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Influence of Antenatal Depression on Offspring's Communicative Intention in Toddler Years

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Abstract

This study investigated the association between prenatal stress, in terms of antenatal depression, and toddler's communicative intention at age two using a prospective design. A population cohort of 31 mothers were recruited in the third trimester of their pregnancy and their depression level was measured using a validated questionnaire, Edinburg Postnatal Depression Scale (EPDS). Their children's communicative intentions were evaluated with a standardized assessment tool, Communication and Symbolic Behavior Scales Developmental Profile (CSBS-DP) and particularly investigated (1) gesture use, (2) emotion, and (3) communication (types and number of communicative intentions expressed). Multiple linear regression revealed depression level in the third trimester significantly predicted reduced gesture use in the children, after controlling for postnatal depression level in the two-year postpartum. This finding supports prenatal stress as a potential risk factor for children with social communication deficits, such as ASD. The findings also support future research in finding direct association of ASD with prenatal stress using a prospective longitudinal design.

Key words: stress, antenatal, depression, communication, intention

In early infancy, newborn babies with their very immature brains, limited cognitions, and motor skills are already specifically motivated and can attract caregivers' sympathetic responses (Trevarthen, 1979). They communicate with the parent through many various modalities of perception and expression such as physical touch, eye-to-eye contact, gesture, voice and facial expression. This kind of two-way interaction takes place in an active, rhythmic, and repetitive manner (Trevarthen & Aitken, 2001). At about two months, infants can engage in interaction with the mothers. They look at and listen to each other in an intricate manner exchanging different signals such as facial expression, vocalization, and gestural expression. Infants at that time can produce distinctive responses to the adults' reaction (Reddy, 2005). This early stage of sharing of experience can be regarded as the preparatory stage for development of intentional communication and is called prelocutionary stage by Bates, Camaioni and Volterra (1975). After two to six months later, babies start to develop social smiles that direct to the caregiver. They can follow pointing (Striano & Bertin, 2005) and eye gazes become more purposeful such that they start to alternate eye gaze (Campos & Steinberg, 1981). For example, when babies come to some distress situations with an object, they will look at adults' faces seeking emotional information from adults' facial expression and then back to the object. This kind of alternate eye gaze is often called joint attention skills and is an indicator of being aware of others' intentions (Baldwin & Moses, 1997). Later, babies become more responsive and babbling emerges, which mark the start of the second stage, illocutionary stage. At about ten months old to one year, communication becomes truly intentional. Babies can direct vocalizations and gestures to their caregivers to achieve desired goals and get pleasure from simple social games, such as peek-a-boo. By intentional communication, Bates (1976) defined it as "a signaling behavior in which the sender is aware, a prior, of the effect that signal will have on his listener, and he persists in that behavior until the effect is obtained or failure is clearly indicated. The

behavioral evidence that permits us to infer the presence of communicate intentions includes (1) alternation in eye gaze contact between the goal and the intended listeners, (2) augmentations, additions, and substitution of signals until the goal has been obtained, and (3) changes in the form of the signal towards abbreviated and/or exaggerated patterns that are appropriate only for achieving a communicative goal." (p.36). Babies understand that they can regulate the behavior of their communication partners such as directing them to achieve certain goals (e.g., refusing an unwanted object or action) (Wetherby & Prizant, 2002). This type of intentional communication is known as behavioral regulation. Eye gaze and the demonstration of emotions can also be used for instrumental purposes, such as request for objects and actions (Mundy & Stella, 2000; Wetherby & Prizant, 2002). Similar communication goals can also be achieved through gestures, such as pointing, showing and giving. The emergence of gestures has been described as the onset of intentional communication in children (Bates et al., 1975). Gestures can be categorized into two types: deictic and representational (Iverson & Thal, 1998). Deictic gestures, which include pointing, showing, reaching, are used to establish reference, either an event or an object, in a communicative context (Bates, 1976). Representational gestures are considered as symbolic gestures, as they carry certain semantic content and do not rely on a context to establish reference, e.g. waving for 'bye', turn hands to indicate opening of jar. Gestures are regarded as communicative when they are directed to adults and either coordinated with vocalizations or coordinated with eye gaze directed to another person's face (Wetherby & Prizant, 2002). Bates et al. (1975) further suggested that the sophistication of gestures can be categorized by considering whether they are contact or distal gestures. Distal gestures are regarded as more sophisticated since they require no contact between the child and an entity, which reflect the child's symbolic representation. When children become more verbal, they demonstrate joint

attention in order to get another person's attention to an object or an event and comment, or seek information by asking questions (Wetherby & Prizant, 2002).

Deficits in Developing Intentional Communication

Deficit in developing intentional communication is a core feature in children with autism spectrum disorders (ASD) (Wetherby, Prizant, & Schuler, 2000). According to DSM-V, ASD is a neurodevelopmental disorder manifested in early childhood, characterized by deficits in (1) communication and social-emotional reciprocity, and exhibition of (2) restricted and stereotyped behaviors (American Psychiatric Association, 2012). Most children with ASD had comparable performance with typically developing children in acts of behavioral regulation and social interaction but a predominant deficit was noted in developing appropriate joint attention and use of conventional gestures (Shumway & Wetherby, 2009; Wetherby, Watt, Morgan, & Shumway, 2007). Joint attention involves the children's communicative intention to direct another person's awareness to an external entity, such as an object or an event (Wetherby & Prizant, 2002). Children with ASD used more primitive form of gestures for communication, such as touching adults, reaching towards adults or treating a human communication partner as a physical tool to achieve their goals. (Shumway & Wetherby, 2009; Wetherby, Watt, Morgan & Shumway, 2007).

Understanding others' communicative intentions was also a problem in individuals with schizophrenia (Langdon et al., 1997). Children who subsequently developed schizophrenia showed significantly lower proportion of positive facial expressions than their age peers (Walker, Grimes, Davis, & Smith, 1993) and individuals with schizophrenia also used fewer intention-cognitive terms (Langdon et al, 1997). These unusual characteristics may ascribe to their failure in considering mental state and intention of others (Corcoran, 2000).

Pre- and Perinatal Contributing Factors

The dramatic development in communicative intention through the first and second year in typically developing children and the developmental nature the deficits in developing intentional communication may suggest that new born infants' brains have prewired innately before birth for the development and expression of intentional and emotional communication (Trevarthen, 2011). A growing body of studies has attested that in a large proportion of ASD cases or nearly every case of ASD, some form of abnormal brain morphogenesis beginning very early in embryo stage in the brain can be found which induce these unusual manifestations in communicative intentions (Trevarthen, Aitken, Papoudi, & Robarts, 1998). One consistent finding reported in recent literature on pathological brain development in ASD is a 10-15% enlargement of the brain size during early childhood (Dager, Frideman, Petropoulos, & Shaw, 2008). A very recent study has pointed to the genetic basis that leads to this brain abnormality. Chow et al. (2012) reported the genetic marker that cause overabundance of brain cells in the prefrontal context in ASD individuals. However, genetic factors alone, or in addition to improved screening and medical care cannot provide a reasonable explanation to the 25-fold increase in the prevealence of ASD from around 4.5 per 10,000 in the late 1990s (Trevarthen et al., 1998) to 1 per 88 individuals recently (Centre for Disease Control and Prevention, 2011). Some studies have put forward the contribution of epigenetic factors to the formation of neuronal systems in addition to genetic factors as the cause of these neurodevelopmental disorders. In fact, prenatal and perinatal factors such as changes in antenatal environment and complications at delivery have long been regarded as a risk factor of various neurodevelopmental disorders (Buss, Davis, Muftuler, Head, & Sandman, 2010; Stott & Latchford, 1976) and specially ASD (Ward, 1990) and schizophrenia (Waddington, et al., 1998). The epigenetic model has provided a more comprehensive account for the strong genetic evidence observed in twin studies – the higher concordance in monozygotic twins than dizygotic twins. This is because monozygotic twins shared more

similar prenatal and postnatal environment, such as the same vascular connection *in utero* than dizygotic twins (Hall, 2007; Kinney, Munir, Crowley, & Miller, 2008). In addition, epigenetic factors also explain the dramatic rise in incidence of these neurodevelopmental disorders as they are induced by external agents.

Specifically, chronic maternal psychological stress has received more and more attention as a significant antecedent for these childhood mental health disorders (e.g., Beversdorf et al., 2005; Ronald, Pennell, & Whitehouse, 2011). However, findings were mixed across studies. For example, for ASD, Beversdorf et al. (2005) conducted a retrospective study, which specifically aimed to investigate the timing of prenatal exposure to stress and incidence of ASD. The Social Readjustment Rating Scale (SRRS) was used to measure the severity level for various stressors occurred during pregnancy (Holmes & Rahe, 1967). Four hundred and ninety two mothers of children with ASD, children with Down syndrome and children without neurodevelopmental problems were surveyed. Mothers of children with ASD on average recalled 32.4 incidences of prenatal stressors per 100 autism survey, which was significantly more than the Down syndrome group (21.7 incidences) and the control group (18.9 incidences). They also had higher occurrence of prenatal stressors at 21-32weeks of gestation, with maximum incidence at 25-28 weeks. One the other hand, a population based cohort study in Denmark cannot replicate the results (Li et al., 2009). From 1978 to 2003, 1,492,709 mothers participated in the project. Maternal bereavement was considered as the main source of stress. Mothers were categorized into 2 groups: (1) those that lost a close family member a year before or during pregnancy, and (2) mothers who did not expose to any bereavement (control group). Their children were being followed up through the Danish Civil Registration System. Information of children with ASD was also obtained through this registry. There was no significant association found between prenatal stress in terms of loss of a close relative of a mother and diagnosis of ASD.

The Present Study

The present study was sought to examine whether maternal mental health problem during pregnancy is associated with development of early communicative intention which is regarded as the early precursor of later neurodevelopmental problems. This present study was more specific in examining prenatal maternal stress in terms of antenatal depression measured using a locally standardized and validated questionnaire (Lee et al., 2007). The study adopted a prospective design following up mothers from pregnancy to the time when their children were at about two years of age. With this rigorous design, the presence or absence of the association between antenatal depression and children's communicative intention can be more systematically tested. It was hypothesized that toddlers with mothers having more severe depression during late pregnancy will have weaker performance in the use of communicative intentions.

Method

This study was an extension of a previous study examining the impact of prenatal stress on obstetric complication (Lee et al., 2007). A prospective cohort design was used to investigate the effect of prenatal mental problem on offspring's communicative intention.

Participants

Fifty-four mothers in the database and their children aged between 22 and 24 months were invited to participate in the study. Inclusionary criteria of mothers in the database were restricted to women of Chinese ethnicity and above 18 years of age. They had no significant medical illness, not considering termination of pregnancy and were not pregnant through in-vitro fertilization (Lee et al., 2007). Additional inclusion criteria for the present study included children to be born full term (at or above 37 weeks of gestation). Three children were hence excluded from the study due to prematurity. One more subject was excluded since her performance in the data collection was not videotaped to allow analysis. There were

50 mothers and their children remaining in the current study. However, due to missing data, less than 50 samples were available for statistical analysis in the third trimester (*n*=31) and in the in two-year postpartum (*n*=49).

The mean age of the remaining mothers during their pregnancy were 33.45 years old (*SD*= 3.98). Participating children had mean age of 24.32 months (*SD*= 1.17). Twenty of them were females (64.5%) and eleven of them were males (35.5%). Fifteen of them were single child (48.4%), while another fifteen of them (48.4%) had one sibling. One of the children (3.2%) had 3 siblings. Parents (58.1%), grandparents (22.6%) and domestic helper (51.6%) were the main caregivers of the children. Nineteen mothers and fathers (61.3%) received tertiary education, while twelve parents (38.7%) received secondary education. There were twenty five families (80.6%) that had income above HK$30,000 per month, which were considered as middle class family.

Predictor Variables

The predictor variables were the antennal depression levels of the mothers during pregnancy at late pregnancy, that is, the third trimester. Mothers self-rated their antenatal depression level using the validated Chinese version of Edinburg Postnatal Depression Scale (EPDS, Lee et al., 2007). Clinical attention was recommended when depression level exceeded the cutoff of 10 (Bergink et al., 2011). For postnatal depression, the suggested cutoff was 13, which can yield the best sensitivity and specificity (Cox, Holden & Sagovsky, 1987). The mothers' scores were saved in an archive for analysis.

Postnatal depression level had been found to be correlated with children's social developmental outcomes, which may be mediated by the reduced mother-child interaction (Laplante et al., 2004; Murray & Cooper, 1997). Therefore, postnatal depression level of the mothers in the two-year postpartum was also taken into account as a covariate.

Outcome Measure for Children's Communicative Intention

A standardized assessment tool, Communication and Symbolic Behavior Scales Developmental Profile (CSBS-DP, Wetherby & Prizant, 2002), was used to measure the toddlers' communicative intention. CSBS-DP was a very widely used assessment tool in evaluating young children's communication and symbolic behaviors, and a tool for identification of developmental disability. This tool provided normative data and had been validated on children having different developmental disabilities. It demonstrated satisfactory sensitivity and specificity in identifying children with language and communication delay. (Paul, 2007; Wetherby et al., 2004; Wetherby, Allen, Cleary, Kublin & Goldstein, 2002). CSBS-DP consisted of three parts: (1) the Infant-Toddler Checklist for screening children at risk for developmental deficit, which was a one-page parent-report questionnaire with 24 items; (2) the Caregiver Questionnaire for parent report, which was a more detailed questionnaire with 41 multiple-choice items and four open-ended questions; and (3) Behavior Sample, which was a direct assessment administered on a child. The present study made use of the Behavior Sample to evaluate the toddler's communicative intention in context.

In the six sampling contexts under the CSBS-DP Behavior Sample, twenty scales were used to measure seven predictors for toddlers' language development, (i) emotion and eye gaze (ii) communication (number and types of communicative intentions) (iii) gesture usage (iv) sound usage (v) words usage (vi) word comprehension, and (vii) object use (Wetherby & Prizant, 2002).

Emotion and eye gaze, communication (number and type of communicative intentions), as well as gesture usage were components included in the *social* composite. The *speech* composite included sound and word usage which measured the children's inventory of words and vocal acts regardless of their intention. Word comprehension and object use were included in the *symbolic* composite which measured toddlers' word comprehension and object use via following the investigator's instructions. Given the purpose of this study was to

investigate toddlers' communicative intention, only the scales in the social composite were used (Shumway & Wetherby, 2009). For the components of emotion and eye gaze, toddlers' spontaneous use of gaze shift, ability in sharing positive affect and following pointing with eye gaze were documented in the six sampling opportunities. For the components of communication, the number of times in communicating with an adult either verbally or nonverbally was recorded up to three times for each sampling opportunity. Their range of communicative intentions exhibited was also measured in aspects of behavioral regulation, social interaction and joint attention. For the final component of gesture usage, it measured toddlers' diverse use of conventional gestures (e.g. giving, pointing, and nodding) to another person to express communicative intentions. The sophistication of the gesture use was also recorded by coding whether the gesture was a contact gesture or a distal gesture (Wetherby & Prizant, 2002).

Procedures

Eligible parents in the database were contacted by telephone. Face-to-face interview was then arranged through home visits or visit to the child laboratory in Prince Philip Dental Hospital. Before the assessment, written consent and demographic information of the mother and toddler about their language use were obtained. Postnatal depression level after the time of testing, that is about two years after pregnancy was also obtained by asking the mothers to fill in the EPDS questionnaire again. The toddler was then evaluated by the CSBS-DP Behavior Sample. Each assessment session lasted for 30 to 45 minutes and was video recorded with a digital video recorder for off-line coding and evaluation of reliability. The toddler's performance was coded and scored in percentile rank, based on the parameters and instructions in the CSBS-DP users' manual. The investigator who administered the assessment and coded the toddler's performance was blinded from the depression level of mothers to avoid biased observation.

Inter-rater Reliability

The primary investigator of this study coded all the samples of CSBS-DP Behavior Sample. Inter-rater reliability testing was conducted for approximately 10% of the data (i.e., six randomly selected samples from fifty participating children). Another undergraduate student in BSc programme in Speech and Hearing Sciences, who was also blinded from the maternal antenatal depression level, helped in conducting the inter-rater reliability test by scoring the selected samples independently. Intraclass correlation coefficients were used to measure the reliability. Inter-rater reliability is considered as acceptable when the coefficients are greater or equal to .60 (Mitchell, 1979).

For the total score in the social composite, a coefficient of .88 was obtained. Interclass correlation coefficients were also calculated for the emotion and eye gaze, communication and gesture components, obtaining a value of .85, .79, and .95 respectively. The coefficients indicated adequate and acceptable inter-rater reliability among the emotion and eye gaze, communication, as well as the gesture components.

Data Analysis

Exploratory data analyses were conducted using multiple regression analysis to examine the predictive relations between the components score in CSBS-DP and antenatal depression level at the third trimester. To ensure that the possible associations detected were attributed to the variables in the antenatal period, the mothers' two-year postnatal depression level was entered as a covariate in the equation. Secondary analyses were performed with univariate analyses in general linear model to examine group difference in CSBS-DP performance between the depressed and non-depressed group, in which the groups were defined using the clinical cut-off score 10. Two-year postnatal depression score was also entered in the analyses as a covariate.

Results

Before subjecting the variables into a regression model, simple correlation was conducted to check for the correlation between the antenatal depression level at the third trimester, as well as the two-year postnatal period. This was to avoid the multicollinearity effect between the predictors, which may limit the size of the variance in the outcome and the effect of individual predictor (Field, 2005). No significant correlation was found between the predictors. Multiple linear regression analysis was conducted for the total score in the social composite of CSBS-DP and each of the three components in the composite, i.e., (1) social composite scores summing up the following three components, (2) gestures, (3) emotion and eye gaze, and (4) communication. Depression levels in the third trimester as well as the two year postnatal period were the independent predictor variables. The results for multiple linear regression analysis for each of the outcome in the third trimester are presented in Table 1. A significant negative predictive relation as indicated by the unstandardized beta value was found between antenatal depression in the third trimester and children's gestures use, accounting for 26.7% of the variance of gesture. The regression models for the other three dependent variables, i.e., emotion and eye gaze, communication, and social composite were not significant.

In order to further investigate the effect of antenatal depression with reference to the clinical cut-off, secondary analyses using ANOVA were carried out. Mothers who scored higher than or equals to 10 in EPDS (n=9) were assigned to the depressed group. The remaining mothers in the third trimester (n=21) were assigned as the control non-depressed group. Levene's tests were conducted to examine the homogeneity of variance between the groups and the results indicated the variance of the two groups did not differ significantly. Mothers' postnatal depression level in the two-year postpartum was controlled by putting it as a covariate. Group difference of children's performance in CSBS-DP in the third trimester with their mean scores (in terms of percentile rank), standard deviations, and effect size were

summarized in Table 2. One missing datum was noted in the third trimester. Therefore only a total of 30 mother-child dyads were included for statistical analysis.

Table 1.
Multiple Linear Regression Model for Children's Performance in the Social Composite of CSBS-DP in the Third Trimester at Age Two Years

	Social Composite				
	R	R^2	*t*	ß[a]	*p*
Step 1					
Constant			3.66	45.34	.00
T3 depression level	.11	.01	-.60	-.90	.55
Step 2					
Constant			3.29	47.79	.00
T3 depression level	.13	.02	-.59	-.90	.56
Postnatal depression			-.34	-.33	.74
	Gestures				
	R	R^2	*t*	ß	*p*
Step 1					
Constant			7.17	59.65	.00
T3 depression level	.45	.20	-2.66	-2.67	.01*
Step 2					
Constant			7.15	66.96	.00
T3 depression level	.52	.27	-2.75	-2.70	.01*
Postnatal depression			-1.56	-1.00	.13
	Emotion and Eye Gaze				
	R	R^2	*t*	ß	*p*
Step 1					
Constant			2.52	39.19	.02
T3 depression level	.01	.00	-.04	-.07	.97
Step 2					
Constant			1.63	29.11	.12
T3 depression level	.21	.05	-.02	-.03	.99
Postnatal depression			1.13	1.38	.27
	Communication				
	R	R^2	*t*	ß	*p*
Step 1					
Constant			2.21	29.87	.04
T3 depression level	.15	.02	.82	1.33	.42
Step 2					
Constant			2.38	37.15	.03
T3 depression level	.23	.05	.80	1.31	.43
Postnatal depression			-.93	-1.00	.36

$p < .05$*

[a] Unstandardized regression coefficient

Table 2.

Group Difference in Performance in the Social Composite of CSBS-DP Behavior Sample in the Third Trimester of Pregnancy

Variables	Depressed Group (n = 9)		Non-depressed Group (n = 21)				
	M [a]	*SD*	*M*	*SD*	*F*	*p*	Partial eta square
Social Composite	44.33	26.54	36.00	25.68	.628	.435	.023
Gestures	34.89	20.43	41.43	18.92	.684	.415	.025
Emotion & eye gaze	41.44	35.26	37.48	31.64	.096	.759	.004
Communication	54.56	23.12	33.81	28.46	3.69	.065	.120

[a] Scores were calculated in percentile rank

No significant group difference was noted between the control and depression group for all dependent variables in the third trimester, after controlling the postnatal depression level in the two-year postpartum.

Discussion

The study aimed to address the association between antenatal depression and offspring's communicative intention. Their communicative intentions were evaluated in terms of gesture use, emotion and eye gaze as well as their communication behaviors using a standardized tool of CSBS-DP. Antenatal depression at the third trimester cannot significantly predict a child's communicative intention ability measured as the social composite in CSBS-DP as a whole. The total social composite score is an indicator of children's range of behaviors that reflect their communicative intention. Wetherby et al. (2004) attempted to use CSBS-DP behavioral sample to distinguish children with ASD from typically developing children and those with developmental delay. Although the behavior

sample can successfully differentiate children with and without disability, it was unable to correctly distinguish children with ASD from those who were developmentally delayed with high accuracy. In the present study, our assumption was that prenatal maternal stress in terms of antenatal depression would have an impact on communicative intentions. It might be possible that the measure was not sensitive enough in identifying children with specific problem in developing communicative intention and no significant association was found with this gross measurement. Therefore, the finer breakdowns of the social composite were examined. Antenatal depression was a significant predictor of children's gesture use at age two after controlling for the postnatal depression level in the two-year postpartum. However, such a relationship was not found for the components of eye gaze and emotion, and communication. In other words, children exposed to more severe antenatal stress were more likely to show more limited gestures.

Gestures

The significance detected in gestures has R^2 value of .267, which indicated that antenatal depression can account for nearly 30% of the variance in gestures. This suggested that antenatal depression in the third trimester significantly predicts a weaker use of gestures to express intentions when the children were two years old. In a study by Shumway and Wetherby (2009), significant difference with large effect size was noted when gesture use between children with ASD was compared with groups of children with typical development (.93) and development delay (.97).This finding by and large supported the hypothesis that for mothers who experienced more severe depression level during pregnancy, the offspring will have a higher risk to exhibit deficit in communicative intention manifested in terms of gestures. The finding is consistent with previous research that there is a significant positive association between prenatal stress towards the end of gestation and incidence of ASD who

always have core deficits in the inventory of gestures (Beversdorf et al., 2005; Ronald, Pennell & Whitehouse, 2011; Shumway & Wetherby, 2009).

Emotion and Eye Gaze, and Communication

Eye gaze has been considered as a reliable means of expressing communicative intention. However, this component showed no association with antenatal depression while gesture use did. This may be possibly due to the coding scheme used in CSBS-DP. Under this component, the children's ability in gaze shift, following pointing and sharing positive emotions with the coordination of eye gaze, which are means for children to express communicative intention, were coded once in each sampling opportunity. In other words, the possible maximum score for each of the ability exhibited using eye gaze by the children is six. This criterion may be sufficient for evaluating for children with developmental disability as what CSBS-DP intended to. However, the criteria may be too lenient to detect subtle differences among children. This speculation is also supported by Shumway and Wetherby (2009) who reported that children with ASD had comparable performances with typically developing children in communicative acts with eye gaze, as well as acts coordinated with eye gaze and gestures and/or vocalizations. In other words, merely measuring the frequency of coordination of communicative means may not be sensitive to capture the children's ability. Instead, type and quality of the communicative acts should also be considered by measuring the duration of eye gazes directed to a person's face, and the time proportions that the children spent looking at a person's face throughout the behavior sampling procedure (Shumway & Wetherby, 2009).

Similar situations were also observed for the communication component. For each sampling opportunity in CSBS-DP behavioral sample, number of communicative acts expressed was documented up to three times. Also, each sampling opportunity was presented in a structured context, such that children were readily tempted to express behavioral

regulation twice. They were also allowed to freely express other types of communicative intention for each sampling opportunity. Under this standard scoring, behavioral regulation was coded in relatively larger proportions. Shumway and Wetherby (2009) revealed children with ASD had comparable performances for communicative acts for behavioral regulation and social interaction. They explained that behavioral regulation related more to the coordination of self and object, and less social sharing was required. For social interaction, children with ASD only had to coordinate face-to-face interaction between self and another person which is similar to the very rudimental reciprocal exchange of experience in newborn babies. The core problem of ASD lied in this aspect is the ability to direct attention among self, another person and an external entity, i.e., joint attention which was more advanced and developed slightly later in typical babies. In the study by Shumway and Wetherby (2009), although they followed the same sampling procedure in CSBS-DP, they employed another coding system by measuring the instances and rate of communicative acts exhibited in the sampling procedure and the proportions of different types of communicative intentions. This finer-grained analysis allowed them to capture the difference between children with ASD from their typical peers and those with developmental delay in conveying communicative intention.

Group Differences

Group differences between the depressed and non-depressed group in the total score of the social composite were not significant and its subsequent components. Mother-child dyads were assigned to the depressed and non-depressed groups based on the clinical cut-off. Depression was regarded as absent for mothers who scored below 10, while those who scored at or above the cut-off suggested presence of depression. This statistical analysis might not be able to reflect the continuous nature of the data to illustrate the potential dose-response relationship between antenatal depression and the children's social communication

developmental outcome. Few studies that investigated the association between antenatal depression and children's social communication outcome using a prospective longitudinal design were available to allow direct comparison with the present study. Nevertheless, this study was broadly consistent with the prospective longitudinal study conducted by O'Connor, Heron, and Glover (2002). In their study, EDPS was also used to measure mothers' antenatal depression level at the third trimester. Based on the clinical cut-off of EPDS considered, no independent association was found between antenatal depression and the children's behavioral and emotion problems, and psychiatric disturbances using parent reports on the Strengths and Difficulties Questionnaire (Goodman, 1997), after controlling for postpartum depression and other covariates when children were four years old.

Implications

Scientists in recent years have attempted to identify the neurological mechanism that can explain how prenatal stress affects children's social cognition. They proposed that the cerebellum, amygdala and the orbitofrontal cortex are regions in the brain that support social cognition and were found to have abnormal brain activity around these regions in different clinical groups such as children with ASD (Courchesne, 1997) and schizophrenia (Waddington et al., 1998). Bachevalier and Loveland (2006) proposed that the orbitofrontal cortex received messages from the amygdala to regulate social communication behavior, when the amygdale was stimulated to an external event. The cerebellum was responsible for regulating the emotional motor system in the brain, which governed the expression of emotions and other social behaviors. Mennes, Stiers, Lagae, and Van den Bergh (2006) further claimed that these brain regions were especially vulnerable to the embryo development due to influence of prenatal stress. In their study, children who experienced high level of stress prenatally had significantly lower performance in cognitive tasks that were related to the orbitofrontal cortex. Pathologies in the cerebellum were found in children with

social communication deficits, especially in children with ASD, in which less brain cells were observed in their cerebellum. Bailey et al. (1998) suggested the cause of this pathological finding might have occurred at or before 32 weeks of gestation. Beversdorf et al., (2005) provided further complementary support that prenatal maternal stress was a potential contributor to the pathologies observed in the cerebellum of children with ASD. The above data concluded that when children were exposed to prenatal maternal stress prenatally, the development of these brain regions may be disrupted, which in turn impaired children's ability to regulate and adjust social behaviors after birth or even in the long run.

The finding from the present study may also highlight the association between the prenatal stage and childhood mental health problems. Despite the purportedly strong genetic basis, this factor cannot fully explain the change in incidence of these mental health problems over the past years. Epigenetic factors such as prenatal maternal stress, in addition to genetic influence may provide a more satisfactory account.

In addition, gestures might be a very robust measure or predictor early on for communicative intention in various neurodevelopmental problems. Since the use of gestures indicated the onset of intentional communication in children (Bates et al., 1975), they provided early insight to children's social communication skills. They were also able to distinguish between different clinical groups of children with neurodevelopmental problems. For example, children with ASD used more deictic gestures to request than share interest, while children with Down Syndrome was able to use social gestures for social interaction and joint attention, but have more difficulty in using gestures for instrumental functions (Mundy, Kasari, Sigman, & Ruskin, 1995; Mundy, Sigman, & Kasari, 1994). People with schizophrenia also demonstrated limited nonverbal communication behavior, such as prosocial behaviors (e.g. head nodding) to encourage social interaction, and gestures to enrich the content of their verbal production (Troisi, Spalletta, & Pasini, 1998).

Limitations

Based on the experimental results, several characteristics of the study were worth pointing out which may provide some insight for future studies of similar kind. The prospective longitudinal design and face-to-face observation of experimental outcome were the strengths of this study. This eliminated the possible occurrence of maternal reporting bias. The children participated were evaluated in a semi-structured setting in which their communication intentive expression in observed natural environment can be elicited and performance can be compared against participants (Wetherby & Rodriguez, 1992).

Several limitations had to be considered in this study. Firstly, this study might be restricted by the standardized coding of the CSBS-DP behavioral sample. CSBS-DP was a very use-friendly tool and was proved to have good sensitivity and specificity in identifying children at risk of developmental disability for early intervention. However, a finer-grain coding scheme can be used to precisely capture all the communicative acts exhibited by the children for research purposes. Secondly, the sample size was small, which provided less statistical power for the results and interpretations made. The external validity to generalize the findings to the general population was also reduced due to the small sample size. Thirdly, there were other potential covariates which might be associated with communicative intention. These covariates included obstetric complications and sociodemographic factors.

Conclusion and Further Studies

This study provides a second line of evidence showing the detrimental effect of prenatal effect on children's social cognition development. Future longitudinal study can also make use of a prospective design to examine the longer term effect of prenatal stress on the offspring's social communication development. To examine more well-defined disorders, such as ASD, more specific assessment tool such as 'Autism Diagnostic Observation Schedule' (ADOS, Lord, Rutter, DiLavore, & Risi, 1999) which is designed to capture not

only the delayed development but also some atypical behavior manifested by children with ASD. This can in turn provide stronger and more valid evidence about the association.

References

American Psychiatric Association. (2012). *Diagnostic and statistical manual of mental disorders* (5th ed.). Manuscript submitted for publication.

Bachevalier, J., & Loveland, K.A. (2006). The orbitofrontal-amygdala circuit and self-regulation of social-emotional behavior in autism. *Neuroscience and Biobehavioral* Reviews, *30*(1), 97-117.

Bailey, A., Luthert, P., Dean, A., Harding, B., Janota, I., Montgomery, M., Rutter, M., & Lantos, P. (1998). *A clinicopathological study of autism*. *Brain, 121*, 889–905.

Baldwin, D. A., & Moses, L. J. (1997). The ontogeny of social information gathering. *Child Development, 67*(5), 1915–1939.

Bates, E. (1976). *Language in context: Studies in the acquisition of pragmatics.* New York: Academic Press.

Bates, E., Camaioni, L., & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill-Palmer Quarterly*, *21*(3), 205-226.

Bergink, V., Kooistra, L., Lambregtse-van den Berg, M.P., Wijnen, H., Bunevicius, R., Baar, A., & Pop, V. (2011). Validation of the edinburgh depression scale during pregnancy. *Journal of Psychosomatic research, 70*, 385-389.

Beversdorf, D.Q., Manning, S.E., Hillier, A., Anderson, S.L., Nordgren, R.E., Walters, S.E., Nagaraja, H.N., Cooley, W.C., Gaelic, S.E., & Bauman, M.L. (2005). Timing of prenatal stressors and autism. *Journal of Autism and Developmental Disorders, 35*(4), 471-478.

Buss, C., Davis, E.P., Muftuler, L.T., Head, K., & Sandman, C.A. (2010). High pregnancy anxiety during mid-gestation is associated with decreased grey matter density in 6-9-year-old children. *Psychoneuroendocrine Imaging, 35*(1). 14-153.

Campo, J.J., & Strinberg, C.R. (1981). Perception, appraisal, and emotion: The onset of social referencing. In M.E. Lamb & L.R. Sherrod (Eds.). *Infant social cognition: Empirical and theoretical considerations* (p.273-314). New Jersey: Lawrence Erlbaum Associates.

Centre for Disease Control and Prevention. (2011). *Autism spectrum disorders*. Retrieved April 9, 2012, from: http://www.cdc.gov/ncbddd/autism/index.html

Chow, M.L., Pramparo, T., Winn, M.E., Barnes, C.C., Li, H.R., Weiss, L., Fan, J.B., Murray, S., April, C., Belinson, H., Fu, X.D., Wynshaw-Boris, A., Schork, N.J., & Courchesne, E. (2012). Age-dependent brain gene expression and copy number anomalies in autism suggest distinct pathological processes at young versus mature ages. *PloS Genetics, 8*(3), 1-14.

Corcoran, R. (2000). Theory of mind in other clinical conditions: is a selective 'theory of mind' deficit exclusive to autism? In S. Baron-Cohen, Tager-Flusberg, H., & Cohen, D.J. (Ed.), *Understanding other minds: Perspectives from developmental cognitive neuroscience* (pp. 391-421). Oxford: Oxford University Press.

Courchesne, E. (1997). Brainstem, cerebellar and limbic neuroanatomical abnormalities in autism. *Current Opinion in Neurobiology, 7*(2), 269-278.

Cox, J.L., Holden, J. & Sagovsky, R. (1987). Detection of postnatal depression: Development of the 10-item edinburgh postnatal depression scale. *The British Journal of Psychiatry, 150*, 782–786.

Dager, S.R., Frideman, S.D., Petropoulos, H., & Shaw, D.W.W. (2008). Imaging evidence for pathological brain development in autism spectrum disorders. In A.M. Zimmerman (Ed.). *Autism: Current theories and evidence* (pp. 361-380). New Jersey: Human Press.

Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). London: SAGE Publications.

Goodman, R. (1997). The strengths and difficulties questionnaire: A research note. *Journal of*

Child Psychology and Psychiatry, 38(5). 581-586.

Hall, J.G. (2007). Twins and twinning. In D.L. Rimoin, J.M. Connor, R.E. Pyeritz, B.R. Korf (Eds). *Emery and rimoin's principles and practice of medical genetics* (pp.374-388). Philadelphia: Churchill Livingstone Elsevier.

Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research, 11*, 213–218.

Iverson, J., & Thal, D. (1998). Communicative transitions: There's more to the hand than meets the eye. In A. Wetherby, S. Warren, & J. Reichle (Eds.), *Transitions in prelinguistic communication* (pp.59-86). Baltimore: Paul H. Brookes.

Kinney, D.K., Munir, K.M., Crowley, D.J., & Miller, A.M. (2008). Prenatal stress and risk for autism. *Neuroscience and Biobehavioral Reviews, 32*, 1519-1532.

Langdon, R., Michie, P.T., Ward, P.B., McConaghy, N., Catts, S.V, & Coltheart, M. (1997). Defective self and/or other mentalising in schizophrenia: A cognitive neuropsychological approach. *Cognitive Neuropsychiatry, 2*, 167-193.

Laplante, D.P., Barr, R.G., Brunet, A., Du Fort, G.G., Meaney, M.L., Saucier, J.F., et al. (2004). Stress during pregnancy affects general intellectual and language functioning in human toddlers. *Pediatric Research, 56*(3), 400-410

Lee, A.M., Lam, S.K., Sze Mun Lau, S.M., Chong, C.S., Chui, H.W., & Fong, D.Y. (2007). Prevalence, course, and risk factors for antenatal anxiety and depression. *Obstetrics & Gynecology, 110*(5), 1102-1112.

Li, J., Vestergaard, M., Obel, C., Christensen, J., Precht, D. H., Lu, M., & Olsen, J. (2009). A nationwide study on the risk of autism after prenatal stress exposure to maternal bereavement. *Pediatrics, 123*, 1102-1107.

Lord, C., Rutter, M., DiLavore, P., & Risi, S. (1999). *Autism diagnostic observation schedule- generic*. Los Angeles, CA: Western Psychological Services.

Mennes, M., Stiers, P., Lagae, L., & Van den Bergh, B. (2006). Long term cognitive sequelae of antenatal maternal anxiety: involvement of the orbitofrontal cortex. *Neuroscience and Biobehavioral Reviews, 38*(8), 1078-1086.

Mitchell, S.K. (1979). Interobserver agreement, reliability, and generalizability of data collected in observational studies. *Psychological Bulletin, 86,* 376-390.

Mundy, P., Kasari, C., Sigman, M., & Ruskin, E. (1995). Nonverbal communication and early language acquisition in children with Down syndrome or normal development. *Journal of Speech and Hearing Research, 38,* 157-167.

Mundy, P., Sigman, M., & Kasari, C. (1994). Joint attention, developmental level, and symptom presentation in young children with autism. *Developmental and Psychopathology, 6,* 389-401.

Mundy, P., & Stella, J. (2000). Joint attention, social orienting and nonverbal communication in autism. In A.M. Wetherby & B.M. Prizant (Eds.), *Autism spectrum disorders: A transactional developmental perspective* (pp. 55-77). Baltimore: Paul H. Brookes Publishing Co.

Murray, L. & Cooper, P.J. (1997). Editorial : Postpartum depression and child development. *Psychological Medicine, 27,* 253-260.

O'Connor, T.G., Heron, J.H., & Glover, V. (2002) Antenatal anxiety predicts child behavioral/emotional problems independently of postnatal depression. *Journal of the American Academy of Child and Adolescent Psychiatry, 41*(12). 1470-1477.

Paul, R. (2007). *Language disorders from infancy to through adolescence* (3rd ed.). St Louis: Mosby.

Reddy, V. (2005). Before the third element. In N. Eilan (Ed.). *Joint Attention, Communication, and other minds: Issues in philosophy and psychology* (pp.85-109). Oxford: Clarendon Press.

Ronald, A., Pennell, C.E., & Whitehouse, A.J.O. (2011). Prenatal maternal stress associated with ADHD and autistic traits in early childhood. *Frontiers in Developmental Psychology, 1*, 1-7.

Shumway, S., & Wetherby, A.M. (2009). Communicative acts of children with autism spectrum disorders in the second year of life. *Journal of Speech, Language and Hearing Research, 52*(5), 1139-1156.

Stott, D. & Latchford, S. (1976). Prenatal antecedents of child health, development, and behavior. *Journal of the American Academy of Child Psychiatry, 15*(1), 161-191.

Striano, T., & Bertin, E. (2005). Social-cognitive skills between 5 and 10 months of age. *British Journal of Developmental Psychology, 23*(1), 559-586.

Trevarthen, C. (1979). Communication and cooperation in early infancy. A description of primary intersubjectivity. In M. Bullowa (Ed.), *Before speech: The beginning of human communication* (pp.321-347). London: Cambridge University Press.

Trevarthen, C. (2011). What is it like to be a person who knows nothing? Defining the active intersubjective mind of a newborn human being. *Infant and Child Development, 20*(1). 119-135.

Trevarthen, C. & Aitken, K.J. (2001). Infant intersubjectivity: research theory and clinical applications. *Journal of Child Psychology and Psychiatry, 42*(1). 3-48.

Trevarthen, C., Aitken, K., Papoudi, D., & Robarts, J. (1998). *Children with Autism: Diagnosis and Interventions to Meet Their Needs* (2nd ed.). London: Jessica Kingsley.

Troisi, A., Spalletta, G., & Pasini, A. (1998). Non-verbal behavior deficits in schizophrenia: An ethological study of drug-free patients. *Acta Psychiatrica Scandinavica, 97,* 109–115.

Waddington, J.L., Buckley, P.F., Scully, P.J., Lane, A., O'Callaghan, E., & Larkin, C. (1998). Course of psychopathology, cognition and neurobiological abnormality in schizophrenia: Developmental origins and amelioration by antipsychotics? *Journal of Psychiatric*

Research, 32, 179-189.

Walker, E.F., Grimes, K.E., Davis, D.M., & Smith, A.J. (1993). Childhood precursors of schizophrenia: Facial expressions of emotion. *American Journal of Psychiatry, 150*, 1654-1660.

Ward, A. J. (1990). A comparison and analysis of the presence of family problems during pregnancy of mothers of "autistic" children and mothers of normal children. *Child Psychiatry and Human Development, 20*(4), 279-288.

Wetherby, A., Allen, L., Cleary, J., Kublin, K., & Goldstein, H. (2002). Validity and reliability of the communication and symbolic behavior scales developmental profile with very young children. *Journal of Speech, Language, & Hearing Research, 45*, 1202–1218.

Wetherby, A.M., & Prizant, B.M. (2002). *Communication and symbolic behavior scales developmental profile—first normed edition.* Baltimore: Brookes.

Wetherby, A.M., Prizant, B.M., & Schuler, A.L. (2000). Understanding the nature of communication and language impairments. In A.M. Wetherby & B.M. Prizant (Eds.), *Autism spectrum disorders: A transactional developmental perspective* (pp. 109-141). Baltimore: Paul H. Brookes Publishing Co.

Wetherby, A.M., & Rodriguez, G.P. (1992). Measurement of communicative intentions in normally developing children during structured and unstructured contexts. *Journal of Speech and Hearing Research, 35,* 130-138.

Wetherby, A.M., Watt, N., Morgan, L., & Shumway, S. (2007). Social communication profiles of children with autism spectrum disorders late in the second year of life. *Journal of Autism and Developmental Disorders, 37,* 960-975.

Wetherby, A.M., Woods, J., Allen, L., Cleary, J., Dickinson, H., & Lord, C. (2004). Early indicators of autism spectrum disorders in the second year of life. *Journal of Autism and Developmental Disorders, 34*(5), 473-493.

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Appendix A. Informed Consent

孕婦身心健康狀況對後代溝通意欲影響之研究
An Investigation of Prenatal Mental Health Problem influence on Offspring's Communicative Intention in Toddler Years

研究資料
Research Information

本人是香港大學教育學院言語及聽覺科學部四年班學生，現正進行由香港大學言語及聽覺科學部助理教授杜潔森博士主理的一項有關孕婦身心健康對孩子溝通意欲影響的研究，研究對象為孕婦/母親。我們誠意邀請您的參加。

We would like to invite you to participate in a project entitled 'An Investigation of Prenatal Mental Health Problem influence on Offspring's Communicative Intention in Toddler Years' conducted by a Year four student in the Division of Speech & Hearing Sciences of Faculty of Education, The University of Hong Kong. This project is supervised by Dr. Carol To in the Division of Speech & Hearing Sciences.

研究目的 PURPOSE OF THE STUDY

研究旨在進一步深入探究孕婦身心狀況(焦慮及抑鬱水平)對後代溝通意欲的影響，借鑒兒童發展，孕婦精神健康及流行病學的研究成果，重點研究母親產前身心健康對兒童日後的溝通意欲，進而探索兒童溝通意欲與孕婦身心健康的聯繫。

This study aims to investigate if the incidence of prenatal mental health problem (in terms of anxiety and depression) impairs offspring's communicative intention. This study will focus on children at about age 2. Potential confounders, which include postnatal anxiety or depression level, birth weight of toddlers, and maternal age, will be controlled in the study.

研究程序 PROCEDURES

該研究前期已收集了孕婦產前的數據資料，包括：

(1) 身心健康問題調查表，在懷孕12周，20周以及36周三個階段及懷孕後通過有效問卷對中國孕婦進 行調查，
(2) 幼兒出生時重量，
(3) 個人信息，包括年齡；

上述前期資料將作為影響因素用於控制後期分析。

我們將繼續邀請符合要求的前期受訪父母參與研究。為展開更深入研究，我們希望通過家長調查問卷及直接觀察的方式跟進孩子的溝通意欲。數據收集過程將在孩子兩歲時進行。

我們將安排家訪，若您認為來香港大學言語及視聽科學部更為方便，我們也非常樂意為您安排（地址：(1)香港堅尼地城卑路乍街二十三號，堅尼地城中心三樓，或(2)香港西營盤醫院道 34 號菲臘牙科醫院五樓，言語及視聽科學部）。每次到訪，您或孩子的照顧者需填一份有關孩子的問卷，主要關於孩子日常溝通語言的方面。問卷需要大約五分鐘來填寫。除此之外，在孩子

與研究員自由玩耍時，我們將觀察孩子玩耍的過程及其溝通意欲等方面情況。上述自由玩耍的過程將持續三十分鐘左右並有視頻錄像。整個訪問大約需要四十五分鐘。
為感謝閣下的參與，在完成每一次的探訪後，我們會奉上一張**面值港幣$100 元的超市現金券**。
In the existing archive, the following antenatal measures had been collected which included;
(1) Mental health conditions and psychosocial characteristics in three time points of gestation (12, 20 and 36 weeks) and postnatal anxiety or depression level collected using validated questionnaires for Chinese population.
(2) birth weight of toddlers, and
(3) maternal age.
The above measures will be retrieved from the current database and serve as confounding control in later analysis.

Parents in the database who are potentially eligible will be invited. We would like to extend the study by following-up your child's communicative intention through a parental survey and direct observation. Data collection will be conducted when your child is at about 2 years old.
Home visits will be arranged. If you prefer visiting us at the Division of Speech and Hearing Science, we are also happy to arrange (Address: (1) 3/F, Kennedy Town Centre, 23 Belcher's Street, Kennedy Town, Hong Kong or (2) Division of Speech & Hearing Sciences, 5/ F Prince Philip Dental Hospital, 34 Hospital Road, Sai Ying Pun, Hong Kong). During each visit, you or your child's caregiver will fill out a questionnaire about the child, particularly about his or her language input from communication partners (e.g. parents) in daily life. The questionnaire will take approximately 5 minutes to fill in. In addition, we will evaluate the child's communicative intention with our investigator with a standardized test. This evaluation process will last for about 30 minutes and be video-recorded. The whole visit will take about 45 minutes in total.
As a token of appreciation, **a supermarket voucher of HK$100** will be given to you upon the completion of each visit.

潛在風險 POTENTIAL RISKS / DISCOMFORTS AND THEIR MINIMIZATION
沒有潛在風險
No potential risks or discomforts.

研究裨益 POTENTIAL BENEFITS
由於這個計劃屬研究性質，所以無須繳交任何費用。 此外，是項研究將能幫助我們了解孕婦身心狀況與子女溝通意欲的聯繫，對日後資源運用的決策有莫大的幫助。故此，你們的參與對香港孕嬰發展有極大的貢獻。
This project is part of an academic research, so it is free of charge. In addition, this research can provide valuable information about the association of prenatal mental problem (in terms of anxiety and depression) and offspring's communicative intention. This finding could have influential impact on clinical as well as political decision making about resources allocation. Your participation will be much appreciated.

個人私隱 CONFIDENTIALITY
在研究過程中所收集的資料(包括視象錄影)，只供作研究用途，個人資料將絕對保密。所有資料將以代碼記錄，以保障閣下的私隱。所有個人資料及視象錄影會在研究完成後五年被銷毀。

已刪取個人資料的文件檔案將會轉成一個檔案庫，無限期存放於研究員的辦公室，並鎖於櫃內。以備日後作更詳細之分析。只有有關研究的人員才可存取資料。你可要求檢視資料記錄，而我們可應你的要求刪除個人文件資料。

Information released by the participants to the investigator, including video recording, at the interview will be used for research purposes only. The information will not be disclosed to any other people. Codes, not names, are used on all test instruments to protect confidentiality. Participants will not be identified by name in any report of the completed study. All personal data including the video recording will be destroyed 5 years after the completion of the project. The questionnaire and related research data will be retained in anonymous form. The data will be stored in a locked cabinet in the office of the investigator and served as an archive for more detailed analysis in the future. Only the research-related personnel will have access to the data. You can review the video recording and erase the entire file or parts upon your request.

參與及退出 PARTICIPATION AND WITHDRAWAL

參與純屬自願性質，閣下可隨時提出終止，有關決定將不會引致任何不良後果。

Your participation in this project is voluntary. This means that you can withdraw from this project at any stage, for any reasons, without negative consequences.

疑問 QUESTIONS AND CONCERNS

如你對是項研究有任何疑問或查詢，請聯絡研究員蕭以嵐(電話：60868559，電郵：jylam@hku.hk)或言語及聽覺科學部助理教授杜潔森博士(電話: 28590591; 電郵: tokitsum@hku.hk)。如果你想知道更多有關研究參與者的權益，敬請聯絡香港大學及醫管局港島西醫院聯網研究倫理委員會 (電話：2255-4162) 。

If you have any enquiries, please contact the investigator Miss Eunice Siu (Tel: 60868559; Email: jylam@hku.hk) or the supervisor of this project, Dr. Carol To (Tel: 28590591; Email: tokitsum@hku.hk). If you have questions about your rights as a research participant, contact the Institutional Review Board of The University of Hong Kong/ Hospital Authority Hong Kong West Cluster (22554162).

謝謝你的參與。

Thank you very much for your interest and support.

孕婦身心健康狀況對後代溝通意欲影響之研究

An Investigation of Prenatal Mental Health Problem influence on Offspring's Communicative Intention in Toddler Years

同意書

Informed Consent

本人 * 同意／不同意 參與是項計劃及提供有關我的孩子 _____(孩子姓名)的資料。有關此計劃的資料以及要參與的測試活動 (包括附件中的內容及程序)，我已清楚明白。本人知道此項計劃所得資料是用作研究及/或教學用途。

I *consent / do no consent to participate in the above project and agree to provide information about my child _____(name of the child). The particulars of which – including details of tests and treatment procedures – have been explained to me and are appended hereto. The project is for the purpose of research and/or teaching and no fees have to pay for the treatment.

母親姓名:	研究員姓名:
Mother's name: _____	Investigator's name: _____
母親簽署:	研究員簽署"
Mother's signature: _____	Investigator's signature: _____
日期 :	日期 :
Date: _____	Date: _____

Appendix B. Demographic Information Questionnaire

孕婦身心健康狀況對後代溝通意欲影響之研究
家長問卷

請家長填寫以下問卷，所有個人資料均會保密。謝謝!

填寫人與幼兒之關係：　母子 / 母女 / 父子 / 父女 / 其他：_____
填卷日期：　_____年_____月_____ 日

請填上答案或在適當的空格上填上√號：

1. 幼兒共有多少個兄弟姊妹？
（不包括幼兒自己）　_____個
（幼兒排行第_____）

2. 幼兒主要由誰人照顧？
□ 父 / 母　□祖父 / 母　□傭人　□其他：_____

3. 幼兒與各家中成員所用的語言或方言
（可選超過一項）
a. 父母　□ 廣東話 □普通話 □英語 □其他：_____
b. 外 / 祖父母　□ 廣東話 □普通話 □英語 □其他：_____
c. 兄弟姊妹　□ 廣東話 □普通話 □英語 □其他：_____
d. 傭人　□ 廣東話 □普通話 □英語 □其他：_____

4. 幼兒曾否接受言語治療，物理治療，職業治療或其他治療？
□ 否
□ 是 (□言語治療 □ 物理治療 □ 職業治療 □ 其他：_____)

5. 幼兒家庭成員曾否有言語障礙？
□ 否
□ 是 (成員是：____ 其障礙是：_____)

6. 幼兒父親教育程度　□ 小學或以下　□中學　□專上、大學或以上

7. 幼兒母親教育程度　□ 小學或以下　□中學　□專上、大學或以上

8. 全家總入息：　□ 一萬元以下　□一萬至三萬元　□三萬元以上

問卷完，請交回機構負責人。謝謝!