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Are sporadic fidgety movements as clinically relevant as is their absence?

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ABSTRACT

Background: Infants with normal fidgety movements at 3 to 5 months after term are very likely to show neurologically normal development, while the absence of fidgety movements is an early marker for an adverse neurological outcome, mainly cerebral palsy (CP). The clinical significance of so-called sporadic fidgety movements (i.e., fidgety movements occur isolated in a few body parts and are of 1- to 3-second-duration) is not yet known.
Aims: Our objective was to determine whether infants who had developed CP and had sporadic fidgety movements have a better outcome than infants who did not have fidgety movements.
Study design: Longitudinal study. Retrospective analysis of prospectively collected data.
Subjects: 61 infants who developed CP (46 male, 15 female; 29 infants born preterm; videoed for the assessment of movements and postures at 9 to 16 weeks post-term age).
Outcome measures: The Gross Motor Function Classification System (GMFCS) was applied at 3 to 5 years of age.
Results: There was no difference between children diagnosed with CP who had sporadic fidgety movements at 9 to 16 weeks post-term age (n = 9) and those who never developed fidgety movements (n = 50) with regard to their functional mobility and activity limitation at 3 to 5 years of age. One infant had normal FMs and developed unilateral CP, GMFCS Level I; the remaining infant had abnormal FMs and developed bilateral CP, GMFCS Level II.
Conclusions: There is no evidence that the occurrence of occasional isolated fidgety bursts indicates a milder type of CP.

1. Introduction

After the assessment of general movements (GMs) was introduced [1], its main field of application has been the prediction of cerebral palsy (CP) [2,3]. Apart from abnormal cramped-synchronised GMs around term age [1,4], it is particularly the absence of fidgety GMs at 3 to 5 months after term that is an early marker for CP [1,5]. Fidgety movements (FMs) are typically of small amplitude and moderate speed with a variable acceleration of small movements of the neck, trunk and limbs in all directions in the awake infant, except during fussing and crying [1,6]. They may be found as early as 6 weeks post-term but usually occur at around 9 weeks and are present until an age of 20 weeks or even a few weeks longer, by which time intentional and antigravity movements occur and start to dominate [1,6,7]. This age range holds true for both term and preterm infants after correcting the age [8–10]. The temporal organisation of FMs varies with age: initially, they occur as isolated events before gradually increasing in frequency until finally, by the age of 16 to 20 weeks, they subside [11]. Gross movements such as kicking, swipes, wiggling–oscillating arm movements, movements to the midline or antigravity movements may occur together with FMs. That is to say that FMs are superimposed on other movements or other movements may occur during the pauses between FMs, or both [7].

In typically developing 9- to 15-week-old infants continual FMs (score: F++) or intermittent FMs (score: F+) are obligatory [10–13]; for definitions and illustration see Table 1 and Fig. 1. Usually, the temporal organisation of FMs is rather robust and could not be significantly changed by different kinds of manipulation such as presenting visual or acoustic stimuli, approach of the caregiver, or hemi-loading of the infant [12,13]. Only the presentation of high-contrast faces caused a decrease or stop of FMs though for no longer than 20s [12].

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Table 1
Temporal organisation of fidgety movements (FMs) [11–13].

Classification	Score	Definition
Continual FMs	F++	FMs occur frequently but are interspersed with very short (i.e. 1–2 s) pauses (Fig. 1, line C). As FMs are by definition GMs, they involve the whole body, particularly the neck, shoulders, wrists, hip, and ankles. Depending on the actual body posture, especially on the position of the head, FMs may occur asymmetrically. If the infant is focused on the environment, his or her FMs are mainly displayed in the hips and ankles, and are less obvious in the shoulders and wrists.
Intermittent FMs	F+	Although FMs occur in all body parts, the temporal organisation differs from F++. Here, the pauses between FMs are prolonged (1–10 s), which creates the impression that FMs are only present during half of the observation time (Fig. 1, line B).
Sporadic FMs	F+/−	Sporadic FMs (Fig. 1, line A) are interspersed with long pauses (up to 1 min). FMs may occur isolated in a few body parts and are of very short duration (1 to 3 s).
Absence of FMs	F−	No FMs can be observed, although other movements may occur.

Infants with normal intermittent or continual FMs are very likely to show neurologically normal development, even if they belong to a high-risk group for maldevelopment. Several large-scale studies reported sensitivities of 95% to 100% and specificities of 96% to 98% for the assessment of FMs [1,14,15]. If FMs are totally absent at 3 to 5 months (score: F−), the infant has a high risk for neurological impairments, mainly spastic uni- or bilateral CP [1,5,14–19], but also dyskinetic CP [20]. Apart from the absence of FMs, a cramped-synchronised movement character, repetitive opening and closing of the mouth as well as abnormal finger postures are more common in infants who later develop CP with severe functional limitations [18,19] as classified on the Gross Motor Function Classification System (GMFCS) [21]. By contrast, a normal posture, absent FMs, and an abnormally jerky but neither monotonous nor cramped-synchronised overall movement character were identified in infants who were later classified at GMFCS Levels I or II (i.e. mild functional limitations) [18,19].

During the second month after term FMs may occur sporadically, i.e. as brief and isolated events. At 3 to 4 months, however, such sporadic FMs (score: F+/−; Table 1, Fig. 1A) are considered age-inadequate. In fact most of the researchers included 3- to 4-month-old infants with sporadic FMs in the group of absent FMs, without either mentioning such a distinction or giving it any further attention [22,23]. Mutlu et al. [22] reported that the almost full agreement between three scorers on 30 individuals assessed three times was slightly reduced as one infant (recorded at 12 weeks) was inconsistently scored by one observer, and this disagreement was due to sporadic vs. absent FMs. The authors discussed that such a disagreement in inter-rater and intra-individual reliability would be irrelevant in a clinical setting "as sporadic FMs would have been as much a cause of concern as the absence of FMs" [22, p. 216]. Hamer et al. [24] described sporadic FMs in ten out of 44 high-risk-infants, of whom only one individual was diagnosed with (unilateral) CP, GMFCS Level II. The remaining nine individuals with sporadic FMs were annotated as no-CP at the 18-month-outcome assessment. However, the authors alluded to the fact that 18 months is relatively early for determining the functional and cognitive outcomes [24]. Therefore, it still remains to be seen if a distinction between absent and sporadic FMs is of clinical significance.

In order to shed light on this blind spot, we re-assessed our prospectively collected footage of infants later diagnosed with CP, and paid special attention to the temporal organisation of their FMs. The aims of our study were (1) to elaborate on sporadic FMs (i.e. duration of single bursts, interval duration between bursts); (2) to analyse the extent to which the temporal organisation of FMs was associated with the concurrent motor repertoire; and (3) to analyse to what extent the temporal organisation is related to the functional mobility and activity limitation at 3 to 5 years of age as classified on the GMFCS.

2. Methods

2.1. Participants

The study comprised 61 children — 46 boys (75.4%) and 15 girls (24.6%) — who had been admitted to (a) the Department of Rehabilitation at the Children's Hospital of the Fudan University, Shanghai, or (b) the Department of Pediatrics, Nanjing Maternity and Child Health Hospital, Nanjing Medical University, PR China between September 2003 and June 2010, and had been diagnosed with spastic CP at the age of 2 to 3 years. The reasons for admission were the following: (a) a high risk for neurodevelopmental disorders due to preterm birth or perinatal asphyxia at term; (b) abnormal findings at paediatric examinations; or (c) parental concerns. Some of the participants had also been included in a previous study [19]. The inclusion criteria for this study were (i) that their motor performance had been videoed at around 4 months of age and (ii) that their gross motor function had been classified by means of the GMFCS [21] at 3 to 5 years of age. Table 2 provides the clinical characteristics of the participants.

2.2. Procedure and assessments

Five- to 7-minute video recordings were made prospectively of the spontaneous motility of each infant at 9 to 16 weeks post-term age. The recordings were made during periods of active wakefulness between feedings, with the infant dressed in a bodysuit, lying in supine position [25]. The video recordings were evaluated retrospectively by

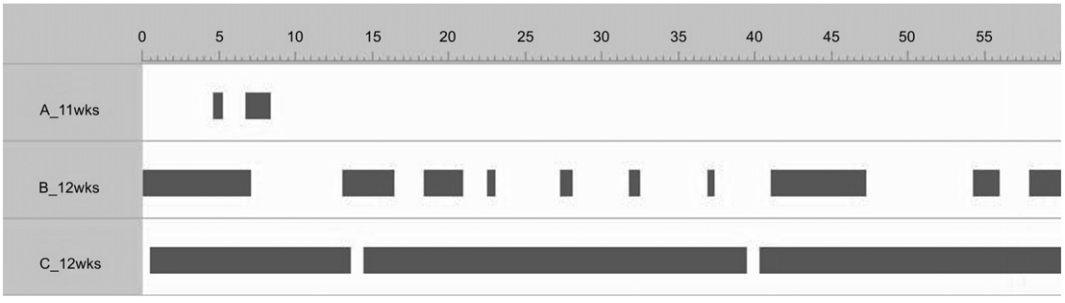

Fig. 1. Temporal organisation of FMs; the duration of the actograms is 60 s. Line A = 11-week-old infant with sporadic FMs (score F+/−); line B = 12-week-old infant with intermittent FMs (score: F+); line C = 12-week-old infant with continual FMs (score: F++).