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Premature Birth and Motor Milestones: The Importance and Use of Adjusted Age

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Abstract

In early childhood, gross motor development is assessed and followed in accordance to motor milestones, which provide a timeline for when children typically acquire various movement skills. Motor milestone acquisition reflects and depends on the development of the central nervous system. However, commonly used motor milestone charts are based on the development of children born full-term. While children born premature acquire motor milestones in the same sequential nature as children born full-term, they often exhibit delays in the emergence of motor milestones. These delays are often attributed to immaturity of the central nervous system. As such, it is important when monitoring the motor development of children born preterm, that time for the system to catch up developmentally to their full-term peers is taken into account and timelines adjusted accordingly. Adjusting for age is a method to account for prematurity, by subtracting how preterm a child was born from their chronological age. It is important for parents and health professionals alike to understand how to calculate adjusted age, which supports the importance of creating and disseminating resources in the area. This infographic and accompanying summary provides information on adjusting for age for motor milestone acquisition in a premature population. **Health & Fitness Journal of Canada 2018;11(1):15-18.**

Keywords: Preterm Birth, Motor Milestones, Adjusted age, Infographic

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Introduction

Children's early motor development is observed and monitored over time according to established motor milestones, which provide a framework as to which movement tasks are expected to be accomplished and when (Gerber et al., 2010). The predictable, sequential manner and mild variability of gross motor milestone attainment offers a way for physicians and allied health professionals to detect potential motor impairments if a child deviates significantly off the expected timeline (Allen and Alexander, 1990). However, commonly available milestone charts are based on typically developing children born full-term (37-42 weeks gestation), and do not adequately represent the developmental trajectories of children born preterm (<37 weeks gestation). Research has shown that children born young for date may acquire motor milestones at later chronological ages (i.e., the age in months or years from date of birth) compared to their peers born full term. The early delays exhibited in motor milestone acquisition in the preterm population are often attributed to immaturity of the central nervous system, the maturity of which determines motor development (Wilson and Craddock, 2004). With preterm birth, the central nervous system has less time to mature in-utero, and therefore children born preterm

require additional time for their system to catch up to that of their full-term peers (Wilson and Cradock, 2004).

Adjusted Age

Infants born premature develop milestones sequentially just as term infants do (e.g., sitting unassisted is acquired before walking unassisted). However, using adjusted age as it relates to motor milestone attainment is recommended as a more appropriate measure of developmental status compared to chronological age (Allen and Alexander, 1990). Adjusted age of a child born preterm takes into consideration the age that the child would be if carried to his/her full-term due date (40 weeks gestational age). While adjusted age is the preferred term, other terms that have been used synonymously are gestation-adjusted age, post conceptual age, and term-equivalent age (D'Agostino, 2010).

Calculating Adjusted Age

Adjusted age is calculated by subtracting how many weeks preterm (of 40 weeks gestational age) the child was born, from the child's chronological age in weeks (American Academy of Pediatrics, 2004). For example, a child born at 34 weeks gestational age was born six weeks early (40 minus 34), and the child's adjusted age would be six weeks younger than their chronological age. If the chronological age of the child in this example is 12 weeks, their adjusted age would therefore be six weeks (12 minus 6). Age can also be adjusted in months, by simply dividing the number of weeks preterm the child was born by four weeks/month, and subtracting this number from the child's chronological age in months. For example, if the child from the above example was born 1.5 months preterm (6 weeks divided by 4

weeks/month), and therefore at the chronological age of 12 months, this child would have an adjusted age of 10.5 months (12 minus 1.5). As the calculations of adjusted age are based upon how early a child was born, adjusted age is a method used only for children born preterm (American Academy of Pediatrics, 2004).

Monitoring Motor Milestones

Today, the age of an infant born premature is adjusted across almost all outcomes in follow-up monitoring, as it is accepted that adjusted age offers a more accurate reflection of the developmental expectations for a child born young for date at a given point in time (D'Agostino, 2010). This is particularly salient for gross motor milestones. Adjusted age offers more accurate reflections of the gross motor skills of children born preterm in early life (D'Agostino, 2010). Adjusting for age is an important consideration when monitoring a preterm population, as it has the potential to impact interpretations of physical growth and motor milestone achievement, which can influence level of care, and future accessibility to services (D'Agostino, 2010).

Limitations

Evidence of adjusting age for prematurity has been documented in practice as early as the 1930's (D'Agostino, 2010), and remains the recommended practice of today. However, the field still lacks a single concrete evidence-based recommendation to follow when adjusting for age in children born preterm (Wilson and Cradock, 2004), and there are still debates as to the optimal level of correction (den Ouden et al., 1991; Lems et al., 1993). There is also debate as to

how long age should be adjusted for, as opinions on when use of adjusted age should be ceased are also somewhat heterogeneous (Wilson and Cradock, 2004). Varied opinions include such notions as: infants born earlier and lighter should be corrected for longer than infants born heavier and later (Lems et al., 1993), and recommendations on the maximum length of full adjustment have included 1 y, 1.5 y, 2 y, and as late as 3 y (American Academy of Pediatrics, 2004; D'Agostino, 2010; den Ouden et al., 1991; Lems et al., 1993). Using full adjustment of age for motor skill assessment continues to be of preference for a minimum of one year (D'Agostino, 2010; den Ouden et al., 1991; Wilson & Cradock, 2004). By two years, it is suggested that children born preterm may 'catch up' to their full-term peers to a point that adjusted age may no longer be warranted (den Ouden et al., 1991). Furthermore, as there is wide variability in the motor development of typically-developing full-term two year olds (den Ouden et al., 1991), the use of adjusted age at two years may no longer be an appropriate tool to use for tracking adequate growth and development of children born premature.

Knowledge Mobilization

An important component of mobilizing evidence-based information for parents of children who are born preterm is information on adjusted age. For example, 62% of parents of children born preterm were shown to be unaware of adjusting their child's age or incorrectly calculating it (Fletcher et al., 2017). This is an important finding because research has demonstrated that parents who can properly adjust their child's age based upon gestation are more likely to anticipate the child's growth and

developmental patterns based on adjusted age (Fletcher et al., 2017). In contrast, improper or lack of adjustment of age can lead parents to believe their child's motor development is delayed, prompting unwarranted concern. This supports the need for simple informational resources on age adjustment as part of the comprehensive care approach for children born preterm (Fletcher et al., 2017). We recommend that adjusted age be used to track the growth and motor development of children born preterm by health care professionals and parents alike. Promoting the distribution of resources (e.g., see the associated infographic) can be a beneficial tool for parents of children born premature to refer to, as well as for use by allied health professionals and qualified exercise professionals.

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Authors' qualifications

The authors qualifications are as follows: Beth Rizzardo, BKin; Shannon Bredin, MSc, PhD.

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