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The Relation of Socioeconomic Status and Parent Education on the Vocabulary and Language Skills of Children who do and do not Stutter

Corrin G. Richels[1],
Old Dominion University, Norfolk, VA

Kia N. Johnson[2],
James Madison University, Harrisonburg, VA

Tedra A. Walden[3], and
Vanderbilt University, Nashville, TN

Edward G. Conture[4]
Vanderbilt University, Nashville, TN

Abstract

Purpose—The purpose of this project was to investigate the possible relation between standardized measures of vocabulary/language, mother and father education, and a composite measure of socioeconomic status (SES) for children who do not stutter (CWNS) and children who stutter (CWS).

Methods—Participants were 138 CWNS and 159 CWS between the ages of 2;6 and 6;3 and their families. The Hollingshead Four Factor Index of Social Position (i.e., Family SES) was used to calculate SES based on a composite score consisting of weighted values for paternal and maternal education and occupation. Statistical regression analyses were conducted to investigate the relation between parental education and language and vocabulary scores for both the CWNS and CWS. Correlations were calculated between parent education, Family SES, and stuttering severity (e.g., SSI-3 score, % words stuttered).

Results—Results indicated that maternal education contributed the greatest amount of variance in vocabulary and language scores for the CWNS and for participants from both groups whose Family SES was in the lowest quartile of the distribution. However, paternal education generally contributed the greatest amount of variance in vocabulary and language scores for the CWS. Higher levels of maternal education were associated with more severe stuttering in the CWS.

[1]Corresponding Author: Corrin G. Richels, Child Study Center, Old Dominion University, 4500 Hampton Blvd., Norfolk, VA 23529, Phone: 757-683-5084, crichels@odu.edu.
[2]Kia N. Johnson, Department of Communication Sciences and Disorders, James Madison University, HHS 1128, MSC 4304, Harrisonburg, VA 22807, Phone: 540-568-6440, Email: johns3kn@jmu.edu
[3]Tedra A. Walden, Department of Psychology, And Human Development, Vanderbilt University, Peabody 512, 230 Appleton Place, Nashville, TN 37203, Phone: 615-322-8141, Email: tedra.a.walden@vanderbilt.edu
[4]Edward G. Conture, Dept. Hearing and Speech Sciences, Vanderbilt University, 1215 21st Avenue South, Rm 8310, Nashville, TN 37232, Phone: 615-936-5100, edward.g.conture@vanderbilt.edu

Conclusion—Results are generally consistent with existing literature on normal language development that indicates maternal education is a robust predictor of the vocabulary and language skills of preschool children. Thus, both father and mothers' education may impact the association between vocabulary/language skills and childhood stuttering, leading investigators who empirically study this association to possibly re-assess their participant selection (e.g., a priori control of parental education) and/or data analyses (e.g., post hoc covariation of parental education).

Keywords

preschool stuttering; socioeconomic status; vocabulary; language; parent education

1. Introduction

Treatment for preschool-age children who stutter often involves training parents to change their behavior in order to facilitate their child's fluency (e.g., Botterill & Kelman, 2010; Gottwald, 2010; Harrison & Onslow, 2010; Richels & Conture, 2007). The primary focus of parent training ranges from training parent(s) to implement treatment (Harrison & Onslow, 2010) to having a forum to interact with other parents of children who stutter (CWS) and learn fluency- enhancing strategies (Richels & Conture, 2007). Of course, there are many factors that both parents and clients bring to the therapy process. One such factor is the socioeconomic status (SES) of the child's family and his/her parents' level of education, a factor that has heretofore received little empirical attention with regard to preschool-age CWS

In the areas of cognition and language, empirical studies have reported significant differences between economically-disadvantaged children and their more advantaged counterparts (e.g., Hoff & Tian, 2005; Feldman et al., 2003; NICHHD, 2000; Pan, Rowe, Singer, & Snow, 2005; Petrill, Pike, Price, & Plomin, 2004; Rescorla & Achenbach, 2002). For example, language development appears to develop at a faster rate for children with high SES, a difference which is most apparent at two years of age (Hoff & Tian, 2005). Recently, Qi, Kaiser, Milan, and Hancock (2006) empirically assessed the validity of the Preschool Language Scale-3 (Zimmerman, Steiner, & Pond, 1992) in an impoverished population and reported that this measure identified significantly more children from the low-SES group as having a delay in language skills. This disproportionate identification of language-delayed children in low SES families, it has been speculated, may be associated with specific properties of language experience provided within the home environment (Hoff, 2003). If differences in SES are associated with differences in language experience within the home environment, such differences may also impact the quantity and/or quality of associated disorders of speech-language, in this case stuttering.

Empirical study of SES, however, does not suggest that SES is the sole, only, or most salient construct associated with childhood stuttering. Specifically, several models suggest that genetics as well as home environment represent salient distal factors associated with childhood stuttering (for further discussion, see Adams, 1993; Conture, Walden, Arnold, Graham, Karrass, & Hartfield, 2006; Yairi, 1997). Indeed, converging evidence from several empirical studies indicates a clear genetic component associated with the onset of stuttering and its persistence for some children, as described recently by Kraft and Yairi (2012). Putting aside, for the purpose of the present study, the potential three-way relation between genetics, SES, and childhood stuttering for preschool-age CWS, the present writers attempted to assess whether SES, and parent education (one apparently salient environmental factor) are associated, in unique ways, to the language skills and stuttering frequency/severity in preschool-age CWS and their CWNS peers. If such associations

between SES and childhood stuttering are found, subsequent empirical studies from a genetic perspective may be helpful in further determining whether this association is better explained by the relation SES and childhood stuttering each has to genetic processes.

As mentioned above, modifying aspects of the child's environment in terms of parent interaction with the child who stutters is one treatment target common to many forms of interventions with preschool-age CWS (Botterill & Kelman, 2010; Gottwald, 2010; Harrison & Onslow, 2010; Richels & Conture, 2007). However, it is not always entirely clear from extant empirical findings which parent, parents, or other caregiver(s) is primarily responsible for implementing strategies associated with parental attempts to alter theirchild's communicative environment. One commonly reported means for indexing the impact of children's environment on their development of speech, language, and cognition has been the quantity and quality of input given by the mothers of the children rather than the father (e.g., Dollaghan et al., 1999; Hoff, 2003; Huttenlocher, Vasilyeva, Waterfall, & Vevea, 2007; Qi, Kaiser, Milan, & Hancock, 2006). Although this traditional view of parenting views mothers as the primary caregivers of young children, it is quite possible that fathers also provide a unique contribution to their child's vocabulary, language development (Pancsofar & Vernon-Feagans, 2006; 2010) as well as to the outcomes of parent-directed fluency treatments.

Indeed, Cabrera, Tamis-LeMonda, Bradley, Hofferth, and Lamb (2000) suggest that constantly changing societal demographics require a shift in how researchers and clinicians view families and the role of both parents in their child's development. Specifically, empirical evidence supports the assertion that fathers offer a unique source of stimulation to their infants and young children and, in some respects, father's speech serves different developmental needs (McLaughlin, White, McDevitt, & Raskin, 1983; Rutherford & Przednowek, 2012). Additionally, Tamis-LeMonda, Shannon, Cabrera, and Lamb (2004) state that father's engagement directly affects children's linguistic, literacy, and cognitive abilities and that fathers' demographic characteristics (e.g., years of education, income) might indirectly influence children's outcomes on these variables. Despite what we know about the impact of SES of the mother and father and their implication in the development of language and vocabulary skills in children, results of research studies usually focus on one parent rather then the role of both parents (Elardo, Bradley, & Caldwell, 1977; Hart & Risley, 1992; Price & Hatano, 1991). Perhaps, by assessing the association of both parents' SES (i.e., education and occupation) to their children's speech-language skills, we may be able to more comprehensively assess between-group differences between preschool-age CWS and their CWNS peers as well as within-group associations between CWS's stuttering frequency/severity and parental SES. Unfortunately, to date, measurement of SES is not always reported in empirical studies of preschool-age children who stutter.

1.1 Measurement of SES

Social economic status (SES) is often determined by asking families to report levels of education and to select income brackets (Hoff, 2003; Huttenlocher et al., 2007). Alternatively, Entswisle and Astone (1994, p. 1526) suggested a shift from classifying family SES by using father's education and income to using mother's education as the measure of "human capital" in the home. Socioeconomic status can also be determined by a) whether or not the family receives public assistance (Pan, Rowe, Singer, & Snow, 2005); b) maternal education, marital status, and number of children in the home (Morgenstern, 1956; Qi, Kaiser, Milan, & Hancock, 2006), c) a 9-step-scale of occupation (Rescorla & Achenbach, 2002); d) participants zipcodes (Reilly et al., 2009) or e) a composite measure called Hollingshead's Four Factor Index (1975; Bornstein & Haynes, 1998). Although each measure has pros and cons, one of the more comprehensive indexes of family SES, is the composite Hollingshead Four Factor Index (Hollingshead, 1975).

1.2 Impact of socioeconomic status on language development

As suggested above, SES has often been implicated as a significant factor in altering the rate of language development in young children (Elardo, Bradley, & Caldwell, 1977; Farran & Haskins, 1980; Hart & Risley, 1992). Farran and Haskins (1980) employed a direct observation method to study the interactions of 3-year-olds in 51 mother-child dyads during a 20-minute free-play activity in a laboratory setting; they hypothesized dyad-specific effects between the mothers and their children based on differences in SES. These researchers reported that the quality of mother-child interactions was not fundamentally different, but the length of mutual play was more than twice as long for the middle-income rather than the low-income dyads. This difference was attributed to affluent families having more resources that permit parents playing with their child(ren) than families with fewer resources. The amount of time mothers spend engaging in child-centered activities may contribute to more opportunities for adult modeling of vocabulary and language (Gottfried, 1984 as cited by Hart & Risley, 1992).

Likewise, in a longitudinal study of 40 American families distributed across SES levels, Hart and Risley (1992) observed hour-long parent-child interactions monthly for 27-months, beginning when the children were on average 9 months old, encompassing the time before and after children learned to talk. Thus, whether cross-sectional or longitudinally reported, findings consistently suggest that families with higher SES, when compared to families of lower SES, spent more time talking with their children, using prosocial parenting practices, and showing an active interest in what their children were doing (Farran & Haskins, 1980; Hoff, 2003, 2006; Pungello, Iruka, Dotterer, Mills-Koonce, & Reznick, 2009). At the least, these findings suggest that the quantity of “talking time” between parent and child is impacted by family SES.

Relatedly, results of Elardo, Bradley, and Caldwell’s (1977) longitudinal study of 74 children in an urban area indicated that certain linguistic abilities are more related to environmental factors than others. For example, Auditory Association (Illinois Test of Psycholinguistic Abilities ; Kirk, McCarthy & Kirk, 1968) is moderately correlated (R = 0.62) with the provision of play materials and a child’s opportunity for variety in daily routine (R = 0.64). At present, however, it is unclear whether such environmental factors in the homes of preschool-age CWS may be associated with differences in their language development. Results of empirical studies and meta-analytical reviews do indicate, however, that the language abilities of CWS differ from their non-stuttering peers on various parameters, (Anderson, 2008; Anderson & Conture, 2000, 2004; Anderson, Pellowski, & Conture, 2005; Anderson, Pellowski, Conture & Kelly, 2003; Byrd, Conture, & Ohde, 2006; Coulter, Anderson, & Conture, 2009; Nippold, 2012; Ntourou, Conture & Lipsey, 2011). Whether these differences are moderated, mediated or merely correlated with environmental factors through a third-order variable (e.g., differences in language differences are correlated with SES because both are related to gender) remains an open empirical question.

1.3 Stuttering and SES

Recently, some empirical studies of preschool-age CWS have begun including descriptions of participants’ SES, as well as racial/ethnic characteristics when reporting language-related findings (e.g., Anderson, Pellowski, & Conture, 2005; Anderson, Pellowski, Conture, & Kelly, 2003; Byrd, Conture, & Ohde, 2006; Johnson, Karrass, Conture, & Walden, 2009; Yairi, Ambrose, Paden, & Throneburg, 1996). Although such specification may chiefly reflect attempts to comprehensively describe participants’ characteristics, some findings suggest that these variables are crucial to consider, especially in the study of CWS and linguistic skills (Nippold, 1990, 2001, 2012). Previous research on the association of SES and stuttering focused on the prevalence of stuttering in college students (Culton, 1986;

Morley, 1952; Schuell, 1946; Sheehan & Martyn, 1970; Porfert & Rosenfeld, 1978), population density (Brady & Hall, 1976; Louttit & Halls, 1936), the onset of stuttering prior to the age of 3 (Reilly et al., 2009), and parental occupation (Morgenstern, 1956). For the purposes of the present study, we will focus on the studies reporting on the association of early childhood stuttering and parental occupation.

Morgenstern (1956) used results of the Mental Survey in Scotland to investigate the prevalence of stuttering in 7,000 11-year-old children born on the first three days of each month in 1936. Morgenstern's (1956) findings suggest that the prevalence of CWS was greater in SES brackets in which families had a better likelihood of being able to improve their financial situations. Morgenstern hypothesized that the parents of the CWS put more pressure on academic and language skills in an effort to ensure that their children would have the best possible chance of improving their social situation.

Reilly and colleagues (2009) investigated the onset of stuttering in a community-ascertained cohort of 1,619 2-year-old Australian children recruited at 8 months of age as part of a larger study on the development of early language. Mother's education level was the primary variable of interest, however SES was measured using the Socio-economic Indexes for Areas (SEIFA), which is an index of relative disadvantage based on participants' zip codes. Results indicated that the children in the stuttering group had higher proportions of boys, twins, and mothers with a degree or postgraduate qualification. This study did not include father's education as a variable.

Thus, it was the purpose of the present study to empirically assess whether family SES, maternal, and/or paternal education make unique contributions to the performance of CWS and CWNS on norm-referenced tests of vocabulary (i.e., receptive and expressive), and overall language. Furthermore, for the CWS the relation between family SES, maternal education, and paternal education on measures of their speech fluency was examined. Specifically, the present study addressed three separate but inter-related issues, with each issue associated with a testable hypothesis.

First, the present study addressed the issue of whether family/parental variable(s) (i.e., family SES, maternal education, or paternal education) were associated with children's performance on tests of language and vocabulary. Specifically, we attempted to determine whether the above family/parental variables contributed to variance on children's performance on three standardized tests of vocabulary and language (Expressive Vocabulary Test (EVT; Williams, 1997, 2007), Peabody Picture Vocabulary Test (PPVT; version III or 4, Dunn & Dunn, 1997, 2007), and the Test of Early Language Development (TELD-version 2 or 3; Hresko, Reid, & Hammill, 1991, 1999), It was hypothesized that maternal education would contribute the majority of the variance for both groups (e.g., CWS, CWNS).

Second, the study addressed the issue of whether the contribution of aforementioned variables differed for participants at the highest and lowest SES levels for this sample. Specifically, we attempted to determine whether the variance in performance on the vocabulary and language measures (e.g., EVT, PPVT, TELD) and family/parental variables were consistent for participants whose family SES were in the lowest quartile (e.g., less than 25^{th}) and for participants whose family SES were in the highest quartile (e.g., greater than 75^{th}). It was hypothesized that maternal education would account for the majority of the variance in performance on the vocabulary and language measures for the highest SES group for both CWS and CWNS.

The third issue involved whether these variables were associated with measures of CWS's fluency. We attempted to determine whether family SES, maternal education, and paternal

education were related to CWS's scores on the SSI-3, percent of stuttered disfluencies (SD), and the proportion of stuttered per total disfluencies. It was hypothesized that parent education (e.g., both maternal and paternal education) may contribute to disfluency variables.

2. Methods

2.1 Participants

2.1.1 Gender and Age—Participants included 297 preschool-age children (CWNS *n*=138; CWS n=159) children between the ages of 2-years-6-months and 6-years-3-months. The mean age for the CWNS was 51.47 months (*SD* = 10.54) and the mean age for the CWS was 49.53 months (*SD* = 10.32). There were no significant between-group differences in chronological age as indicated in Results, Section 3.1.

Ratios of male to female participants in the present study were consistent with the ratios typically seen in the two populations being studied (i.e., CWNS ratio 1.2:1 males *n* = 77 to females *n* = 61, CWS ratio 3:1 males *n* = 119 to females *n* = 40). In order to insure that gender of the child and parent education were not related, correlation coefficients were calculated for each talker group (e.g., CWS and CWNS) and parent education score (e.g., father's and mother's) as well as Family SES. Using the Bonferroni approach to control for Type I error across the 6 correlations (i.e., 2 groups X 3 measures), a *p* value of less than . 008 was required for significance. Results for the preschool-age CWNS and their CWS peers indicated no significant correlations between *gender* and father's education score (CWNS $r(129) = -.006$, $p = .947$; CWS $r(154) = -.039$, $p = .630$), mother's education score (CWNS $r(137) = .151$, $p = .078$; CWS $r(157) = .004$, $p = .963$), and Family SES (CWNS $r(129) = .013$, $p = .879$; CWS $r(159) = .022$, $p = .779$). These results are consistent with Hart & Risley's (1992) data that reported no correlation between child gender, SES, IQ, or any of the measures of parenting employed in their study. Given present findings, and similar findings of others, no other correction for gender in the present analyses.

2.2 Explanation of the procedures

All participants were part of an ongoing series of empirical studies through Vanderbilt University's Developmental Stuttering Project (DSP) examining the relation between speech-language processes, emotional variables, and developmental stuttering in preschool-age children (e.g., Arnold, Conture, Key & Walden, 2011; Choi, Conture, Walden, Lambert, & Tumanova, in press; Karrass et al., 2006; Richels, Buhr, Conture, & Ntourou, 2010; Walden, Frankel, Buhr, Johnson, Conture & Karrass, 2012).

2.2.1 Description of the data source—The sample used for the present study was obtained at the first of two on-campus visits. During the first visit, the child participated in non-experimental research activities (e.g., standardized testing, language sampling). All participants were paid volunteers referred to the Vanderbilt Bill Wilkerson Center by their parents, speech-language pathologists, daycare, preschool, school personnel or other health-care providers. No child had previously received or was receiving formal intervention for stuttering or any other communication disorder. In addition, participants had no known or reported hearing, neurological, developmental, academic, intellectual, or emotional problems. Parents completed a detailed developmental questionnaire where there were multiple opportunities for parents to report any developmental anomalies. Additionally, parents were interviewed by either a Ph.D. level developmental psychologist or speech-language pathologist in order to clarify any discrepancies in developmental milestones being reported or observed. This study's protocol was approved by the Institutional Review Board of Vanderbilt University, Nashville, Tennessee. For each participant, parents signed an

informed consent, and their children assented to participation in the study. The parent interview was conducted by a member of the research team and included questions regarding the occupation and highest level of education obtained for both the father and mother of the participating child.

2.2.2 Vocabulary and Language Measures—While the parent was interviewed, the participating child was administered speech-language measures including: Expressive Vocabulary Test (Williams, 1997, 2007), Peabody Picture Vocabulary Test (version III or IV, Dunn & Dunn, 1997, 2007), and the Test of Early Language Development (TELD-version 2 or 3; Hresko, Reid, & Hammill, 1991, 1999), to measure expressive and receptive vocabulary and language, respectively. Speech-language measures provided descriptive information about participants and helped screen for comorbid speech-language problems so that findings would not be confounded by clinically significant speech-language deficits other than stuttering.

2.2.3 Hearing screening—All participants passed a pure tone hearing screening conducted in accordance with ASHA guidelines.

2.2.4 Classifying participants as children who stutter (CWS)—All participants participated in a parent-child interaction to permit analysis of disfluencies/stutterings (e.g., Logan & Conture, 1997) for determination of talker group (e.g., CWNS or CWS). A child was considered to stutter if he or she (a) exhibited three or more stuttered disfluencies (i.e., sound/syllable repetitions, monosyllabic whole-word repetitions, or sound prolongations) per 100 words of conversational speech (based on the first 300 words of the conversational sample; Conture, 2001) and (b) received a total score of 11 or above (a severity equivalent of at least “mild” for preschool-age children) on the *Stuttering Severity Instrument-3* (SSI-3; Riley, 1994). Disfluency counts were obtained at the time the sample was recorded.

The mean SSI-3 score for the CWS was 18, which corresponds to a severity rating of “moderate” (*SD* = 6.06). For the CWNS, the mean score was 6 (*SD* = 3.04), which corresponds to a severity rating of “very mild” or subclinical. Stuttering frequency was calculated using data obtained during a 300-word conversational sample (described above). Stuttering frequency was 9.22% (*SD* = 5.62) words stuttered for CWS and 1.82% (*SD* = 1.74) for CWNS.

2.3 Measures

2.3.1 Socio-economic status (SES) of the family—Socio-economic status was determined from parent report of paternal and maternal occupation and level of education using the 4-factor index of social position (termed Family SES for this paper; Hollingshead, 1975). This index provides scores on a continuum (i.e., 8 to 66) with 8 indicating the lowest possible level of occupational status (e.g., dishwashers) and education (less than 7th grade) and 66 indicating the highest level of occupational status (e.g., aeronautical engineer) and educational level (graduate education).

2.3.1.1 Occupation: Hollingshead (1975) used occupational titles assigned by the United States Census as the basis for delineating occupational status. The list was then divided into nine scores. Occupation scores range from a scale score of 1 for a person who is employed as a menial service worker or farm laborer to a scale score of 9 for higher executives and major professionals (See Table 1 for a more detailed description of the scores for occupation and education).

2.3.1.2 Education: Education scores range from a scale score of 1 for a person who has achieved less than a 7th grade education to a scale score of 7 for an individual who has graduate level professional training (See Table 1 for a more detailed description of the scores for occupation and education).

2.3.1.3 Four Factor Index (Family SES): The Family SES is a weighted score that is calculated by multiplying the scale score for occupation by a weight of five and the scale score for education by a weight of three (Hollingshead, 1975). Using this formula, the Family SES for a single-parent home where the mother is an accountant (occupational scale score 8) with a bachelors degree (education scale score 6) would be: (8 x 5) + (6 x 3) = 58.

The marital status of the family is not specifically asked during intake. In the cases where occupation and education are designated for parents, the education and occupation of each parent was used to estimate the Family SES. Two factors (weighted occupation score + weighted education score) for each parent are averaged to yield the Family SES. For example, employing this formula, for a family who reports maternal occupation as a dietician (occupational scale score 6), paternal occupation as an aeronautical engineer (occupational scale score 9), maternal education as a masters degree (educational scale score 7), and paternal education as a doctoral degree (educational score 7) would result in a 2-factor score for the mother of (6 x 5) + (7 x 3) = 51, and a 2-factor score for the father of (9 x 5) + (7 x 3) = 66. Therefore, the Family SES would be the average of the two 2-factor scores, or (51 + 66)/2 = 58.5, rounded up to 59.

Consistent with Hollingshead's (1975) descriptions for pre-analysis data preparation, the following procedures were employed to deal with situations where (1) only one parent was head of household and (2) one parent was reported not to be employed outside the home. In cases where the occupation and education are designated for just one of the parents (e.g., mother only, father only), the Family SES is based on the occupational and educational data of the reported parent. For the CWNS group (N = 138), 9 participants (6.5% of the total sample) reported mother's occupation and education only and 1 participant (0.72% of the total sample) reported father's occupation and education only. In the CWS group (N = 159), 5 participants (3.1% of the total sample) reported mother's education only and 2 participants (1.25% of the total sample) reported father's education only.

For the present study, in cases in which a parent was not employed outside the home, the Family SES was based on the employed parent's occupational and educational scores. For the CWNS group, 57 participants (41.3% of the total sample) reported that mothers were not employed outside the home. In the CWS group, 59 participants (37.1% of the total sample) reported that mothers were not employed outside the home. Even though these parents were not employed outside the home, their education scores were used in the data analyses related to the education variables.

2.4 Analysis techniques

A Multivariate Analysis of Variance (MANOVA) was done to determine whether there were between talker group differences (CWNS vs. CWS) on the dependent measures of age (in months), paternal education, maternal education, Family SES, PPVT, EVT, and TELD-Spoken Language Quotient (SLQ; See Table 2 for means and standard deviations). Statistical multiple regression analyses were performed using forward selection with the probability of F-to-enter <= .05. That is, in each step, SPSS entered the one predictor variable that would produce the largest increase in R^2. When the probability of the F ratio for the R^2 increased due to the additional variables fell below .05, no further variables were added to the model. This procedure was performed to evaluate how well standard scores on the PPVT, EVT, and TELD-SLQ could be predicted from maternal education, paternal

education, and Family SES. Each independent variable (maternal education, paternal education, Family SES) had an equal chance of being entered into the equation first. However, only variables that contributed the greatest amount of variance to the dependent variable (PPVT, EVT, or TELD-SLQ) were entered into the equation.

These analyses were repeated with further division within each talker group (CWNS and CWS) by SES quartile (<25th Quartile vs. >75th Quartile). A bivariate correlation for CWS determined if parent education (e.g., maternal and paternal education) and Family SES were related to measures of stuttering: (1) the overall SSI-3 score, the percent stuttered disfluencies (SD), and proportion of SD to total disfluencies in a 300-word spontaneous language sample.

2.5 Measurement Reliability

As part of data processing, information was checked for reliability of coding of maternal education and occupation, and paternal education and occupation. The entered data for 81 CWS and 81 CWNS (54% of total data) was checked by the first author for agreement of coding. For maternal education, agreement was 97% with kappa = .88. For maternal occupation, agreement was 94% with kappa = .84. For paternal education, agreement was 98% with kappa = .90. For paternal occupation, agreement was 94% with kappa = .88.

3.0 Results

3.1 Between talker group measures

A MANOVA was calculated to determine the effect of talker group membership (CWS vs. CWNS) on the dependent variables of age in months, maternal education score, paternal education score, Family SES, and PPVT, EVT, TELD-SLQ. Levene's test of equality of error variances was non-significant, indicating that the error variances of the dependent variables are equal across groups. Therefore, MANOVA results could be interpreted. There was no overall effect of talker group, Wilks' Lambda = .961, $F(7,272) = 1.58$, $p = .142$, $\eta^2 = .039$, indicating no need for statistical corrections due to pre-existing group differences, that is, differences in chronological age, standardized speech-language testing, etc.

3.2 Regression Analyses by Talker Group

3.2.1 Regression Analyses for Preschool- age CWNS—For the CWNS, only maternal education was a significant contributor (p values ranging from $p < .001$ to $p < .007$) to the variance in scores on the PPVT, EVT, and TELD-SLQ. Paternal education and Family SES were not significant contributors to the variance of these language and vocabulary scores.

3.2.1.1 PPVT for CWNS: For CWNS, the correlation between standard scores on the PPVT and maternal education was statistically significant, $r(126) = .271$, $p < .002$. The R^2 for this equation was .073, that is, 7.3% of the variance in PPVT scores was predictable from maternal education. Therefore, the strength of maternal education predicting CWNS's PPVT scores was weak-moderate (Cohen, 1988) and positive, indicating that as maternal education increased so did children's scores on the PPVT.

3.2.1.2 EVT for CWNS: The correlation between standard scores on the EVT and maternal education was statistically significant, $r(126) = .310$, $p < .001$. The R^2 for this equation was .096, that is, 9.6 % of the variance in EVT scores was predictable from maternal education. Therefore, the strength of maternal education predicting scores was moderate and positive, indicating that increases in maternal education were associated with increases with children's EVT scores on the EVT.

3.2.1.3 TELD – SLQ *for CWNS*: The correlation between standard scores on the TELD-SLQ and maternal education was statistically significant, $r(126) = .238$, $p < .007$. The R^2 for this equation was .057, that is, 5.7% of the variance in TELD-SLQ scores was predictable from maternal education. Therefore, the strength of maternal education predicting scores was weak to moderate and positive, indicating that as maternal education increased so did children's scores on the TELD-SLQ.

3.2.2 Regression Analyses for preschool-age CWS—For the CWS, only paternal education was a significant contributor to the variance in scores on the PPVT, EVT, and TELD-SLQ. Maternal education and Family SES were not significant contributors to the variance of these scores.

3.2.2.1 PPVT for preschool-age CWS: The correlation between standard scores on the PPVT and paternal education was statistically significant, $r(150) = .201$, $p < .013$. The R^2 for this equation was .040, that is, 4.0 % of the variance in PPVT scores was predictable from paternal education. Therefore, the strength of paternal education predicting scores was weak and positive, indicating that as paternal education increased so did children's scores on the PPVT.

3.2.2.2 EVT for preschool-age CWS: The correlation between standard scores on the EVT and paternal education was statistically significant, $r(150) = .240$, $p < .003$. The R^2 for this equation was .057, that is, 5.7 % of the variance in EVT scores was predictable from paternal education. Therefore, the strength of paternal education predicting scores was weak to moderate and positive, indicating that as paternal education increased so did children's scores on the EVT.

3.2.2.3 TELD – SLQ *for CWS*: The correlation between standard scores on the TELD-SLQ and paternal education was statistically significant, $r(150) = .221$, $p < .006$. The R^2 for this equation was .057, that is, 5.7% of the variance in TELD-SLQ scores was predictable from paternal education. Therefore, the strength of paternal education predicting scores was weak and positive, indicating that as paternal education increased so did children's scores on the TELD-SLQ.

3.3 Effect of low and high SES on the relation of parental education to PPVT, EVT, and TELD-SLQ Standard Scores for preschool-age CWNS and CWS

Previous research indicates that there are significant differences in cognitive and language skills between economically disadvantaged children and their more economically advantaged counterparts (Hoff & Tian, 2005; Feldman et al., 2003; NICHHD, 2000; Pan, Rowe, Singer, & Snow, 2005; Petrill, Pike, Price, & Plomin, 2004; Rescorla & Achenbach, 2002). These differences suggest that low versus high stratification may be necessary to investigate in studies of SES. The distribution of Family SES scores for each talker group was relatively normally distributed. To investigate this potential influence of SES on language and vocabulary development in CWNS and CWS, the entire distribution of Family SES scores was stratified into quartiles. Following this division, data below the 25^{th} percentile (low SES) and that above the 75^{th} percentile were analyzed using the same procedures as above.

3.3.1 Between- group measures for SES quartiles—A MANOVA was calculated to determine if there were any significant differences between the talker groups (CWS vs. CWNS) and SES quartile ($<25^{th}$ vs. $>75^{th}$) for the dependent variables of maternal education score, paternal education score, Family SES, and PPVT, EVT, TELD-SLQ. See Table 3 for means and standard deviations by talker groups and SES quartile for the independent and

dependent variables. Levine's test of equality of error variances was non-significant, indicating that the error variances of the dependent variables are equal across groups. Therefore, MANOVA results could be interpreted. There was no main effect of talker group, Wilks' Lambda = .979, $F(3,289) = 2.05$, $p = .107$, $\eta^2 = .021$, no main effect for SES quartile Wilks' Lambda = .988, $F(6,578) = .584$, $p = .743$, $\eta^2 = .006$, and no significant interaction between talker group and SES quartile, Wilks' Lambda = .986, $F(6,578) = .678$, $p = .668$, $\eta^2 = .007$, indicating no need for statistical corrections due to pre-existing group differences.

3.3.2 Regression Analyses for CWNS by SES quartile

3.3.2.1 Regression Analyses for CWNS by < 25th quartile: For the CWNS in the lowest (< 25th) quartile, none of the independent variables (paternal education, maternal education, and Family SES) contributed significant variance for scores on either the PPVT or TELD-SLQ. However, maternal education was the significant contributor ($p = .020$) to the variance in scores on the EVT. Paternal education and Family SES did not enter the equation as they were not significant contributors to the variance of the EVT scores. The correlation between standard scores on the EVT and maternal education was statistically significant, $r(28) = .422$, $p < .020$. The $R^2$for this equation was .178, that is, 17.8% of the variance in EVT scores was predictable from maternal education. Therefore, for the lowest (<25th) quartile of the preschool-age CWNS distribution, the strength of maternal education predicting EVT scores was moderate and positive, indicating that as maternal education increased so did children's scores on the EVT.

3.3.2.2 Regression Analyses for CWNS by > 75th quartile: For the CWNS in the highest (>75%) quartile, none of the independent variables (paternal education, maternal education, and Family SES) contributed significant variance for scores on the PPVT, EVT or TELD-SLQ for participants whose Family SES scores put them in the greater than 75th quartile of the distribution.

3.3.3 Regression Analyses for preschool-age CWS by SES quartile

3.3.3.1 Regression Analyses CWS by < 25th quartile: For the CWS in the lowest (<25%) quartile, maternal education was the significant contributor to variance in scores on the PPVT and TELD-SLQ. However, paternal education was the significant contributor to the variance in scores on the EVT. Family SES was not a significant contributor to the variance of any of the scores.

3.3.3.2 PPVT for CWS by <25th quartile: The correlation between standard scores on the PPVT and maternal education was statistically significant, $r(37) = .440$, $p < .005$. The R^2 for this equation was .194, that is, 19.4 % of the variance in PPVT scores was predictable from maternal education. Therefore, the strength of maternal education predicting scores was moderate and positive, indicating that as maternal education increased so did children's scores on the PPVT in the lowest quartile of the distribution.

3.3.3.3 EVT for CWS by <25th quartile: The correlation between standard scores on the EVT and paternal education was statistically significant, $r(37) = .502$, $p < .001$. The R^2 for this equation was .252, that is, 25.2% of the variance in EVT scores was predictable from paternal education. Therefore, the strength of paternal education predicting scores was moderate and positive, indicating that as paternal education increased so did children's scores on the EVT in the lowest quartile of the CWS distribution.

3.3.3.4 TELD-SLQ for CWS by <25th quartile: The correlation between standard scores on the TELD-SLQ and maternal education was statistically significant, $r(37) = .497$, $p < .001$. The R^2 for this equation was .247, that is, 24.7% of the variance in TELD-SLQ scores

was predictable from maternal education. Therefore, the strength of maternal education predicting scores was moderate and positive, indicating that as maternal education increased so did children's scores on the TELD-SLQ in the lowest quartile of the distribution.

3.3.3.5 Regression Analyses for CWS by > 75th quartile: For the CWS in the highest (>75%) quartile, none of the independent variables (paternal education, maternal education, and Family SES) contributed significant variance for scores on the PPVT, EVT or TELD-SLQ for participants whose Family SES scores put them in the greater than 75th quartile of the distribution.

3.4 Relation of parent education, Family SES, and stuttering severity

Correlational analyses indicated no significant correlation between Family SES and paternal education for any of the fluency measures (See Table 4). However, a significant correlation was found between maternal education and SSI-3 Scores $r(153) = .177$, $p = .028$ and percent SD $r(157) = .167$, $p = .036$. These positive correlations indicate that as maternal education increases so does stuttering severity as measured by scores on the SSI-3 and the percent SLD produced in a 300-word spontaneous language sample.

3.5 Summary of Results

Overall, the present study resulted in three main findings. The first main finding indicated that across all levels of SES, *maternal* education contributed to a significant amount of the variance for the vocabulary and language scores for the preschool-age CWNS. This finding is consistent with other empirical studies of typically developing children (references) . However, for preschool-age CWS *paternal* education was the significant contributor to variance in vocabulary and language scores. The second main finding was that for participants with Family SES in the lowest (<25th) quartile in the distribution, maternal education was significantly related to both vocabulary and language, with one exception for the CWS (paternal education contributed, similar to findings for the overall SES distribution, the greatest to variance on EVT scores). However, for participants whose Family SES was in the highest (>75th) quartile, none of the independent variables (e.g., maternal education, paternal education, Family SES) contributed significantly to the variance in the participants scores on the dependent variables (e.g., PPVT, EVT, or TELD-SLQ) regardless of talker group (e.g., CWNS or CWS). The third main finding indicated that for preschool-age CWS, *maternal* education again was the significant variable, with increases in maternal education being associated with increases in stuttering severity and stuttering frequency. Results will be discussed in relation to 1) Family SES, 2) maternal education and vocabulary and language scores, 3) paternal education and vocabulary and language scores, 4) stuttering severity, and 5) conclusions.

4.0 Discussion

4.1 Relation of Family SES to vocabulary and language scores

For the present sample of 297 CWNS and CWS, Family SES, as measured using the Hollingshead Four Factor Index, was not as robust a predictor of the participants' standard scores on the PPVT, EVT, and TELD-SLQ as was parental education (maternal and paternal). Although parental education is a part of the Hollingshead Index, it appears that the most salient aspect of the formula is derived from the measures of parent education. As stated above, parents' education has a significant influence on the language outcomes of their children. Potential influences and interrelations between parent education, genetic propensities (e.g., due to assortative mating; for example see Petrill & Wilkerson, 2000; Wainwright, Wright, Gefffen, Luciano, & Martin, 2005), and child temperament are all other likely contributors to this effect.

4.2 Relation of maternal education to vocabulary and language scores

For the CWNS participants, results are generally consistent with previous studies showing that maternal education is the main contributor to language and vocabulary skills in typically- developing preschool-age children (e.g., Arriaga, Fenson, Cronan, & Pethick, 1998; Bornstein, Haynes, & Pointer, 1998; Dollaghan et. al., 1999; Elardo, Bradley, & Caldwell, 1977; Fenson, et. al., 1994; Hoff, 2003; Hoff & Tian, 2005; Pan, Rowe, Singer, & Snow, 2005, Qi, Kaiser, Milan, & Hancock, 2006). However, for the CWS participants, present results diverge from those for CWNS in that paternal education accounted for the greatest amount of variance for both vocabulary and language scores. As discussed previously, researchers have reported that the interaction styles of mothers can significantly influence the language development of preschool children (e.g., Elardo, Bradley, & Caldwell, 1977; Farran & Haskins, 1980; Hart & Risley, 1991; Hoff, 2003; Hoff & Tian, 2005). From a “directionality of effect” perspective, perhaps stuttering impacts mothers’ interaction with their children in some way that changes the nature of the interaction. Specifically, the presence of stuttering in children impacts the quantity and/or quality of interactions between mothers and their children in ways that alter the impact of maternal education on CWS’ language skills and allows paternal education to gain more influence.

When the entire sample was stratified into lower and upper SES groupings, other interesting relations were observed. For the CWNS in the lowest (<25%) SES group, maternal education was still positively related to language and vocabulary skills. Likewise, for the CWS group in the lowest SES quartile, maternal education also accounted for the greatest amount of variance in scores on the PPVT and TELD-SLQ. Conversely, for both the CWNS and CWS upper (>75%) SES quartile, no predictor variables accounted for variance in scores for the PPVT, EVT, and TELD-SLQ. Elardo, Bradley, and Caldwell (1977) suggest that access to resources changes dramatically as SES increases. It is possible that the overall resource advantages (e.g., better childcare, greater access to books/online resources, better nutrition, better access to healthcare) of upper SES children creates a ceiling effect that attenuates the effect of parent education (either mother’s or father’s) on the child’s vocabulary and language development. For the CWS, the higher levels of education may make mothers in the upper SES group more likely to seek information about, therapeutic intervention for their child’s stuttering and/or modify their own behavior accordingly.

As noted above, for both CWNS and CWS in the lower quartile, maternal education was related to vocabulary and language scores. It is possible that the access to resources that attenuates the effect of maternal education at the upper SES level is less available in the lower SES quartile. That is, maternal education contributes a significant amount of variance to the language and vocabulary scores for both CWS and CWNS in the low SES group because the overall reduction in resources makes parent-child interaction and possibly genetics the more significant factors. This finding is consistent with other studies showing that maternal education contributes to the amount of time mothers spend interacting with their preschool-age children (e.g., Elardo, Bradley, & Caldwell, 1977; Farran & Haskins, 1980; Hart & Risley, 1991; Hoff, 2003; Hoff & Tian, 2005). Differences in time spent interacting may also account for the finding that paternal education was the significant predictor for scores on the EVT for the CWS. Overall, our results indicate that the primary difference between the CWS and CWNS is seen in relation to the contribution of paternal education.

4.3 Relation of paternal education to vocabulary and language skills

Interestingly, present results suggest that with the exception of the low-SES group, paternal education is a more significant factor for the preschool-age CWS than for their CWNS peers for both vocabulary and language skills Researchers investigating the interactions of fathers

and mothers with their toddlers report that fathers tend to be more cognitively demanding interaction partners (Rowe, Coker, & Pan, 2004). This finding seems consistent with interaction data that CWS are more likely than CWNS to be influenced by the temporal characteristics of their father's as opposed to their mother's speech during conversations (Savelkoul, Zebrowski, Feldstein, & Cole-Harding, 2007). Savelkoul et al., (2007) suggest that CWS's tendency to be influenced by the temporal characteristics of their parents' speech may be an attempt to manage their stuttering. In terms of speech rate, Kelly (1994) reported that the greater the difference between father and child speaking rates the more severe the child's stuttering tended to be.

Perhaps, and this would be empirically testable, this "gap" in speaking rate between father and child "grows" as paternal education increases. The widening of this "gap" leading to two possible scenarios: (1) the child's increased attempts to emulate the father's speaking rate, a goal beyond their level of development, making it increasingly difficult for the child to fluently initiate and/or maintain speech fluency or (2) the child's increased attempts to "break-into" the father's utterances – because the child cannot keep up with them – forcing the child to simultaneously attend to both the father's as well as their own utterance making it difficult for the child to fluently initiate and/or maintain speech fluency. Perhaps, the child in (1) would be perceived as speaking very fast (for a child) and the child in (2) perceived as having poor listening and/or turn-taking skills. Whether any of these possible verbal interaction styles are related to paternal education is an open, but testable empirical question.

4.4 Family variables and stuttering severity

It is interesting to note that the correlation between stuttering severity and stuttering frequency during spontaneous speech, was consistent with the findings regarding maternal education, vocabulary and language scores. That is, increases in maternal education are also related to increases in the CWS's stuttering frequency and severity. This leads to speculation about combinations of maternal and paternal education paired with the child's temperament that may be more or less conducive to the exacerbation of stuttering. Belsky, Bakermans-Kranenberg, and van IJzendoorn (2007) describe a differential susceptibility theory that posits a direct interaction between a child's temperament, genetics, and the parenting practices he/she experiences. Perhaps some of the known differences between the temperaments of CWS and CWNS (e.g., Eggers, De Nil, & Van den Bergh, 2010; Anderson, Pellowksi, Conture, & Kelly, 2003, Seery, Watkins, Mangelsdorf, & Shigeto, 2007) have a crucial interplay with the genetic propensity to stutter (e.g., Kraft & Yairi, 2012) and interaction patterns related to parent education (e.g., Rowe, Coker, & Pan, 2004; Savelkoul et al., 2007). CWS, for one reason or another may be especially receptive and/or are sensitive to the unique contribution of paternal input on their language skills. These notions, although admittedly speculative, are empirically testable, but, at present, must await future empirical study

4.5 Caveats

Lack of representation of all of the levels of SES will prevent generalization of these findings to preschool-age CWS from the lowest SES groups. Although planned comparisons stratified the sample into distinct SES groups with fairly normal distributions, the overall range of scores was not representative of all SES levels. For this sample of CWS and CWNS, the overall SES scores generally ranged from individuals described as skilled craftsmen (Family SES scores between 30 and 39; 21%), medium business, minor professional, technical people (Family SES scores between 40 and 54; 47%) to major business and professional people (Family SES scores between 55 and 66; 25%; Hollingshead, 1975). Compared to US Census data (2010), there were fewer families in the present study from the lowest two categories identified by Hollingshead (1975) as machine

operators, semiskilled workers (Family SES scores between 20 and 29; 5%) and unskilled laborers, or menial service workers (Family SES scores between 8 and 19; 1%). This lack of representation of the lowest levels of education and occupation limit the generalizability of these results to families in the middle to upper SES range. Additionally, results from this dataset may not translate to global populations where social systems are more or less supportive of families from lower SES categories. However, these findings are generally consistent with those of Reilly et al., (2009) who found that families in the lowest SES demographic were less likely to participate in research of this kind. Whatever the case, these findings point out the need to obtain samples of CWS and their normally fluent peers more representative of the entire SES spectrum.

An additional limitation of our results is in the strength of the correlations. Despite the statistically significant findings for each of the variables explored, the overall strength of the correlations is weak to moderate. Rather than regarding this as a confound to the significance of the results, it serves as a reminder that SES is only one component of a child's environment and therefore should not be regarded as the only, sole or major contributing factor to language and vocabulary growth. Present findings are, however, are consistent with the tenets of the Communication-Emotion model (Conture, et. al., 2006) whereby environment along with genetics are considered to be a contributing distal factor in onset and development of stuttering.

4.6 Conclusions

Present findings regarding the association of childhood stuttering and SES – the latter one seemingly salient aspect of a child's environment seem to suggest that the child's social-communicative surroundings, particularly those provided by mothers and fathers, are importantly associated with both speech-language development and childhood stuttering. This result appears to support the findings of Pancsofar and Vernon-Feagons (2006, 2010) who reported that the number of different word roots used by fathers made a significant contribution to children's expressive language scores at 36 months. Specifically, present findings suggest that one notable aspect of that environment, parental education, impacts all children, but perhaps uniquely so for children who stutter. If present findings are supported by replication, and the fathers of CWS are shown to have as much if not more influence on language and vocabulary than their mothers, such information may need to be considered by both theoretical as well as therapeutic approaches to childhood stuttering. This would particularly be the case for treatment approaches involving, in any way, the child's environment. Indeed, present findings are suggestive of the possibility that that more attention be paid to the association of children's socio-educational environment and their speech and language development as well as responsiveness to various treatment regimens.

This study extends the existing literature on the association between SES, children's language and stuttering by examining the effect of not only family SES, but also separate effects of maternal and paternal education levels on the language performance of CWS and their non-stuttering peers. Additionally, the present study is one of the first the present authors are aware of to consider the potential impact of paternal education on child language and vocabulary development for CWS and CWNS. Results should help inform both clinicians and researchers about the impact of these variables on child language in populations with diagnosed impairments (e.g., stuttering) and influence service-delivery to children who stutter.

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Highlights

- We discuss development of emotion vocabulary as central to self-regulation skills
- AWS and AWSLI show a lack of flexibility in their use of different types of affective process words.
- Emotion vocabulary may bridge the relationship between expressive vocabulary skills and self-regulation.

Table 1

Description of occupation and educational scores based on Hollingshead (1975).

Scale Score	Occupational Scale	Educational Scale
1	Farm laborers/Menial service workers (e.g., dishwashers)	< 7th grade
2	Unskilled workers (e.g., bartenders)	Junior high school (9th grade)
3	Machine operators and semiskilled workers (e.g., bus drivers, child care workers)	Partial high school (10th or 11th grade)
4	Smaller business owners, skilled manual workers (e.g., electricians), craftsmen (e.g., dry wall installers), and tenant farmers	High school graduate
5	Clerical and sales workers, small farm and business owners (valued between $25,000 and $50,000)	Partial college at least 1 year
6	Technicians (e.g., air traffic controllers), Semiprofessionals (e.g. dieticians,), farm and business owners (valued between $50,000 and $75,000)	Standard college or university graduation
7	Managers, minor professionals (e.g., real estate agents), farm and business owners (valued between $75,000 and $100,000)	Graduate professional training
8	Administrators (e.g., district managers), lesser professionals (e.g., accountants), farm and business owners (valued between $100,000 and $250,000)	
9	Higher executives (e.g., CEO), major professionals (e.g., Aeronautical engineer), farm and business owners (valued at $250,000 or more)	

Table 2

Means *(standard deviation)* by talker group (CWNS and CWS) for dependent measures

Talker Group	Age in Months	Father's Education Score	Mother's Education Score	Family SES Score	PPVT Standard Score	EVT Standard Score	TELD Standard Score
CWNS	51 *(10.54)*	6 *(.94)*	6 *(.86)*	47 *(10.56)*	107 *(14.8)*	110 *(12.5)*	110 *(14.9)*
CWS	50 *(10.32)*	6 *(1.00)*	6 *(.85)*	46 *(11.16)*	104 *(13.7)*	109 *(11.9)*	105 *(15.8)*

Table 3

Means *(standard deviation)* by talker group (CWNS and CWS) and SES quartile (< 25th and > 75th) for dependent measures

Measure	SES <25th Quartile		SES > 75th Quartile	
	CWNS	**CWS**	**CWNS**	**CWS**
PPVT	104 *(13.8)*	105 *(13.5)*	109 *(14.5)*	105 *(11.9)*
	N = 33	*N* = 42	*N* = 38	*N* = 36
EVT	107 *(10.0)*	109 *(10.8)*	112 *(14.5)*	110 *(12.4)*
	N = 33	*N* = 42	*N* = 38	*N* = 36
TELD	108 *(14.8)*	107 *(13.9)*	111 *(12.9)*	105 *(17.0)*
	N = 33	*N = 42*	*N* = 38	*N* = 36
Maternal Ed	5 *(.756)*	5 *(.928)*	6 *(.603)*	6 *(.612)*
	n = 32	*n* = 42	*n* = 38	*n* = 36
Paternal Ed	5 *(1.02)*	5 *(1.12)*	6 *(.608)*	6 *(.56)*
	n = 31	*n* = 39	*n* = 35	*n* = 35
Family SES	33 *(5.37)*	32 *(6.04)*	59 *(2.98)*	61 *(3.30)*
	N = 33	*N* = 42	*N* = 38	*N* = 36

Table 4

Correlation coefficients for family variables and fluency variables.

		SSI-3 Score	Percent Stuttering-like Disfluency	Proportion of SLD to Tot Disfluency
Family SES	Pearson Correlation	.121	.146	.011
	Sig. (2-tailed)	.135	.066	.888
Father's Education Score	Pearson Correlation	.038	.138	.043
	Sig. (2-tailed)	.647	.088	.598
Mother's Education Score	Pearson Correlation	.177*	.167*	.086
	Sig. (2-tailed)	.028	.036	.285

*Correlation is significant at the 0.05 level (2-tailed)