



Cognitive and language performance in children is associated with maternal social anxiety disorder: A study of young mothers in southern Brazil



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ABSTRACT

Background: It has been shown that maternal mental health is associated with poorer skills development in the offspring. However, the evidence evaluating the association between social anxiety disorder (SAD) and cognitive or language development, is scarce.

Aim: To evaluate the association between maternal SAD and performance in cognitive and language tests in 30-month old children.

Study design: This was a *cohort study* involving young women evaluated since pregnancy.

Subjects: We evaluated 520 mother–child dyads who received prenatal medical assistance through the National Public Health System in a southern Brazilian city, from October 2009 to March 2011.

Outcome measures: We used the Mini Neuropsychiatric Interview Plus (MINI Plus) to assess SAD among young mothers. Cognitive and language performance in their offspring was analyzed using the Bayley Scales of Infant and Toddler Development – 3rd Edition.

Results: We found an association between maternal SAD and performance in cognitive and language tests. Children of mothers with SAD had in average 4.5 less points in the Bayley scale, when compared to those with mothers without SAD: in the cognitive ($\beta = -4.53$ [95% CI $-7.8; -1.1$] $p = 0.008$) and language subscales ($\beta = -4.54$ [95% CI $-9.0; -0.5$] $p = 0.047$).

Conclusions: Our findings suggest that children with mothers suffering from SAD have poorer cognitive abilities and language skills.

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1. Introduction

Cognitive development allows individuals to *appropriately respond and solve everyday problems*. Among the cognitive skills, language appears as a crucial element, as it allows us to represent objects, people, and events, as well as to reflect on observations and experiments. The acquisition and integration of cognitive and language skills depends on individual factors, but also on environmental and social interactions, especially during the first years of life. [1–4].

Poor language and cognitive development in children aged between 2 and 4 years, range from 2.3% to 17.5% [5–7] and from 0.3% to 11% [8,9], respectively. It has been shown that this poor development is higher in

male children [10–14], as well as in those born premature [8,15], who do not go to a daycare [14] and who spend less time with their mothers. In addition, maternal characteristics are also important predictors cognitive and language development. Children born to young mothers [11,16,20], of low socio economic status [13,17–19], less educated [10,11,13,21,22], with no occupation [11,23] and poor mental health [4,24] are prone to have a poor performance in cognitive and language tests.

Social anxiety disorders (SAD) usually begins in adolescence [25] and is most common during youth [26,27] and in women [26,28,29]. Showing prevalence of 7.3% [25] and 8.3% [30] among young women. Since SAD is characterized by an avoidant behavior, intense fear in social situation and significant psychosocial impairment [31], Children of mothers with this disease, could lack of proper stimulation and social interaction during their first years of life which could ultimately affect their cognitive development [32–34].

Phobic models can be transmitted from parents to children; however, is the environment in which the child is raised and the maternal

Abbreviations: SAD, social anxiety disorder.

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responsiveness what may influence the onset of anxiety in children [35] and not genetic factors. It has been shown that children of mothers with SAD have higher levels of anxiety and avoidance behavior [36], and reduced social responsiveness to the stranger [37]. These characteristics can interfere with language acquisition, considering that speech delay is associated with low social interaction [38]. Moreover, very anxious mothers are more critical, controller, and intrusive; they impose more rules and do not allow their children to have an age-appropriate level of autonomy. These characteristics can suggest to the children that the environment is very difficult and dangerous, and that they have no skills to deal with it or to succeed the challenges imposed. These aspects may restrict the development of some domain skills, such as the ability to solve problems [39].

The main purpose of this study was to evaluate the association between maternal SAD and performance cognitive and language tests in 30-month old children. Our hypothesis is that maternal SAD could be significantly associated with poorer performance in the cognition and language scales of the Bayley-III.

2. Methods

2.1. Survey data and study sample

This study is part of a larger cohort study on maternal mental health and child development. The original sample consisted of teenage mothers who received prenatal medical assistance through the National Public Health System in the city of Pelotas in southern Brazil. The participants were recruited from October 2009 to March 2011 in 47 primary healthcare units and in 3 public obstetric ambulatory care units. The study sample included 537 mother–child dyads (30-month old children and their respective mothers).

The Research Ethics Committee of the Universidade Católica de Pelotas (Catholic University of Pelotas) RS-Brazil, approved this study. We explain the study characteristics to all participants, who agree to participate by providing their free and informed assent for analysis and anonymous publication of results according to resolution 466/12 (CONEP). Parents of women younger than 18 years old, were also informed about the study characteristics and they needed to sign the term of free and informed assent. Children who showed poorer performance in the Bayley Scale, as well as the mothers diagnosed with psychiatric disorders, were sent to a mental health care clinic.

2.2. Measures and variables

2.2.1. Socio-demographic data

A self-report questionnaire was used to obtain socio-demographic data from the mothers: age, marital status, education, occupation and family income (according to the Economic Classification for Brazil of the Brazilian Association of Population Survey Companies in which the highest-income level is “A” and the lowest is “E”). Information was also collected regarding the delivery type, birth weight and the possible prematurity of the children (less than 37 weeks of pregnancy), primary caregiver and daycare attendance.

2.2.2. Social anxiety disorder

Mothers were interviewed by trained psychologists, and completed the Portuguese validated version of the Mini Neuropsychiatric Interview Plus (MINI Plus), a short structured interview compatible with DSM-IV and ICD-10 validated for Brazil. [40]

2.2.3. Cognitive and language measures

All children completed The Bayley Scales of Infant and Toddler Development – 3rd Edition [41] to assess infant cognitive and language development. The scale use items administered to the child. The items on the Cognitive Scale include sensorimotor development, exploration and manipulation, object relatedness, concept formation, memory and

other cognitive abilities. The Language Scale evaluates Receptive and Expressive Communication. The Receptive subtest includes vocabulary development (recognize objects and pictures referenced), vocabulary related to morphological development (pronouns and prepositions), and understanding of morphological markers (plural, tenses and the possessives), as well children's social referencing and verbal comprehension. The Expressive Communication subtest includes items that assess vocabulary development (naming objects, pictures, and attributes), and morpho-syntactic development (using two-word utterances, plurals, and verb tense). Both subscales were used together to determine language performance. The scales were administered by psychologists, master and doctorate degree students, trained and supervised by an experienced child clinical psychologist. For each scale, the child's score was determined by the number of items for which credit was received. The Bayley Scale has not been validated for the Brazilian population, and no cut-off values for the subscales have been determined. Thus, for methodological purposes related to statistical power, we used the composite score for the scales as the outcome. The data presented here for each subscale are composite scores relating the child's performance to age-based norms.

2.3. Statistical analysis

The statistical analysis was performed using SPSS 21.0 for Windows. Univariate analysis was employed to verify sample characteristics. After carrying out the bivariate analysis, using *t*-test and ANOVA, all variables with *P*-values <0.2 in the crude analysis were included in the adjusted analysis. A linear regression analysis was performed and adjusted to check for effects remaining between variables to ensure that, after adjusting for the first level, variables that did not retain *P*-values <0.2 were not included in the analysis of the second hierarchical level. The same procedure was carried out for the variables of the second level to set the third hierarchical level. After the adjusted analysis, the statistical significance was consistently evaluated using the level of 0.05 (two-tailed) as indicative of statistical significance.

3. Results

Of the initial 534 mother–child dyads, 520 (97.3%) completed the measurement instruments. Mean age for the mothers was 20.1 years (SD ± 1.5 years) and for the children 30.7 months (SD ± 3.4 months). General Mean (SD) Bayley-III scores were as follows: cognitive, 90.8 (SD ± 10.2); language, 98.5 (SD ± 13.3). Sample characteristics and cognitive and language mean composite scores in Bayley Scale-III are listed in Table 1.

The sample showed 7.9% (*n* = 41) prevalence of social anxiety disorder. Maternal SAD was significantly associated with poorer performance in both scales; cognitive (*p* = 0.007) and language (*p* = 0.014) (Table 1). In adjusted analysis, children of mothers with SAD had on average 4.5 less points, in the Bayley cognitive ($\beta = -4.53$ [95% CI -7.8; -1.1] *p* = 0.008) and language ($\beta = -4.54$ [95% CI -9.0; -0.5] *p* = 0.047) scales, when compared to children of mothers without the disorder. Regarding the cognitive scale, a lower mean score was found in male children, those who were not attending a daycare, and children of mothers with less than 20 years, less years of education, and unemployed (Table 1). After adjusting for potential confounding variables, less years of education (*p* <0.001) and mother not working (*p* = 0.036) remained significantly associated with poorer cognitive performance. In addition, children whose mothers had between 11 and 14 years of education had on average 4.5 points more in the cognitive scale, compared to those mothers with less than 5 years of education. In addition, children of employed mothers had on average 2.1 more points than children whose mothers were not working (CI 95% 0.1; 4.1) (Table 2).

For the language score, we observed a lower score in male children and those who did not attend a daycare, and in children of women with

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