



Immobility reaction at birth in newborn infant



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ABSTRACT

Objective: To describe an immobility reaction (IR) that was not previously reported at or immediately after birth in human newborns.

Method: We analyzed 31 videos of normal term vaginal deliveries recorded from Time 0 of birth defined as the moment that lies between the birth of the thorax and the pelvis of the infant. We searched for perinatal factors associated with newborn's IR.

Results: IR at birth was observed in 8 of the 31 newborns. The main features of their behavior were immobilization, frozen face, shallow breathing and bradycardia. One of the 8 newborns had sudden collapse 2 h after birth. We found significant relationships between maternal prenatal stress (PS) and IR ($p = .037$), and a close to significant one between infants' lividness at Time 0 and IR ($p = .053$). The first breath of the 31 newborns occurred before and was not associated with the first cry ($p < .001$).

Discussion: The main features of IR at birth are similar to those of the universal most severe response to severe stress or danger. The relationship with PS suggests that children who had IR at birth might be at risk for similar disorders as those associated with PS. Sudden neonatal collapse of one of the IR newborns needs further research to determine if they are at risk for sudden infant death syndrome.

Conclusion: This first report of an IR reaction at birth in human infants could open up new paths for improving early neonatal care. Further research is needed for maternal PS, stress hormones, umbilical cord blood pH measurements in IR newborns. The challenge of education and support for parents of IR newborns is outlined.

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1. Introduction

In a research project on antenatal education for parenting, we filmed 75 term births to study the very early interactions between the newborn and his mother and father. While preparing a DVD for educational purpose, we observed a particular behavior of some newborns which has not been reported before as far as we know. These newborns remain at birth or shortly after in a state of immobility that ends with a startle followed by cries and limb movements. We found numerous publications and several terms to refer to a behavior of similar immobility in animals and humans: feigned death in wild

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animals attacked by a predator (Darwin, 1883), catatonia, animal hypnosis, tonic immobility, or freezing in laboratory animals (Hoagland, 1928; Gallup & Maser, 1977), fright paralysis in domestic animals (Leyhausen, 1967), prolonged immobility in experimental studies of wild rodents when exposed to sudden and intense stress or put in the presence of a predator (Hofer, 1970), fear paralysis reflex (Kaada, 1987), freezing in unloved infants exposed to strange situation (Fraiberg, 1982) and in young adults exposed to CO₂ enriched air (Schmidt, Richey, Zvolensky, & Maner, 2008), and tonic immobility in reports from human adults and children victims of physical or sexual assault (Suarez & Gallup, 1979). Whatever the term used, immobilization is considered as the most intense defensive response of animals and humans to severe stress or predator. During immobilization, the amygdala elicits cardiovascular changes and discharge of stress hormones into the hypothalamic–pituitary–adrenal (HPA) axis to prepare response of the flight, fight or freeze system (LeDoux, 1996; Blanchard, Hynd, Minke, Minemoto, & Blanchard, 2001).

The present study was designed to determine whether the immobility behavior we observed in several newborns at birth was the intense defensive response to threat described in most animal species and man and to search for perinatal associated factors. To address these issues, we describe this behavior in detail, comparing it to similar behavior published in the literature, discussing the significance, and drawing the implications it may have for child development, perinatal care, and parental education. For that purpose, the videos previously recorded for the research project on antenatal education were used as well as the obstetric records of the mothers and their newborn infants.

2. Methods

2.1. Participants

Our project of studying the early interactions between the neonate and his parents for the purpose of improving antenatal parenting education was presented from December 1999 to May 2003 in a continuous series 294 pregnant women at the time of their antenatal appointments with the approval of the Ethics Committee of the Hospital. There were four refusals, two for religious reasons and two for personal reasons by the child's father. The only inclusion criteria for video recordings of births were the availability and ability of a member of the obstetric team or the father of the child to manipulate the camera and keep it focused on the neonate's face. No professional cameraman was allowed into the delivery room so as not to disturb the intimacy of the parents and their infant. We were thus able to film 75 births with the written consent of both parents to use the videos for scientific and educational purposes.

For the present study, we selected the videos that were filmed continuously from Time 0 of birth defined as the moment that lies between the birth of the thorax and the pelvis of the infant. Other inclusion criteria of the videos were gestational age 37–41 weeks, spontaneous or induced labor with or without epidural analgesia, cephalic presentation, normal fetal heart monitoring, spontaneous vaginal delivery, clear amniotic fluid, a 5 min Apgar score at or above 7, newborn placed on the abdomen of the mother for immediate skin-to-skin contact. Exclusion criteria were maternal hypertension, smoking, gestational diabetes, general anesthesia, breech presentation, instrumental or cesarean delivery, and resuscitation or malformation of the newborn. The sample for this study was 31 infants, 21 boys and 10 girls.

The level of maternal education was rated low for primary not completed or completed and secondary not completed, and high for secondary completed or higher. Adverse life events reported by mothers during pregnancy and noted in their obstetric file were considered as maternal prenatal stress (PS): long-term infertility, unwanted pregnancy, bleeding, excessive fear of an abnormal child, pregnancy following perinatal loss or abortion, domestic violence, abandonment by the father of the child, death or serious illness of a loved one during pregnancy.

2.2. Procedure

During labor, continuous fetal heart rate monitoring was used with an external Doppler device or a fetal scalp electrode once the amniotic membranes were ruptured. At birth, newborns were systematically placed on the mother's chest and rubbed dry as quickly as possible. Umbilical cord pulsations, respiratory movements, and skin color changes were monitored until the first cries of the infant. The umbilical cord was cut when the pulsations had stopped.

The video analysis was performed using the Edius Neo mounting software (Grass Valley, USA) which enables frame by frame analysis of selected sequences and visualization of the sound intensity on the sound mixer display. Two teams of independent judges (PVR, MP and FC, DD) noted on the timeline delays between Time 0, the first breath and first cry of the newborns, the beginning of rubbing, the beginning and the duration of the immobility of the newborn, and the presence of lividness. The first breath was located by a sound like inhaling water, a peak of the waveform on the video software timeline, and a brief opening movement of the mouth like that of the breaststroke swimmer when lifting his head out of the water to take in air.

2.3. Statistics

Statistical analyses were conducted using the IBM SPSS 20 software. *p* values were considered as significant when <0.05. The randomness of the sample was tested by comparing the sex ratio (SR) of children in the study ($N=31$, $SR=2.1$) with that of the children born between 1999 and 2003 ($N=66,250$, $SR=1.05$) in the Province of Hainaut (Belgium) where mothers

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