PARENT PERCEPTIONS OF THEIR PREMATURE CHILDREN: ASSOCIATIONS WITH COGNITIVE AND MOTOR DEVELOPMENT

BY

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ABSTRACT

Empirical evidence to date has been contradictory in regards to the relationship gestational age at birth may have with increased levels of parental overprotection (POP) and parental perceptions of child vulnerability (PPCV). The current study evaluated the occurrence of these two parent factors, via questionnaire, within a sample of 77 parent-child dyads in which school age child participants had been born either preterm or full term. There was a significant relationship between preterm birth status and high levels of PPCV with a large effect size (Cohen's d =.820). POP was unrelated to birth status. Children also participated in a cognitive assessment. Results from these tests determined that when PPCV increased child motor performance decreased. PPCV and POP were unrelated to verbal fluency. POP was also unrelated to motor performance. Further research is needed in order to identify the underlying processes that determine the relationship between PPCV and child motor performance.

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INTRODUCTION

Within the animal kingdom, indications that the weaning process between parent and child has commenced are often salient, even to the lay observer. Species-specific behaviors are present among mothers pushing their offspring out of the “nest” so to speak. In some species, the mother takes on an aloof attitude towards her offspring, such as walking away while the animal tries to suckle or simply leaving her offspring unattended. However, human parent-child relationships are more complex and enduring than those found in most species, and innumerable idiosyncrasies exist in how mother and child choose to negotiate the process of individuation.

Although many philosophies have been formulated regarding best child rearing practices, as evidenced by the numerous books devoted to this topic (approximately 50,000 using a book distribution website search engine), there is no obvious consensus on the correct way to raise a child. However, when a parent brings a child in for a clinical evaluation prompted by concerns about the child’s social, emotional, or cognitive functioning, it is important to evaluate how parenting behaviors and parents’ perceptions of their child might influence the development and or maintenance of the presenting problem.

Parental overprotection is a type of behavior that may have deleterious effects on a child’s ability to build skills needed for self-sufficiency, which are vital to a child’s ability to thrive once separate from the parent. In the search to delineate the etiology of overprotection, numerous variables have been cited as possible contributors to the occurrence of the behavior. Low socioeconomic status, younger parent age, only child status, and environmental safety concerns (i.e. living in a high crime neighborhood), were significantly associated with higher scores on a measure of overprotection (Thomasgard, Metz, Edelbrock, & Shonkoff, 1995). However these correlations have not necessarily held in subsequent studies (Wightman et. al, 2007). Since it is not yet clear exactly how these variables interact or which ones are primarily responsible for the behavior, it is reasonable to conclude that the development of overprotection warrants further research. The present study sought to identify whether mothers of premature children have increased rates of overprotectiveness as compared to parents of full term children. Premature children often enter the world with medical complications and systems compromised by underdevelopment. Therefore, these vulnerabilities common to the premature child may trigger a heightened need to protect in the parent.

The current state of the research examining the occurrence of increased levels of parental overprotection (POP) within a population of parents of children born prematurely does not offer definitive conclusions. Thomasgard and Metz maintain, “that current overprotective behaviors toward children aged 2-10 years are not related to a history of…prematurity” (1999, p. 348) based on data they collected from a 1982-1987 cohort of children born < 37 weeks. Thomasgard points to the etiology of POP as driven by the co-occurring “psychological symptoms of phobic anxiety, psychoticism, and paranoid ideation” (1998, p. 238). The results from the 1998 study, collected from a 1989-1992 cohort of children born < 37 weeks, showed significant associations between these symptoms as measured by the Brief Symptom Inventory (Derogatis, 1993) and overprotection as measured by the Parent Protection Scale (Thomasgard, Metz, et. al., 1995). Thomasgard found no significant associations between POP and the variables of prematurity and history of life-threatening illness. Therefore it would follow that rates of POP in a premature parent sample should not differ significantly from those in a full term parent sample. However, Wightman et al. (2007) found a higher incidence of POP in a sample of parents of 8-year-old children from the 1992-1995 cohort who were born at a mean gestational age of 26.4 weeks, compared to parents of term-born children. This finding remained significant even when preterm children with neurosensory impairments were excluded from analysis. Wightman et al. (2007) questioned if this finding was due to neonatal risk being higher in their sample than in that of the Thomasgard, Metz, et. al. (1995) sample from the 1982-1989 cohort, in which no significant correlation was found between prematurity and POP.

Some evidence exists for higher rates of increased parental perception of child vulnerability (PPCV) in parents of premature children than in parents of term children. High levels of PPCV may pose a threat to the healthy functioning of the parent-child dyad and increase the probability that the child will develop behavioral problems (Forsyth, Horwitz, Leventhal, Burger & Leaf, 1996). In the case of a parent who holds an accurate perception of their child’s vulnerability, parental monitoring would be an advantage for the child’s well being. For example if a child has epilepsy then a parent’s efforts to pay close attention to their child would result in swift action should an episode occur. However when a child has a past history of illness or a present minor health concern and a parent views the child as excessively vulnerable this can give rise to unwarranted “physical and/or psychological restrictions” (Bergman & Stamm, 1967; Thomasgard, Shonkoff, Metz, & Edelbrock, 1995).

The Vulnerable Child syndrome (Green & Solnit, 1964) is a parent-child relationship disorder that arises from a parent’s persistent belief that their child is at risk of becoming ill and/or dying, which consequently interferes with the child’s psychological and social development. Parents who maintain perceptions of vulnerability tend to act overly indulgent or prohibitive, and the child consequently responds with defiance or over-dependence (Green & Solnit, 1964). Thomasgard and Metz (1999) surveyed parents and found those high in PPCV believed their ability to consistently set limits with their child was compromised by feelings of guilt about past suffering the child had endured from illness. Significantly higher PPCV levels were found for parents of 3-year-olds born prematurely compared with parents of term born controls in a sample from the 1982-1983 cohort (Perrin, West, & Culley, 1989). This finding contrasts with data from the same study that shows mothers of sick term infants rated their children similarly in terms of vulnerability to those mothers with healthy term infants. These reports indicate that there is something unique to the experience of having a premature child that may be dissociated from the presence of illness that creates an increased perception of vulnerability.

However, there are a multitude of valid reasons a parent of a premature child would have that would warrant perceptions of vulnerability and overprotective behaviors. The premature child typically enters the world with numerous medical complications and often times their ability to thrive or survive is in jeopardy. Premature birth compromises brain development due to an interruption of natural in-utero growth, which is often times coupled with various physical insults such as cerebral hemorrhaging (Baron & Rey-Casserly, 2010). Parents of preterm children are in many cases subject to a violation of the expectancy of birthing a healthy child, which could elicit overprotective behaviors. Parents of premature children are confronted with a steep learning curve after their child's birth and are required to assimilate a large amount of medical information in order to successfully take care of their child. It would make sense that a parent would choose to err on the side of safety and overprotection while processing this information.

The aim of the present research was to assess if POP and PPCV were higher within a sample of parents of premature children compared to parents of full term children, at early school age. The next step was to examine whether high POP and or high PPCV were inversely related to a child's performance on verbal fluency or motor tests. Verbal fluency, a test of executive functioning (Nash & Snowling, 2008; Sauzéon, Lestage, Raboutet, N'Kaoua, & Claverie, 2004), has been show to be a specific vulnerability for late pre-term children (Baron et. al., 2009). Reduced executive functioning and motor functioning have also been found in extremely preterm children at six years of age compared to term born peers (Marlow, Hennessy, Bracewell, Wolke, 2007). Clearly, the evidence indicates a strong likelihood of finding low levels of functioning on motor and verbal fluency tests in the present preterm sample. However, there are findings that indicate fluency and motor functioning may bear out a unique relationship to overprotection and perceptions of child vulnerability.

Field (1979) found significantly lower scores in a high-risk preterm sample at age 2 compared to a full term sample on measures of verbosity, mean length of utterance, and working vocabulary. She posited that "lesser amount of exploratory behavior, lower gross and fine motor scores, and less developed language" might be associated with parent overprotection or perceptions of fragility (1979). She also found that use of imperative statements, especially regarding safety, was higher in parents of two-year-old preterm children than parents of full term children. It is probable that there may be developmental consequences for the child if overprotective parents limit a child's opportunity for self directed play and self-regulation.

Research has shown parents of premature children engage in prematurity stereotyping (Stern, Karraker, MicIntosh, Moritzen, & Olexa, 2006). Parents of premature children 5 months of age were presented with a videotape of a 5-month-old child labeled "premature" and a videotape of a 5-month-old child labeled "full term". When asked to pick a toy for the premature child to play with they consistently picked a less challenging toy than picked for the full term child. The same procedure at 9 months and 12 months had the same results. All of the videotaped children were born full term. Stern et al. (2006) posit that these results indicate presence of a prematurity stereotype. It has been hypothesized that this stereotype can create a negative feedback loop between the caregiver-premature child dyad wherein parents perceive their children as less capable and exclusively attend to cues that indicate weakness, thereby leading to parenting behaviors that leave children unchallenged.

Results from the Stern et al. (2006) observational videotaped portion of the study showed mothers of premature infants, who rated their children as highly vulnerable on the Vulnerable Child Scale (VCS, Perrin et. al., 1989), were significantly more intrusive, more hostile, and showed less positive facial expression toward their children than other preterm parents who didn't rate their children as vulnerable. The preterm children rated as highly vulnerable showed less movement and less vocalization during this interaction with their mother. Results showed full term infant mothers who rated their children as highly vulnerable had no measured behaviors that were related to their scores on the VCS. However their infants were significantly fussier during the observation period as compared to full term infants who had not been rated highly vulnerable. The entire sample showed there was no difference in level of vulnerability scores between preterm and full term groups and that both groups who rated their children as highly vulnerable at 5 months had infants who scored lower on the Mental Scale of the Bayley Scales of Infant Development (BSID-M, 2ND Edition, Bayley, 1993) at 32 months. However it is worth noting that the infant-mother interactions were qualitatively quite different between the two groups during the observational study, yet regardless of this both highly vulnerable groups had similar BSID-M outcomes.

Current Study

In summary, the study addressed the following research questions:

1) Is there a higher level of PPCV and or POP in a premature parent sample compared to a full term parent sample?

   Hypothesis: Parents of 6 year olds born premature will score higher on the POP and PPCV measures than parents of 6 year olds born full term.

2) Do parent perceptions of child vulnerability and parental overprotection have an inverse relationship with child performance on verbal fluency and motor tasks?

Hypothesis: High levels of parent perceptions of child vulnerability and parental overprotection will be inversely correlated with child performance on verbal fluency and motor tasks.

METHOD

Participants

Eighty-five pairs of parent and child agreed to participate in this study. Eight full term participants had incomplete parent questionnaires and were excluded from all analyses. The remaining participants were 77 parent-child dyads. Of these 77 children, 20 were born preterm (<33 weeks gestation) and at extremely low birth weight (ELBW; <1000 g), and 57 were born full term (≥ 37 weeks). Child participants, 41 male and 36 female, were tested at a mean decimal age of 6.55 ± .29 (range: 6.02 to 7.22). The mean level of maternal education in years for the entire sample was 16.09 ± 2.08 (range 12-20 yrs.); 25% of mothers had ≤ 14 years of education. Table 1 describes additional characteristics by gestational week group.

Instruments

POP was measured using the Parent Protection Scale (PPS) developed by Thomasgard, Metz, et. al. (1995). The 25-item measure uses a frequency scale (0 = never, 1 = sometimes, 2 = most of the time, 3 = always) to “assess specific items of parenting behavior related to child autonomy, individuation, and separation” (Thomasgard, Metz, et. al., 1995, p. 332). Higher scores indicate greater levels of overprotection. Sample items include, “I have difficulty leaving my child with a babysitter” and “I dress my child even if he/she can do it alone”.

Scores for all items were totaled and left as a continuous variable. Test-retest reliability for a three to five week retest interval was .86 (Thomasgard, Metz, et. al., 1995). Criterion validity was demonstrated by significant association of the PPS with clinician judgment of occurrence of overprotection ($\chi^2 = 12.5$, $p = .0004$) (Thomasgard, 1998). There are four subscales of the POP questionnaire: Supervision, Separation, Dependence, and Control.

PPCV was measured using the Vulnerable Child scale developed by Perrin et al. (1989). The scale is a revised version of the Child Vulnerability Scale developed by Forsyth and Canny (1985). Lower scores were interpreted as indicating the presence of increased levels of PPCV. The scale has a significant positive correlation with birth weight. There was a significant negative correlation with parents' rating of a child's poor self-control as measured by the Personality Inventory for Children (higher scores indicate less self-control) (Wirt, Lachar, & Klinedienst, 1982). Perrin et al. (1989) reported test-retest reliability as .95 and .96 for a four-week retest interval. Items were constructed to measure the level at which a parent believes their child is subject to illness and death. Sample items include, "I often check on ______ at night to make sure he/she is ok" and "I have to keep ______ indoors because of health reasons. Validity for this measure was based on findings for the earlier version of the scale. Thomasgard pointed to findings that "children with a history of severe medical illness were significantly more likely to be categorized as vulnerable compared to those children without such a history" and "parents with a prior fear that their child might die were significantly more likely to be categorized as vulnerable compared to those without such a fear" as evidence of internal validity (1998, p. 228). [1]

The Beery-Buktenica Test of Visual-Motor Integration-Fifth Edition measures a participant's level of visual motor coordination (Beery, Buktenica, & Beery, 1997; Baron, 2004). Participants were asked to draw up to 24 geometric designs of increasing difficulty presented visually. The participant completed items until the child failed three consecutive items. Participants were awarded one point for each correctly completed item. The raw score of total number of correct items was converted to a standard score based on established norms for each age group. Concurrent validity has been assessed using two other measures of visual motor integration. Correlations with the Wechsler Preschool and Primary Scale of Intelligence Geometric Design subtest ($r = .60, p < .01$) and the Bender-Gestalt test ($r = -.46, p < .01$) were all in the expected direction (Aylward & Schmidt, 1986).

The Purdue Pegboard (Tiffin & Asher, 1948) was designed to test fine motor coordination (Gardner & Broman, 1979). Participants were asked to place one pin at a time into consecutive empty holes that descend vertically down a board placed in front of them. One trial each was given for the dominant hand, the non-dominant hand, and both hands at the same time. Each of these trials was preceded by a practice run in which the

[1]As part of a larger longitudinal study parents filled out several additional questionnaires which used scales that presented negative responses on the left side of the scale. In order to minimize confusion the Vulnerable Child scale was revised to follow the same format of negative items on the left moving toward positive items on the right. All items on the scale were reverse scored except for the 2 items that were reverse scored in the original format in order to account for this revision. The current study used a 4-point scale with a left side anchor of 0 unlike the Perrin et. al. scale, which used an anchor of 1. The blank name placeholder in each item was replaced with the word "my child" to simplify directions and format.

participant was allowed to place approximately three to four pins into the row(s) of holes. Once the trials commenced, participants were given 30 seconds to place pins in the row of holes. Errors were defined as help from the other hand, dropping of a pin, and picking up more than one pin at a time. Raw scores were converted to T- scores using norms developed by Wilson, Iacoviello, Wilson, & Risucci (1982). Concurrent validity of the pegboard was established by Smith, Hong, and Presson (2000) using the Nine-Hole Peg Test with 826 children aged 5 to 10 years. The Nine-Hole Peg Test is also a measure of fine motor skills and is scored as number of seconds the child takes to place all nine pegs in the board. Correlation with the Purdue Pegboard for dominant ($r = -.80$) and nondominant ($r = -.74$) hands was significant ($p < .0005$).

Verbal Fluency was measured using a letter and noun retrieval task. The letter subtest involved three 60-second trials in which the participant retrieves as many words as he or she could starting with a specified letter (F, A, S). Words other than numbers and proper noun names of people and places were required. Retest reliability ranges from ".67 to .88" (Baron, 2004, p. 175). The category task required participants to retrieve as many animal names as possible within a 60-second trial. The total number of words for the three letter retrieval subtests, excluding repeated words and rule breaks such as nonsense words, were totaled and converted to a T-score. Separate T-scores were calculated for the animal subtest. Verbal Fluency is commonly understood to be a test of executive functioning because it depends on the employment of strategic word retrieval searches (Nash & Snowling, 2008; Sauzéon, Lestage, Raboutet, N'Kaoua, & Claverie, 2004). Positive correlations with tests of attention (WAIS-R Digit Span; $r = .45$, $p < .001$), verbal memory (Selective Reminding test; $r = .17$, $p < .001$), word knowledge

(WAIS-R Vocabulary; $r = .41, p < .001$), and executive function in adults (WAIS-R Similarities; $r = .30, p < .001$) support validity for controlled oral word association tests such as the FAS (Ruff, Light, Parker, & Levin, 1997). The animal category fluency task has been shown to correlate positively with speech rate in children aged 11 to 17 when controlling for age ($r = .20, p < .05$) (Martins, Vieira, Loureiro, & Santos, 2007).

In order to increase statistical power, the study included a Total Motor variable, which is an aggregate of each participants T-scores for the Beery VMI, Purdue dominant hand, Purdue nondominant hand, and Purdue both hands.

Procedure

Participants were recruited from the Inova Fairfax Hospital for Children (IFHC) in Falls Church VA. Potential participants who met the criteria of having delivered their child at IFHC were sent a letter informing them of an opportunity to take part in a study of outcomes of premature birth. In exchange for participation parents received a cognitive assessment of their child at no charge. Parents interested in participating were asked to sign and submit a response card, which gave permission for the research team to contact them to set up a testing time. Participants were informed that the purpose of the study was to evaluate the cognitive development of preterm children treated in the Neonatal Intensive Care Unit at IFHC under the care of Fairfax Neonatal Associates and full-term children born at IFHC.

Parents and children were seen at the offices of Fairfax Neonatal Associates for assessment sessions. Parents signed an informed consent form prior to commencement of the testing session. Research assistants administered a battery of cognitive, neuropsychological, and behavioral tests to the child, which usually took 3 hours to complete. During the testing session parents remained in the waiting room and answered several questionnaires including the POP measure, PPCV measure, and demographic data. At a break midway through testing parents were given a chance to raise questions pertaining to the forms. After testing, parents received a report of their child's performance on several of the tests via mail. The Inova Health System IRB and American University Human Subjects Committee approved the study.

Statistical Analysis

PPCV, POP, and POP subscales were treated as continuous variables across all analyses. Chi-square tests were used to make comparisons between groups for categorical variables. Group differences were analyzed using independent t tests or Mann-Whitney U tests for continuous variables. Associations between continuous variables were analyzed using Pearson correlations or Spearman correlations depending on the normality of the distributions in the analyses. Cohen's d was used to calculate effect sizes. Alpha was set at .05 for all analyses.

RESULTS

Descriptive Data

No significant group differences were found for gender (χ^2 (df = 1, N = 77) = .033, p = .85) but there was a significant difference in age (t (74.12) = 5.39, p = .001) as children born preterm were younger than children born full term at time of testing. There were also significant differences between the preterm and full term groups for level of maternal education (χ^2 (df = 5, N = 77) = 13.51, p = .01), and race/ethnicity (χ^2 (df = 6, N = 77) = 21.94, p = .001) (Table 1).

Table 1. Participant Demographic Characteristics by Gestational Week Group

Demographic Variables	Preterm < 33 weeks (n = 20)	Full term ≥ 37 weeks (n = 57)
Gestation, mean ± SD, [range], wk	26.55 ± 2.69 [23 - 32]	39.35 ± .95 [37 – 41]
Birth weight, mean ± SD, [range], g	763.35 ±109.04 [606 – 987]	3560.68 ± 404.01 [2770 – 4810]
Age at evaluation, mean ± SD, [range], yrs	6.36 ± .12 [6.06 - 6.55]	6.62 ± .30 [6.02 – 7.22]

Males, n [%]	11 [55 %]	30 [53 %]
Race/Ethnicity, n [%]		
African-American	1 [5 %]	3 [5 %]
Asian	4 [20 %]	1 [2 %]
Caucasian	8 [40 %]	47 [82.5 %]
Hispanic	3 [15 %]	2 [3.5 %]
Indian	2 [10%]	0
Middle-Eastern	0	2 [3.5 %]
Bi-Racial	2 [10 %]	2 [3.5%]
Maternal Education ≤ 14 years, n [%]	10 [50%]	9 [16 %]

Research Question 1: Is there a higher level of PPCV and or POP in a premature parent sample compared to a full term parent sample?

In order to compare groups on the PPCV measure the nonparametric Mann-Whitney U test was used because the Kolmogorov-Smirnov test for normality was significant at the $p < .01$ level. The Mann-Whitney U test was also used for the Control subscale of the POP measure because the test for normality was significant at the $p < .05$ level. An independent samples t-test was used to compare full term parent and preterm parent scores on the POP and remaining POP subscales.

PPCV

Preterm parents showed a lower mean score, indicating a higher level of PPCV, for perceptions of child vulnerability than full term parents (Table 2). The difference in scores was found to be significant (p = .006) and this effect size was large according to Cohen's d (.820). According to the Mann-Whitney U test these results indicate that the two samples were not drawn from the same population and have significantly different scores not due to chance.

POP

As reflected in Table 2 there was no significant difference between scores of overprotection in preterm and full term parents.

POP subscales: Supervision, Separation, Control, and Dependency

No significant differences were found for any of the overprotection subscales (Table 2). Preterm parents had higher mean scores on all of the scales except for Separation.

Table 2. PPCV, POP, and POP Subscale Scores by Gestational Week Group.

	< 33 weeks (n = 20) M ± (SD)	≥ 37 weeks (n = 57) M ± (SD)	t (77)	*p*	*d*
PPCV *	36.90 ± 8.18	42.16 ± 3.90	—	.006	.820
POP	29.95 ± 7.81	26.86 ± 5.74	1.88	.064	.450
POP Subscales					
Supervision	12.85 ± 2.60	11.49 ± 3.09	1.76	.083	.476

Separation	3.90 ± 2.29	4.14 ± 2.40	.38	.699	.102
Control*	9.85 ± 3.70	8.54 ± 2.02	—	.310	.439
Dependency	4.85 ± 2.25	4.54 ± 1.60	.66	.513	.159

*Mann-Whitney U test was used for this measure so no t-value is provided. d = Cohen's d effect size measure (.2 = small, .5 = medium, .8 = large

Due to concerns that two categorical variables (maternal education and race/ethnicity) were significantly different between the preterm and full term groups a 2-way ANOVA was used to determine if either of these factors accounted for the difference in PPCV scores between the two subject groups. In terms of race/ethnicity no main effect was found F (1,76) = 1.98, p = .164. However it is important to note that in order to run the analysis race/ethnicity was transformed into a dichotomous variable (Caucasian, and all other races aggregated). The main effect was provided by birth status F (1,76) = 10.53, p <.01.

Maternal education level was also transformed into a dichotomous variable (education level less than or equal to two years of college, education more than two years of college) and no significant main effect was found F(1. 76) = 3.59, p = .062) The significant main effect was that of birth status F(1, 76) =9.42, p <.01. Interactions between race/ethnicity with birth status or maternal education level and birth status were not found.

Research Question 2: Do parent perceptions of child vulnerability and parental overprotection have an inverse relationship with child performance on verbal fluency and motor tasks?

Spearman's rank correlation coefficient was used to determine the relationship between PPCV and the POP Control subscale with tests of verbal fluency and motor skills. Pearson product-moment correlations were used to determine the relationship between POP and the remaining POP subscales with tests of verbal fluency and motor skills.

Descriptive statistics

Descriptive statistics for the combined group sample are listed in Table 3 and Table 4. T-scores have an average mean of 50 and standard deviation of 10.

PPCV

Perceptions of child vulnerability were significantly correlated with scores on the Beery VMI ($r = .25$, $p < .05$), Purdue Pegboard dominant hand ($r = .27$, $p < .05$), and Total Motor ($r = .27$, $p < .05$). These significant results indicated that when parent perceptions of vulnerability increased, as reflected by low scores on the PPCV measure, child motor performance decreased. No significant correlations were found between the PPCV measure and the other Purdue tests, the FAS test ($r = .18$, $p = .118$), or the Animal Fluency test ($r = .18$, $p = .118$) (Table 5).

POP

There were no significant correlations between parent overprotection scores with verbal fluency and motor test scores (Table 5).

POP subscales: Supervision, Separation, Control, and Dependency

Three significant correlations were found between subscales of the POP measure and motor tests. The Supervision subscale was negatively correlated with Purdue Pegboard non-dominant hand scores ($r = -.24, p < .05$). The Dependency subscale was negatively correlated with Purdue Pegboard dominant hand scores ($r = -.23, p < .05$) and Total Motor scores ($r = -.23, p < .05$). There were no significant correlations between POP subscales and Verbal Fluency tests (Table 5).

Table 3. Descriptive Statistics for Parent Questionnaires for Combined Group Sample.

	Mean ± SD	Range of scores	Possible Range of scores
PPCV	40.79 ± 5.77	19-48	0 - 48
POP	27.66 ± 6.43	18-45	0 - 75
POP Supervision	11.84 ± 3.01	6-20	0 - 21
POP Separation	4.08 ± 2.37	0-12	0 - 21
POP Control	8.88 ± 2.60	4-17	0 - 27
POP Dependency	4.62 ± 1.79	0-9	0 - 15

Table 4. Descriptive Statistics for Verbal Fluency and Motor Tests for Combined Group Sample

	Mean ± SD	T-score to percentile conversion for mean score	Range of Scores	T-score to percentile conversion for range of scores
Beery VMI	100.87 ± 15.24	50%	73-138	4% - 99%
Purdue DH, T-scores	42.00 ± 11.80	21%	6.87-76.94	< .01%- 99.5%
Purdue NDH, T-scores	44.77 ± 12.33	30%	21.97-74.80	.2% - 99%
Purdue BH, T-scores	47.75 ±11.30	42%	15.35-73.76	< .01 - 99%
Purdue Error	3.55 ± 3.59	-	0-15	-
FAS, T-scores	61.30 ± 14.01	86%	31.90-95.10	4% - > 99.99%
Animal Fluency, T-scores	52.00 ± 20.07	55%	9.40-96.90	< .01 - > 99.99%
Total Motor, aggregate of T-scores	235.39 ± 40.71	-	134.65-335.19	-

Table 5. Correlation Values for Parent Measures with Tests of Verbal Fluency and Motor Skills.

	PPCV°	POP	POP Supervision	POP Separation	POP° Control	POP Dependency
Beery VMI	.25*	-.02	-.08	.10	.09	-.19
Purdue Dominant Hand	.27*	-.12	-.06	-.12	.01	-.23*
Purdue Non-dominant Hand	.18	-.22	-.24*	-.05	-.18	-.13
Purdue Both Hands	.19	-.19	-.19	-.08	-.03	-.20
Purdue Error	-.14	.16	.17	.02	.09	.08
FAS	.18	-.06	-.14	-.02	.14	-.18
Animal Fluency	.18	-.08	-.01	-.02	-.07	-.09
Total Motor	.27*	-.16	-.17	-.04	-.02	-.23*

*significant at $p < .05$, °Spearman correlation.

DISCUSSION

In the current study results showed that perceptions of child vulnerability were significantly higher in a preterm parent sample than in a full term parent sample. Although scores on the overprotection measure and on three of the four overprotection subscales were higher in the preterm parent sample, these findings were not significant. A small to medium effect size that trended toward significance was found for the difference in overprotection scores between the gestational week groups in the hypothesized direction.

The question of whether there is a higher level of PPCV and or POP in a premature parent sample compared to a full term parent sample has been studied before. These results mirror findings from previous studies that showed higher levels of PPCV were present in parents of school aged children born premature (Thomasgard, 1998), and POP was unrelated to prematurity status (Thomasgard, Metz, et. al., 1995). Higher levels of PPCV had also been found in a previous study of 3 year olds born premature (Perrin et. al., 1989) However, contradictory findings in which PPCV was not related to prematurity (Thomasgard & Metz, 1995; Thomasgard & Metz, 1997) and POP was higher in preterm parents than full term parents (Wightman et al., 2007) are apparent in the literature.

It is unclear what variables account for these conflicting findings. Across studies, many variables have been suggested as possible moderators of the PPCV-prematurity relationship. One of those variables, level of maternal education predicted greater vulnerability in the Perrin et. al. (1989) sample when years of education were high. But other studies (Allen, Manuel, Legault, Pivor, & O'Shea, 2004; De Ocampo, Macias, Saylor, & Katikaneni, 2003) found increased vulnerability was unrelated to years of education. In the current sample, lower levels of maternal education showed a significant correlation with increased perceptions of vulnerability (Spearman's $r = .248$, $p = .029$). However this finding was for the entire sample of preterm and full term parents combined. Although mothers with a lower level of education (≤ 14 years) comprised 50 percent of the preterm parent group as opposed to 16 percent of the full term parent group, a small sample size precluded the possibility of a powerful moderator analysis. Consequently, it would be premature to conclude low levels of maternal education explained the strength of the relationship between PPCV and prematurity status. Also, maternal education may have been a confound in the study as opposed to a moderator.

It appears that until researchers investigating the PPCV-prematurity link and POP-prematurity link make a concerted effort to consistently code for suspected explanatory variables across studies in the hopes that eventually a metanalysis will shed more light on which variables account for the bulk of these relationships, the options are as follows: a) continue down the same path, sifting through research and struggling to make strong connections across studies, or b) consider what might be gleaned from a more observational/qualitative approach.

The benefit of a qualitative study would be to determine how and when perceptions of vulnerability or overprotective behaviors arise. Furthermore, it should be acknowledged that in many cases perceptions of vulnerability may actually reflect a true vulnerability in the child that demands parental attention. Likewise, depending on each individual child's path of development, different stages will necessitate parental intervention that shouldn't be misconstrued as overprotective. For example, parents who endorse the POP questionnaire item, "I always help my child go to the bathroom", may need to do that if their child has not been toilet trained or has a physical impairment that complicates the process of using the bathroom. This study did not code for such issues, but it is essential to control for these actual vulnerabilities as rated not solely by a parent but possibly a teacher or other observer. Once researchers are able to isolate a population of preterm children who are free from objectively rated vulnerability, they can move toward looking at how PPCV and POP affects a currently healthy child using longitudinal and observational research designs.

Green and Solnit (1964) have proposed that premature children are likely candidates for the vulnerable child syndrome, and some of the studies to date have shown a connection between parent perceptions of child vulnerability and preterm birth status. It is clear that there would be value in moving forward with the research in order to determine what factors increase perceptions of vulnerabilities, specifically ones that are not present in the child as rated by a physician, teacher, and possibly another family member.

The correlational method used in the study limits the number of inferences that can be drawn from the results. It remains unknown as to whether prematurity status predicts PPCV or other factors are responsible for the relationship. Also, SES and only child status were not included in the analyses, variables that have been shown in previous studies as related to rates of PPCV and POP. However, this thesis has proposed ways to push the research into a direction wherein future researchers may begin to identify cause and effect.

The implications of these findings are that, indeed, another result that can be substantiated by previous research has been found, but these results also remain at odds with previous findings. In future research on birth status, PPCV and POP, it is essential to use the same suspected moderator variables across studies so that possible moderators can be pinpointed with more confidence. At this juncture, it might be useful to promote new forays into longitudinal observational research. The goal would be to determine the etiology of PPCV in a population of premature children using an exclusion criterion of significantly impaired abilities.

Previous work by Thomasgard, Shonkoff, et. al. (19995) stated that the PPCV and POP measures were designed to measure discriminate constructs. It is important to note that in this particular study a post-hoc analysis confirmed that there was a significant correlation between the PPCV and POP measures (Spearman's $r = -.36$, $p < .01$). This calculation alone is insufficient evidence on which to draw a conclusion that the measures are not discriminate especially in light of the results discussed above. However, maybe the constructs of parental overprotection and parental perceptions of child vulnerability have more overlap when operationalized in questionnaire format than they do when they are outlined as theoretical concepts.

In the second section of the study high PPCV in the full sample was associated with low test scores on several motor functioning measures, but not verbal fluency measures. The parental overprotection scale did not bear out any significant relationship with motor tests or fluency tests. Out of 32 correlations between overprotection subscales with motor tests, only three correlations reached a significant level. No relationships were found between overprotection subscales and verbal fluency measures in the full sample.

A significant relationship between perceptions of vulnerability and child motor outcomes was found. A likely inference to make is that some process occurred between the parent and child that produced this outcome. However, because objective ratings of vulnerability by someone other than the parent were not included, there was no way to decipher whether the child was truly vulnerable or if the parent perceived an otherwise healthy child as being vulnerable. A solution would be to design a longitudinal study with repeated PPCV measures, motor tests, and a second party rating of vulnerability based on observational data and medical history for both full term and preterm children. The practical implication is that further research examining the link between vulnerability and motor scores is worth pursuing in order to determine if perceptions of vulnerability predict a decrease in motor functioning. It would be worthwhile to evaluate at different stages of development if a parent of an objectively rated healthy child who maintains increased perceptions of vulnerability limits their child's motor activities. For example, prior to age two, how much time does that child spend being held or in a playpen compared to children of parents low in perceptions of vulnerability? As the child develops, would these parents high in PPCV take longer to transfer feeding and dressing responsibilities to the child compared to parents low in PPCV?

There may be several reasons that there was a lack of significance between verbal fluency measures with either of the parent questionnaires. The fluency tests used in this study have been proposed as tests of executive functioning (Hurks et. al., 2006, Sauzéon et. al., 2004). These tests require the ability to inhibit rule violations and automatic thoughts (Martins, et. al., 2007). It is possible children with parents high in PPCV who are unable to set consistent boundaries may be at a disadvantage for learning self-regulatory skills, such as inhibition of undesired responses. However an inability to inhibit in that case may be more salient using a behavioral assessment rather than a cognitive assessment. Also, maybe PPCV and POP are more likely to be associated with a natural fluency measure like verbosity and mean length of utterance. It has been suggested that parental overprotection and perceptions of vulnerability may be related to impairments in a child's language development (Field, 1979), however to date there is no evidence of such a relationship. Lastly, perhaps there was simply no connection between fluency and PPCV or POP.

It is important to point out that the study was subject to several constraints that may have influenced the results. Participants chose to take part in the study for many reasons. It is unclear what percentage of parents were motivated by anxious concern for their child's development as opposed to curiosity about their child's level of intelligence. Until more is understood about the motivating factors behind participation, it is difficult to conclude whether this sample is representative of a larger population. Also, the small preterm sample size weakens the power of the gestational age group comparisons used in the study.

In conclusion, the results from this study deserve closer inspection and further research. The significant associations between parent perceptions of vulnerability and child performance on motor tasks for the entire sample indicate that there is a component of PPCV that relates to motor functioning independent of birth status.

APPENDIX A

Descriptive Statistics for Verbal Fluency and Motor Tests by Gestational Week Group

	< 33 weeks		≥ 37 weeks		< 33 weeks		≥ 37 weeks			
	Mean ± SD	Mean T-score to %ile	Mean ± SD	Mean T-score to %ile	Range of Scores	Range of T-scores to %iles	Range of Scores	Range of T-score to %iles	T score	p
Beery VMI	91.20 ± 11.59	27%	104.26 ± 14.99	61%	75-113	5% - 81%	73-138	4% - 99%	3.54	.001
Purdue DH, T-scores	34.39 ± 11.80	6%	44.67 ± 10.67	30%	6.87-54.29	<.01% - 67%	16.69-76.94	0.1% - 99.5%	3.61	.001
Purdue NDH, T-scores	34.98 ± 9.15	7%	48.21 ± 11.48	45%	21.97-53.84	.2% - 64%	22.17-74.80	.2% - 99%	4.66	>.001
Purdue BH, T-scores	38.77 ±11.71	13%	50.91 ± 9.37	53%	15.35-60.07	<.01% - 84%	28.43-73.76	2% - 99%	4.66	>.001
Purdue Error	6.05 ± 4.38	-	2.67 ± 2.82	-	1-15	-	0-15	-	3.96	>.001
FAS, T-scores	51.65 ± 12.18	54%	64.68 ± 13.09	93%	31.90-69.30	4% - 97%	38.9-95.1	13% - > 99.99%	3.90	>.001
Animal Fluency, T-scores	40.88 ± 18.07	18%	55.90 ± 19.40	73%	9.40-71.90	<.01% - 98%	21.9-96.9	.2% - > 99.99%	3.03	.003
Total Motor, aggregate of T-scores	199.33 ± 32.71	-	248.05 ± 35.48	-	134.65-267.27	-	175.23 - 335.19	-	5.39	>.001

APPENDIX B

Correlation Values for Parent Measures with Tests of Verbal Fluency and Motor Skills by Gestational Week Group.

	< 33 weeks (n = 20)	≥ 37 weeks (n = 57)
PPCV & Beery VMI	r = .14, p = .561	r = .17, p = .196
PPCV & Purdue DH	r = .38, p = .096	r = .12, p = .364
PPCV & Purdue NDH	r = .00, p = .999	r = .06, p = .686
PPCV & Purdue BH	r = -.13, p = .595	r = .11, p = .416
PPCV & Purdue Error	r = -.18, p = .457	r = .02, p = .870
PPCV & FAS	r = -.29, p = .221	r = .17, p = .201
PPCV & Animal Fluency	r = .18, p = .440	r = .06, p = .641
PPCV & Total Motor	r = .13, p = .585	r = .13, p = .345
POP & Beery VMI	r = .43, p = .058	r = -.06, p = .651
POP & Purdue DH	r = -.18, p = .446	r = .03, p = .799
POP & Purdue NDH	r = -.29, p = .214	r = -.09, p = .485
POP & Purdue BH	r = .01 p = .982	r = -.16, p = .233
POP & Purdue Error	r = .30, p = .194	r = -.08, p = .548
POP & FAS	r = .33, p = .150	r = -.10, p = .454

POP & Animal Fluency	r = -.35, p = .132	r = .14, p = .307
POP & Total Motor	r = .01, p = .973	r = -.09, p = .513
POP Supervision & Beery VMI	r = .40, p = .077	r = -.10, p = .465
POP Supervision & Purdue DH	r = -.01, .p = .976	r = .03, p = .821
POP Supervision & Purdue NDH	r = -28, p = .237	r = -.14, p = .297
POP Supervision & Purdue BH	r = .12, p = .626	r = -.20, p =.130
POP Supervision & Purdue Error	r = .38, p = .104	r = -.01, p = .920
POP Supervision & FAS	r = .23, p = .320	r = -.15, p = .269
POP Supervision & Animal Fluency	r = -.24, p = .299	r = .14, p = .300
POP Supervision & Total Motor	r = .11, p = .660	r = -.13, p = .329
POP Separation & Beery VMI	r = .07, p = .775	r = .11, p = .431
POP Separation & Purdue DH	r = -.39, p = .094	r = -.08, p = .570
POP Separation & Purdue NDH	r = -.19 p = .432	r = -.06, p = .673
POP Separation & Purdue BH	r = -.13, p = .582	r = -.12, p = .378
POP Separation & Purdue Error	r = .30, p = .200	r = -.09, p = .492

POP Separation & FAS	r = .04, p = .882	r = -.07, p = .611
POP Separation & Animal Fluency	r = -.37, p = .108	r = .07, p = .612
POP Separation & Total Motor	r = -.21, p = .366	r = -.03, p = .836
POP Control & Beery VMI	r = .51, p = .023*	r = .04, p = .772
POP Control & Purdue DH	r = -.02, p = .933	r = .09, p = .500
POP Control & Purdue NDH	r = -.26, p = .270	r = -.07, p = .589
POP Control & Purdue BH	r = .01, p = .977	r = -.01, p = .968
POP Control & Purdue Error	r = .25, p = .292	r = -.03, p = .819
POP Control & FAS	r = .49, p = .028*	r = .13, p = .324
POP Control & Animal Fluency	r = -.22, p = .353	r = .05, p = .724
POP Control & Total Motor	r = .01, p = .982	r = .03, p = .835
POP Dependency & Beery VMI	r = -.09, p = .695	r = -.21, p = .114
POP Dependency & Purdue DH	r = -.32, p = .175	r = -.17, p = .218
POP Dependency & Purdue NDH	r = -.09, p = .705	r = -.11, p = .406
POP Dependency & Purdue BH	r = -.32, p = .164	r = -.11, p = .432

POP Dependency & Purdue Error	r = .38, p = .094	r = -.20, p = .136
POP Dependency & FAS	r = -.20, p = .387	r = -.15, p = .252
POP Dependency & Animal Fluency	r = -.40, p = .080	r = .08, p = .547
POP Dependency & Total Motor	r = -.29, p = .218	r = -.20, p = .129

* significant at $p < .05$

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