



Brief communication

Trauma-related predictors of deontic reasoning: A pilot study in a community sample of children[☆]

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ABSTRACT

Objective: Deontic reasoning (i.e., reasoning about duties and obligations) is essential to navigating interpersonal relationships. Though previous research demonstrates links between deontic reasoning abilities and trauma-related factors (i.e., dissociation, exposure to multiple victimizations) in adults, studies have yet to examine deontic reasoning abilities in children exposed to trauma. Given that social and safety rules (exemplars of deontic reasoning rules) may appear arbitrary for children in the face of trauma exposure, particularly interpersonal violence perpetrated by adults (i.e., caregivers, close relatives), we predicted that the ability to detect violations of these rules would vary as a function of trauma exposure type (no, non-interpersonal, and interpersonal). Additionally, given previous research linking dissociation and deontic reasoning in adults, we predicted that higher levels of dissociation would be associated with more errors in deontic problems.

Methods: Children exposed to interpersonal violence (e.g., sexual abuse by an adult family member, witnessing domestic violence, or physical abuse in the home) were compared to children exposed to non-interpersonal trauma (e.g., motor vehicle accident, natural disaster) or no trauma on their ability to detect violations of deontic and descriptive rules in a Wason Selection Task and assessed for their level of dissociative symptoms.

Results: Dissociation (but not trauma exposure type) predicted errors in deontic (but not descriptive) reasoning problems after controlling for estimated IQ, socio-economic status, and children's ages.

Conclusions: The current study provides preliminary evidence that deontic reasoning is associated with dissociation in children. This pilot study points to the need for future research on trauma-related predictors of deontic reasoning.

Practice implications: Deontic rules are essential to navigating interpersonal relationships; errors detecting violations of deontic rules have been associated with multiple victimizations in adulthood. Future research on violence exposure, dissociation, and deontic reasoning in children may have important implications for intervention and prevention around interpersonal functioning and later interpersonal risk.

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Introduction

Deontic reasoning involves reasoning about “what one may, ought, or may not do in a given set of circumstances” (Cummins, 1996a, p. 161), whereas descriptive reasoning involves reasoning about descriptions of some aspect of the world (Ermer, Guerin, Cosmides, Tooby, & Miller, 2006). For example, a deontic rule states, “If it is cold outside, then you must wear

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a coat.” A descriptive rule, on the other hand, states “If you play soccer, then you take the red water bottle.” Typically developing children and adults are more likely to detect violations of deontic rules compared to descriptive rules (e.g., Cosmides, 1989; Cosmides & Tooby, 1992, 1997; Ermer et al., 2006; Klaczynski, 1993; Light, Blaye, Gilly, & Giroto, 1989), even as young as 3–4 years of age (Cummins, 1996b; Núñez & Harris, 1998).

Deontic reasoning is critical to navigating social relationships and institutions (Cummins, 1996b). Impoverished deontic reasoning abilities are likely to place individuals at high risk for being taken advantage of in relationships or failing to protect against harm (Stone, Cosmides, Tooby, Kroll, & Knight, 2002). Thus, deontic reasoning performance may be particularly relevant to the deleterious interpersonal consequences associated with child victimization, such as peer victimization in childhood (e.g., Shields & Cicchetti, 2001; Schwartz, Dodge, Pettit, & Bates, 1997; Schwartz, Dodge, Pettit, & Bates, 2000) and physical and/or sexual revictimization in adolescence and young adulthood (for review, see Arata, 2002).

To date, we are aware of only one study that has examined deontic reasoning and trauma-related factors. DePrince (2005) reported that young adults who reported histories of victimizations both before and after age 18 made significantly more errors detecting violations of deontic rules (both social contract – rules involving a social exchange; and precautionary – rules involving safety) than their peers; the groups did not differ in descriptive reasoning. Importantly, pathological dissociation explained unique variance in deontic reasoning performance after controlling for other trauma-related factors (DePrince, 2005). Dissociation is associated with a host of information processing difficulties (e.g., memory problems; see Putnam, 1997), including disruptions in working memory and processing speed (DePrince & Weinzierl, 2006). Working memory and processing speed have, in turn, been implicated in deontic reasoning (Klaczynski, Schuneman, & Daniel, 2004). In the current study, we evaluated whether dissociation was linked with deontic (and not descriptive) reasoning errors in school-aged children. Specifically, we predicted that higher levels of dissociation would be associated with more errors in deontic (but not descriptive) reasoning problems.

In addition to dissociation, we also examined trauma exposure history in relation to deontic reasoning. While DePrince (2005) argued that poorer deontic reasoning may increase risk of multiple victimizations in young adulthood, certain types of trauma exposure in childhood may be associated with deficits in deontic reasoning. To the extent that traumatic events generally challenge fundamental assumptions regarding predictability, safety, and trust (e.g., Janoff-Bulman, 1992), deontic rules may seem arbitrary and unreliable to children who grow up in environments that include exposure to potentially traumatizing events. Therefore, trauma-exposed children may generally show problems detecting violations of safety and social relationship rules. Thus, we predicted that any trauma exposure (non-interpersonal or interpersonal) would be associated with worse deontic performance than no exposure.

To further qualify this prediction, we also hypothesized that interpersonal trauma exposure would be associated with worse deontic performance than non-interpersonal trauma exposure. In the face of interpersonal violence, deontic rules about safety and social exchange may seem particularly arbitrary and, therefore, be associated with worse performance. Indeed, Freyd (1996) has argued that the close nature of victim–perpetrator relationships (e.g., in familial violence) may decrease children’s motivation to develop accurate reasoning about social relationships because the abusive caregiving relationship violates a fundamental social contract. In addition, violent family environments, in particular, may fail to provide the structure or social learning environment required to develop these reasoning abilities. Thus, we predicted that interpersonal trauma exposure would be associated with poorer deontic (but not descriptive) than non-interpersonal trauma exposure, which would be associated with worse performance than no trauma exposure.

Current study

The current study provides the first examination of trauma-related predictors of children’s deontic reasoning performance. Drawing on theory (e.g., Janoff-Bulman, 1992; Freyd, 1996) and previous research (DePrince, 2005), we tested the contributions of trauma exposure type and dissociation to deontic reasoning performance in school-aged children. A priori contrast weights for trauma exposure groups that corresponded to the predicted pattern of means were assigned (weights: interpersonal trauma = 1, non-interpersonal trauma = 0, no trauma = –1). The use of planned contrast weights is justified given a priori predictions (Loftus, 1996; Furr, 2004) and minimizes Type II errors that would be associated with post hoc comparisons between multiple groups in a small pilot sample.

Method

Participants

Prior to data collection, all procedures were approved by the University of Denver Institutional Review Board. Participants were recruited in the Denver, Colorado, metro area through flyers in social service and mental health agencies, community centers, and local businesses as part of a larger study on parenting and stress that involved additional lab tasks not reported here. Female guardians and their school-aged children were paid for their participation; children received several small prizes throughout the testing session. All participants completed an extensive informed consent process. Of the 72 children who participated in the larger study, we report here on the 63 children for whom we had complete reasoning data. Of these 63 children (Age $M=8.89$; $S.D.=1.36$), 43 were female. Five female guardians did

Table 1
Descriptive statistics for variables used in hierarchical regression analyses

	No trauma ^a (n = 22)		Non-interpersonal trauma ^b (n = 14)		Interpersonal trauma ^c (n = 27)		Differences between groups
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
<i>Predictors</i>							
IQ estimate	106.09	17.78	99.36	14.27	92.67	12.83	a, c
Child age	8.82	1.22	8.79	1.37	9.07	1.47	
SES composite	0.07	0.89	0.16	0.71	-0.15	0.79	
Dissociation	0.18	0.17	0.21	0.14	0.4	0.38	a, c
<i>Outcomes</i>							
Descriptive errors (range 0–12)	5.14	1.78	6.21	1.97	5.63	1.82	
Deontic errors (range 0–24)	4.55	3.88	6.14	3.88	6.33	5.06	

Note: Letters indicate differences between groups revealed by Tukey's Honest Significant Difference (HSD) test ($p < .05$).

not provide racial/ethnic information about their children; the remaining children were reported to be of the following racial and ethnic backgrounds: 40% Euro-American, 19% African-American, 19% Hispanic/Latino, 3% Native Hawaiian/Pacific Islander, and 11% other race or bi/multiracial. Mothers reported the following income levels: 33.3% below \$10,000; 14.3% \$10,000–20,000; 14.3% \$20,001–30,000; 7.9% \$30,001–40,000; 7.9% \$40,001–50,000; and 22.2% above \$50,000. An SES composite score was created by transforming the following variables to z-scores and calculating the average: income (ranging from 1 = \$10,000 or below to 6 = \$50,000 or above), maternal occupational status (Hollingshead, 1975), and maternal years of education (see Table 1). The SES composite did not differ across the trauma exposure groups ($F(2, 60) = .82$, $p = .44$).

Materials

Replicating methods from previous studies of deontic reasoning (e.g., Cosmides & Tooby, 1992, 1997; Stone et al., 2002; Núñez & Harris, 1998), participants were presented with a series of conditional (if p, then q) rules using the Wason Selection Task (WST). Consistent with WST methods previously used with children (Núñez & Harris, 1998), response sets developed for this study included four cards with pictorial representations of p, not-p, q, and not-q options. Children were instructed to pick which cards must be turned over to check if anyone was breaking the "if p-then q" rule (see Section "Procedure" for additional task administration details). For each rule, a child could make up to four errors (two commission and two omission). Deontic rules included three social contract and three precautionary rules. As detailed by Ermer et al. (2006), social contract rules took the form "If you [take the benefit P], then you must [satisfy the requirement Q]". For example, "If you go outside to play, then you must have a clean room." Precautionary rules took the form "If you [engage in the hazardous activity P], then you must [take the precaution Q]". For example, "If it is cold outside, then you must wear a coat." Descriptive rules took the form "If you are [in category P], then you [have the preference, habit or trait Q]". For example, "If you are reading a book, then you sit in a green chair." Total errors for the six deontic (possible range: 0–24) and three descriptive (possible range: 0–12) rules were tallied.

In order to help rule out the possibility that any differences in WST performance were due to overall intelligence, children also completed the Block Design and Vocabulary scales of the Wechsler Intelligence Scales for Children (WISC; either 3rd or 4th edition; Wechsler, 1991a, 2003a). Full Scale IQ was estimated from scaled scores (Wechsler, 1991b, 2003b) and used as a covariate in regression models.

Guardians reported on children's trauma history using behaviourally defined questions from the UCLA PTSD Index (Pynoos, Rodriguez, Steinberg, Stuber, & Frederick, 1998). The measure has been shown to have good test-retest reliability and internal consistency (e.g., Roussos et al., 2005) as well as validity (e.g., correspondence with well-established PTSD interviews; Rodriguez, Steinberg, Saltzman, & Pynoos, 2001). While this measure also assesses PTSD symptoms, we only used the reports of the child's trauma exposure here. Dissociation was assessed using the Child Dissociative Checklist (CDC; Putnam, 1997), a 20-item guardian-report measure that assesses multiple types of observable, dissociative behaviors. The CDC has been shown to have good test-retest reliability and internal consistency, as well as discriminant validity in distinguishing children with and without pathological levels of dissociation (for review see Putnam, 1997). Internal consistency was excellent in this sample (Cronbach's alpha = 0.89).

Procedure

After the consent process, mothers were seated in a private room and asked to complete questionnaires. Children were tested by a graduate research assistant in a separate, private room. WISC scales were administered first, followed by the WST. WST rules were read out loud to children, who were asked to make responses using pictures; this procedure has been used successfully by other researchers with young children (e.g., Núñez & Harris, 1998). Children were asked to play a detective game in which they had to decide when rules might be broken. The experimenter told chil-

dren that they would hear a rule and see four cards with information on only one side. Using these cards, children were asked to decide when the rule might be broken and an investigation should be started. Children were instructed to pick (by pointing at pictures) only those cards to investigate that were the most important. Children did not receive accuracy feedback, as such feedback could have guided performance on the test rules (e.g., children would know that there were always two correct responses). After three sample rules to familiarize children with the task, test rules were presented in random order for each participant. Upon completion of the study tasks, child and adult participants were debriefed.

Results

Table 1 provides descriptive statistics for study variables by trauma-exposure group, as well as differences between the groups. Notably, neither predictor nor outcome variables differed as a function of gender; therefore gender is not included in the reported analyses.

WST psychometrics

Cronbach's alphas were calculated for errors on the six deontic rules; internal consistency was excellent ($\alpha = .82$). Task validity was assessed by comparing deontic and descriptive performance. Convergent with previous findings using the WST, children made significantly more errors (as a proportion of errors possible) on descriptive than deontic rules [$t(62) = 9.41$, $p < .001$]; the effect size was large (Cohen's $d = 1.35$).

Predictors of WST performance

Using hierarchical multiple regression analyses, we tested models predicting both descriptive and deontic errors. Correlations among predictor variables for the hierarchical regressions are reported in Table 2. Child age, IQ estimate, and SES composite were entered on the first step; trauma exposure status and dissociation scores were entered on the second step. The model predicting descriptive errors failed to reach significance at either the first ($F(3, 59) = 2.13$, $p = .11$) or second ($F(5, 57) = 1.63$, $p = .17$) step.

The model predicting deontic errors was significant at Step 1 ($F(3, 59) = 2.97$, $p < .05$; $R^2 = .13$). The change in R^2 was significant ($F\text{-change}(2, 57) = 3.95$, $p < .05$) at Step 2, with the full model reaching significance ($F(5, 57) = 3.54$, $p < .01$; $R^2 = .24$). As seen in Table 3, only dissociation scores explained unique variance in deontic errors, though estimated IQ approached conventional significance levels.

Discussion

This pilot study is the first to examine trauma-related predictors of deontic reasoning in children. Dissociation explained unique variance in deontic errors ($\beta = .35$), even after controlling for estimated IQ, socio-economic status, and child age. This finding contributes to the larger literature on dissociation and disruptions in information processing, replicating a recent finding with young adults. Specifically, DePrince (2005) reported that dissociation predicted unique variance in deontic (e.g., $\beta = .30$), but not descriptive reasoning errors. Thus, in both children and young adults, dissociation is associated with a specific type of reasoning error, but not global reasoning deficits (as illustrated by the lack of relationship to descriptive reasoning errors). As working memory and processing speed are implicated in both dissociation (e.g., DePrince & Weinzierl, 2006) and deontic reasoning (e.g., Klaczynski et al., 2004), future research should evaluate whether links between dissociation and deontic reasoning are mediated by deficits in working memory and/or processing speed.

Because of the importance of deontic reasoning to social relationships, the dissociation–deontic reasoning findings reported here may have implications for understanding some of the interpersonal correlates of dissociation, including revictimization. Several researchers have reported associations between dissociation and revictimization (see Classen, Paless, & Aggarwal, 2005); however, the mechanisms by which dissociation might mediate later victimization have been unclear. In the current study, dissociation is associated with more errors in deontic reasoning fairly early in child development. By

Table 2
Zero-order correlations among predictor variables used in hierarchical regression analyses

	Dissociation	SES composite	Child age	Trauma exposure group
IQ estimate	−0.10	0.40**	0.01	−0.37**
Dissociation		0.09	0.23	0.34**
SES composite			−0.09	−0.13
Child age				0.09

Note: The trauma exposure group variable was coded using a priori contrast weights: no trauma (−1), non-interpersonal trauma (0), interpersonal trauma (1).

** $p < .01$.

Table 3
Regression coefficients for hierarchical regression model predicting deontic errors

	Beta	S.E. (B)	t
Step 1			
Estimated IQ	−0.28	0.04	−2.09 [†]
SES composite	−0.14	0.73	−1.07
Child age	−0.06	0.40	−0.50
Step 2			
Estimated IQ	−0.24	0.04	−1.74 [†]
SES composite	−0.20	0.71	−1.57
Child age	−0.14	0.40	−1.19
Trauma exposure group	−0.05	0.66	−0.35
Dissociation	0.35	1.95	2.75 ^{**}

[†] $p < .10$.

^{*} $p < .05$.

^{**} $p < .01$.

young adulthood, participants reporting experiences of revictimization both make more errors in deontic reasoning problems; and report higher levels of dissociation (DePrince, 2005). Therefore, future longitudinal research should test whether disruptions in deontic reasoning early in development might mediate links between dissociation and later victimization risk.

In contrast to our prediction, trauma-exposure was not associated with deontic reasoning errors. It may indeed be the case that these variables are simply unrelated; however, several methodological issues should be taken into account in future research. First, given that we used a screener (rather than interview) for trauma exposure, we had relatively limited information about the details of the trauma exposure. Nineteen of the 27 children in the interpersonal trauma group were reported to have been exposed to violence in the family environment (e.g., sexual abuse by an adult family member, witnessing domestic violence, or physical abuse in the home); the remaining 8 were exposed to interpersonal violence in their communities or sexual abuse by an adult whose relationship to the child was not specified. Among those exposed to violence in the family, the degree of closeness with the perpetrator may have varied greatly. It may be that trauma exposure is associated with deontic reasoning disruptions in cases of close-other abuse; and not in more general cases of interpersonal violence (e.g., see Freyd, 1996). We were unable to examine this closely in the current data.

Second, we relied on parent-report of trauma exposure. Parents may have failed to report fully on interpersonal violence exposure because of social desirability, fears of consequences of reporting, or lack of knowledge about such events. Thus, some children may have been mis-categorized in terms of the trauma exposure group. As noted by one anonymous reviewer of this manuscript, in the case of under-reporting of familial violence, dissociation may actually be a better indicator of level of trauma than the form of trauma reported by parents. Thus, extending this research to samples with confirmed abuse or where children also report on trauma-exposure will be important.

Interpretation of these findings must be cautious for many reasons. Small sample size, low power, and potential self-selection biases inherent in community-based recruiting create challenges in generalizing these findings to other groups, therefore requiring replication in other samples. Further, participants in this sample reported low income levels, suggesting further research is needed to evaluate how findings generalize to other socio-economic groups. As noted previously, the current study depended on guardian-reported trauma history and child symptoms. Given various pressures (e.g., social desirability), some guardians may have failed to accurately report on their children's trauma histories or symptoms, thus adding error variance. Finally, the questionnaire used to assess trauma exposure did not allow us to examine contextual factors, such as age of onset or frequency of exposure to potentially traumatic events that may be important contributors to deontic reasoning abilities.

In summary, these findings contribute to the growing literature on information processing alterations associated with maltreatment (e.g., Pollak, Cicchetti, Hornung, & Reed, 2000) and dissociation (e.g., Cromer, Stevens, DePrince, & Pears, 2006; DePrince & Weinzierl, 2006).

Given the importance of deontic reasoning to navigating the social world and the serious interpersonal consequences associated with child maltreatment, future research of reasoning abilities in relation to trauma exposure and trauma-related symptoms is warranted.

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