 2008)—which is itself consistently linked to CPUN (e.g., Lorber et al., 2011)—we suspect that child behavior and parent emotion are primary among proximal risk factors. Second, there was much

less variability in linear change in CPUN from age 3 to 9 than there was in its level at age 3. Individual differences in the development of CPUN were overshadowed by its sample wide normative decline. That is, most parents reported a fairly similar decrease in CPUN. Alternatively, the effects of the predictors (and change in them) could be on shorter term change in CPUN. Had we taken into account change over weeks or months in a predictor variable, we might have been able to predict change over weeks or months in CPUN.

Our focus is on change in risk factors given the wealth of prior research linking CPUN to risk factors' levels. However, we briefly note that the absolute levels of mothers' depression, substance use, parenting stress, negative child affect, and IPV victimization at age 1 and 3 were also associated with higher age 3 CPUN but *not* with long term linear change in CPUN between age 3 and 9. Such findings are consistent with considerable prior research (e.g., Kohl et al., 2011; Lee et al., 2010; MacKenzie et al., 2015; Murray et al., 2012).

Limitations and Future Research Directions

Two limitations beyond those detailed above are important to consider in interpreting the present study's results. First, all data were obtained via self-report and thus could be affected by biases characteristic of self-report data. Many of the associations we reported may correspondingly be colored by shared informant variance. Additionally, the questionnaires can be seen as cumbersome in length, and thus, fatigue could have been a factor that created bias in self-reports. Furthermore, several of the factors measured are typically assessed via questionnaires or interviews because they are difficult to observe (e.g., CPUN and IPV). Yet the use of additional informants in future research would mitigate the methodological threats we have identified (e.g., partners; Lee et al., 2012; Lorber & O'Leary, 2012).

Second, we have chosen to focus on the prediction of CPUN by change in risk factors. Yet there are plausible alternative causal process linking CPUN to what we considered to be risk factors. For example, reciprocal causality is frequently found in the parenting and child behavior literature (e.g., Lansford et al., 2011; Lorber & Egeland, 2011). They may also reflect shared genetically influenced behavioral propensities in parents and children (Moffitt, 2005). Alternative forms of reciprocal and "third variable" causation may also explain the links between CPUN and the other risk factors in focus. That our approach was concerned with identifying predictors of CPUN does not imply that alternative causal patterns are less important.

If they prove to be replicable, the present findings have implications both for *what* factors may be screened for and *when* they should be measured to increase the reach of preventive interventions to a wider group of at risk

parents. Interventions that seek to prevent early elevations of CPUN may reach a wider group of at risk mothers if parents are selected for prevention based on repeated screenings for depression, substance use, parenting stress, and child negative affect between ages 1 and 3. That is, if an intervention were only selectively offered at age 1 to mothers with high levels of these risk factors, that intervention would fail to include a group of women who will eventually be at risk – those whose maternal depression, substance use, parenting stress, and child negative affect will eventually increase. Intervention can be offered to parents who report either high levels of and/or increases in these risk factors at any point – each successive screening can be expected to capture the “newly at risk.” Such an approach could potentially provide incremental improvement in “nipping” early elevations of CPUN “in the bud,” but may not alter the longer-term growth of CPUN, given the present findings. Such an approach would differ from the present norm in which interventions that prevent early CPUN are typically offered to parents based on risk factors measured at a single point-in-time (e.g., Zielinski et al., 2009). To reach more parents at risk for developmentally atypical increases in CPUN between ages 3 and 9, the identification of additional risk factors for *change* in CPUN may be needed. Future research could examine if indeed taking a dynamic approach in assessing risk factors would lead to better identification of those in need of interventions.

To our knowledge, the present investigation’s dynamic approach to risk factors for the levels and long term growth of early childhood maternal CPUN is a unique contribution to the literature. The results underscore the importance of considering change in risk factors, alongside their absolute levels, in the development and prevention of parental aggression. The characteristics of the sample (i.e., low-income, unwed mothers) represent a growing segment of the American population (Martin et al., 2012). The findings may generalize to a correspondingly large group of parents who are at elevated risk for CPUN.

More broadly, however, particularly considering the global dispersion of CPUN (Zolotor & Puzia, 2010), more research is needed to document the extent to which occasion specific variation in risk factors has universal vs. culturally specific associations with CPUN. As the work of Lansford and Dodge (2008) illustrates, CPUN rates vary widely internationally, with CPUN far more culturally acceptable in some countries than others (Lansford, Deater-Deckard, Bornstein, Putnick, & Bradley, 2014). Although there is cultural variation in attitudes toward CPUN within the US (Jambunathan, Burts, & Pierce, 2000), it is generally viewed as relatively taboo. To the extent that CPUN is doled out in a relatively controlled, culturally sanctioned manner, it may be less subject to influence by fluctuations in risk factors such as the ones studied herein. Thus, generalization to countries with more accepting

cultural norms regarding CPUN cannot be assured. The prevention of CPUN is a worldwide concern. Gaining a more complete cross-cultural understanding of the risk factors for CPUN is a critical building block for the development of scientifically informed, culturally nuanced preventive interventions.

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Table 1

Prediction Models' Fit

Prediction Model	χ^2	df	RMSEA	CFI	TLI
Maternal Substance Use					
Age 1	11.12	2	.04	.99	.98
Age 3	9.65	2	.03	.99	.98
Age 1/3	12.36	3	.03	.99	.98
Maternal Parenting Stress					
Age 1	40.32	12	.02	.99	.98
Age 3	41.30	12	.02	.99	.98
Age 1/3	150.26	34	.03	.98	.97
Child Negative Affect					
Age 1	29.67	8	.03	.99	.98
Age 3	377.37	75	.04	.96	.95
Age 1/3	535.77	114	.03	.96	.95
IPV Victimization					
Age 1	8.99	2	.03	.99	.98
Age 3	10.61	2	.03	.99	.98
Age 1/3	9.63	3	.02	1.00	.99

Note. Age 1 and Age 3 models correspond to Table 2 results; Age 1/3 models correspond to Table 3 results;

depression model fit is not available, as described above.

Table 2

Prediction of Corporal Punishment Slope and Intercept by Levels of Predictors

Predictor	Corporal punishment							
	Age 3 intercept				Age 3-9 slope			
	β	<i>SE</i>	<i>t</i>	<i>p</i>	β	<i>SE</i>	<i>t</i>	<i>p</i>
Maternal depression								
Age 1	0.09	0.03	3.06	.003	0.02	0.03	0.58	.861
Age 3	0.18	0.03	7.07	< .001	0.03	0.03	1.05	.403
Maternal substance use								
Age 1	0.10	0.03	3.93	< .001	0.00	0.02	-0.06	.952
Age 3	0.12	0.02	4.98	< .001	-0.04	0.02	-1.95	.218
Maternal parenting stress								
Age 1	0.29	0.03	9.29	< .001	-0.05	0.04	-1.43	.764
Age 3	0.25	0.03	8.79	< .001	0.02	0.03	0.52	.603
Child negative affect								
Age 1	0.17	0.03	6.04	< .001	0.01	0.03	0.40	.861
Age 3	0.38	0.02	16.70	< .001	-0.05	0.03	-1.71	.218
IPV victimization								
Age 1	0.06	0.02	2.73	.006	-0.01	0.02	-0.60	.861
Age 3	0.05	0.02	2.11	.035	0.02	0.02	0.99	.403

Note. Coefficients are standardized regression weights, evaluated relative to robust *SEs*; *p*-values are corrected for false discovery rate.

Table 3

Prediction of Corporal Punishment Slope and Intercept by Occasion Specific Change in Predictors

Predictor	Corporal punishment							
	Age 3 intercept				Age 3-9 slope			
	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>	β	<i>SE</i>	<i>t</i>	<i>p</i>
Maternal depression								
Age 1	-0.03	0.04	-0.59		0.01	0.04	0.22	
Age 3	0.20	0.04	5.02	< .001	0.03	0.04	0.66	.509
Maternal substance use								
Age 1	0.08	0.03	3.01		0.01	0.02	0.43	
Age 3	0.09	0.02	4.08	< .001	-0.04	0.02	-2.06	.136
Maternal parenting stress								
Age 1	0.19	0.05	3.52		-0.10	0.05	-1.84	
Age 3	0.11	0.05	2.20	.035	0.09	0.05	1.74	.136
Child negative affect								
Age 1	0.02	0.03	0.56		0.04	0.03	1.11	
Age 3	0.38	0.03	13.91	< .001	-0.07	0.04	-1.92	.136
IPV victimization								
Age 1	0.05	0.02	2.26		-0.02	0.02	-1.07	
Age 3	0.03	0.02	1.28	.201	0.03	0.03	1.21	.283

Note. Coefficients are standardized regression weights evaluated relative to robust *SEs*; CPUN is maternal corporal punishment; *p*-values are corrected for false discovery rate; hypothesized associations are boxed.

Figure 1. Analytic strategy using the example of parent depression. The age 3 intercept and age 3 to 9 slope of maternal corporal punishment in relation one another and to depression at child age 1 (left panel) and age 1 and 3 (right panel).