

Maternal mental health and well-being during pregnancy linked to brain development and function in children

KEY POINTS:

- Research from GUSTO (Growing Up in Singapore Towards healthy Outcomes) shows that distress during pregnancy—even at mild to moderate levels—can affect the development and function of the child with respect to a wide range of cognitive and emotional outcomes.
- These outcomes include executive functions that emerge early in life and are determinants of both academic performance and mental health.
- As such, these functions are critical for successful passage through life, and its impairment places the individual at lifelong disadvantage.
- Importantly, S-PRESTO (Singapore Preconception Study of long-Term maternal and child Outcomes) findings show that relevant levels of maternal mental health problems pre-date conception and remain stable over the course of pregnancy and following birth.
- Interventions need to focus on the mother and infant, with parental needs being supported even before the child is born.



Why are maternal mood and mental health important?

Pregnancy is a life-changing event. Some degree of emotional impact in pregnancy is inevitable for all women. How that manifests positively or negatively depends on many contextual factors. Many women experience distress, anxiety or depression during and after pregnancy. Poor prenatal maternal mental health is associated with poor obstetric outcomes, but also has major consequences beyond that.

In the GUSTO study, up to 40% of mothers reported feeling depressed or anxious during pregnancy, from mild to more severe ranges,¹ consistent with previous Singaporean reports.² US studies show that these levels of problems are sufficient to impair the psychological and social function of the mother.^{3,4}

North American and GUSTO researchers have shown that high levels of perceived stress, depressive symptoms and/or anxiety during pregnancy affects the child's brain development during the pre- and post-natal periods, resulting in patterns of structure, connectivity and electrophysiology that may affect behavioural problems^{1,5-14} including executive functions such as working memory, attention, self-regulation, impulsivity and sensory processing.^{15,16} Importantly, language development is similarly affected, especially by a poor level of positive mental health and inadequate parent-child interactions. These effects then compromise the child's school readiness and subsequent journey through school and into society.^{17,18}



Maternal stress during pregnancy can affect a child's readiness for school.

Nearly



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The total proportion of affected pregnancies in mothers with mild to severe mood disturbance is potentially as high as 40%.^{18,19} Importantly, we observe effects on brain development that are apparent at birth in GUSTO newborns^{8,9} that imply a biological signal from the mother directly influencing infant brain structure and connectivity. Poor maternal mental health then persists following birth to influence the quality of parental care. Studies in the UK show that the father's mental health is also a source of influences, however, this effect is primarily due to the effect of paternal mood on maternal well-being.

GUSTO research has uncovered another dimension to the association between maternal mental health and child development—positive mental well-being.²⁰ Positive health is not simply the absence of symptoms. Positive maternal mental health provides the focus, energy, commitment and judgement to provide the best parenting. GUSTO researchers show that positive maternal mental health is essential for the forms of parenting that 'nurture' the development of executive functions and social skills.²⁰

The finding that a child's development is mediated in part by maternal *prenatal* mood, however, indicates that the observed effects are being exerted through biological rather than environmental mechanisms.^{8,9} Postnatal maternal mood remains an important component in a child's development.

This highlights the value of promoting mental health among all pregnant women, in addition to targeted interventions for those needing support.

Brain development and function

Maternal mental health and well-being are directly associated with the development of infant brain regions critical for early cognitive, emotional and social function. These functions include the ability to consciously control behaviour; flexible thinking that forms the basis for planning and problem solving; the ability to regulate attention and process information; the self-regulation of emotional states; goal setting, planning and organisation.²¹ These so-called “executive functions” are absolutely central to acquiring knowledge and solving problems, and are therefore critically important in school, work, and other aspects of daily life. Furthermore, these skills promote the psychological resilience required to meet the inevitable adversities of life.²² Impairments to executive function potentially mean greater lifelong risks of disorders in learning, behaviour and mental health; more brushes with the justice and welfare system; and also limits school success, and the development of stable relationships and lifetime earnings and the individual’s positive contributions to society.²³

The optimal development of executive functions in **early life** is the best way to reduce the risks of lifelong downstream disadvantages. Given that neurodevelopmental pathways generally become less easily reversible, because of the nature of brain development, as a child gets older, **interventions need to occur as early as during pregnancy and the early postnatal period.**

Implications for policy and for service provision

The focus on women’s mental well-being before pregnancy through to after birth is essential for effective long-term benefit across generations. These interventions must be acceptable to pregnant women facing challenges, particularly those in the workplace or of low socioeconomic position. Interventions must be scalable, affordable and effective. This is presently a significant gap in Singapore and worldwide.

Specifically, all pregnant women in Singapore should be formally screened for mental health and well-being. Those with mild



Executive function is central to the ability to learn and promotes psychological resilience.

to moderate mood disorders or poor levels of positive mood should not be ignored, they merit support of welfare and mental health services. Screening must be coupled to accessible services that will require innovation.

There are ways to reduce stress vulnerable women may feel during pregnancy. While psychiatric interventions have their place, they are best suited to individual treatment and need not be the primary approach. Scalable, population-based approaches such as social, psychological and financial support would help reduce the impact of stress on women, especially those of lower socioeconomic status.

Finally, there is evidence from the S-PRESTO study that women’s mood before conception track into pregnancy and after birth so that a proactive approach to the mental health of all women in the reproductive age group should be considered.²⁴

RECOMMENDATIONS:

- Proactive approach to mental health of all women in reproductive age group should be considered.
- Provide interventions that are scalable, affordable and effective to address the gaps in Singapore.

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