

# Rhythmic Movement Disorder in Children

By Timothy F. Hoban, MD

## ABSTRACT

*How should sleep-related rhythmic movements in children be assessed and treated? Rhythmic movement disorder (RMD) represents an unusual variety of childhood parasomnia characterized by repetitive motion of the head, trunk, or extremities, which usually occurs during the transition from wakefulness to sleep or arises during sustained sleep. Although the condition most often affects infants and toddlers in a transient and self-limited fashion, the condition occasionally persists in a problematic fashion, which may nevertheless be amenable to treatment. Since RMD may occasionally cause injury or resemble nocturnal seizure, prompt recognition, and appropriate management on the part of the clinician is essential. This article will examine the spectrum of RMD in children, including their common clinical manifestations; data regarding their epidemiology and natural history; the role of polysomnography, electroencephalography; and other diagnostic testing. Potential causes of the condition and available methods of treatment are also examined.*

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## INTRODUCTION

Parasomnias are undesirable physical or mental phenomena that occur during or in relation to sleep. They are common in children, where common varieties include sleepwalking, nightmares, and night terrors.

Rhythmic movement disorders comprise the group of parasomnias where repetitive and well-stereotyped movements are the defining clinical characteristic. This article will describe the common varieties of rhythmic movement affecting children, examine the mechanisms postulated to underlie the condition, and review available options for treatment.

## CLINICAL MANIFESTATIONS OF RHYTHMIC MOVEMENT DISORDER

Rhythmic movement disorder (RMD) is characterized by recurrent episodes of well-stereotyped, rhythmic movements that occur in association with sleep. The movements may involve the head, neck, trunk, or limbs either independently or in combination, typically at a frequency of 0.5–2 Hz. One unusual feature of RMD is the fact that the characteristic movements often span sleep states. Movements may often commence during wakefulness or drowsiness and either persist or recur during sustained sleep.

RMD was independently described in 1905 by Zappert<sup>1</sup> and Cruchet.<sup>2</sup> Cruchet described sleep-related rhythmic movements in two boys of 3 and 6 years of age, using the term “rhythmie du sommeil” to describe the prominent rolling movements of the body observed in both boys.<sup>2</sup> Zappert was the first to use the term “jactatio capitis nocturna,” which continues to be used as a synonymous term for headbanging.<sup>1</sup>

Over time, several distinct varieties of rhythmic movement have been characterized in children. Headbanging refers to vigorous anteroposterior movements of the head, most commonly onto the pillow or mattress and less frequently into a wall or headboard.<sup>3</sup> The movements usually occur while the child is in a supine or prone position but have been occasionally reported to occur from the sitting position.

Headrolling tends to occur in the supine position, and is characterized by regular lateral rotation or rolling of the head and neck. Some children may place their hands on their head during these episodes, resulting in concurrent movement of the flexed arms and entire upper trunk during headrolling.

Body rocking is a dramatic variety of RMD in which the child rises upon hands and knees and rocks the entire body vigorously in an anteroposterior direction. A distinctive humming or moaning vocalization often accompanies the observed movements.

Other occasionally encountered varieties of RMD may include body rolling, leg rolling, and leg banging.

## EPIDEMIOLOGY AND NATURAL HISTORY OF RHYTHMIC MOVEMENT DISORDER

RMDs are common during the first year of life, when a majority of infants exhibit rhythmic motor activity during drowsiness or sleep on at least an occasional basis. The condition seldom develops after 18 months of age.<sup>3</sup> The overall prevalence of RMD in a group of 212 Swedish children followed longitudinally declined from 66% at 9 months of age to 6% at 5 years of age.<sup>4</sup> In this cohort, body rocking was the most common variety of RMD in younger infants, whereas rhythmic head movements were the most frequent RMD beyond 1 year of age (Figure 1).

Although RMD usually resolves spontaneously between 2 and 5 years of age, the condition persists in a small minority of children.<sup>5</sup> Laberge and colleagues<sup>6</sup> found persistent

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body rocking in 3% of 1,353 children at 13 years of age. The frequency with which RMD persists into adulthood is unknown; however, most adults with RMD date the onset of symptoms to infancy or early childhood.<sup>7-9</sup> Familial clustering of RMD has also been reported.<sup>10</sup>

**COMORBIDITY OF CHILDHOOD RHYTHMIC MOVEMENT DISORDER**

RMD most often affects infants and young children who are otherwise healthy. Nevertheless, rhythmic movements are sometimes associated with developmental disabilities, such as mental retardation or autistic spectrum disorders.<sup>3</sup> In the disabled population, rhythmic movements during wakefulness may be quite prominent, and include headbanging or rocking to a degree that occasionally becomes self-injurious.

Acquired RMD appears to be uncommon in children, but has been reported in adults following herpes encephalitis and head trauma.<sup>5,11</sup>

Diurnal headbanging may occur in the context of tantrum or self-abusive behavior, but typical sleep-related rhythmic movements are seldom associated with obvious psychiatric comorbidity. Despite speculation that RMD might represent a form of anxiety relief—Benjamin Spock once described rhythmic movements as a “common nervous symptom”<sup>12</sup>—few studies have systematically examined the potential link between RMD and other behavioral disorders. In the largest pediatric series to address this area, Laberge and colleagues<sup>6</sup> identified high anxiety scores among 42 children with bodyrocking compared with 1,296 children with no history of parasomnias.

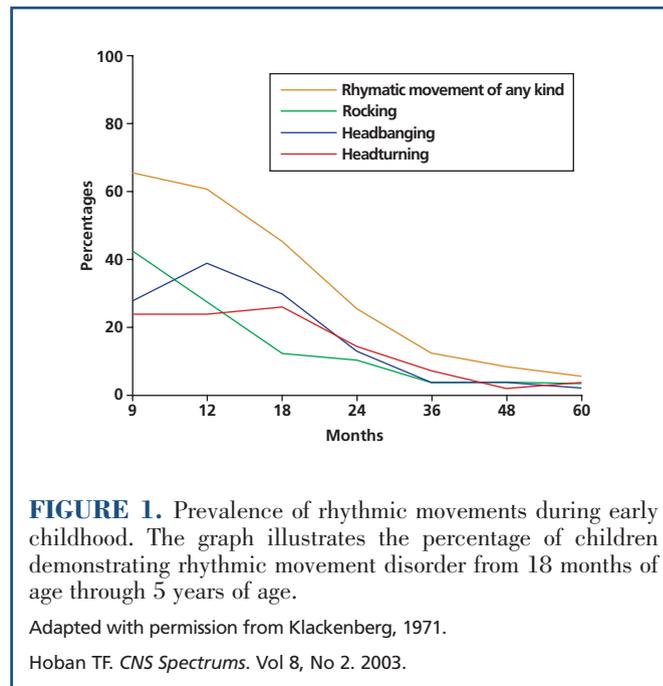
**POLYSOMNOGRAPHY IN RHYTHMIC MOVEMENT DISORDER**

Evidence-based guidelines for the assessment of childhood RMD do not exist and it is the author’s practice to use polysomnography on a selective rather than routine basis in most cases. Diagnosis of RMD can usually be established on the basis of clinical history or video recordings provided by the child’s family. Polysomnography is indicated when the clinical history alone is insufficient to provide diagnostic certainty or when the movements are atypical or particularly violent.

When polysomnography is performed in children with rhythmic movements, use of concurrent video recording allows for exact correlation between clinical and polysomnographic findings. In the event of any substantial clinical suspicion that rhythmic movements might result from seizure, full electroencephalography (EEG) can be monitored during the polysomnogram in many laboratories.

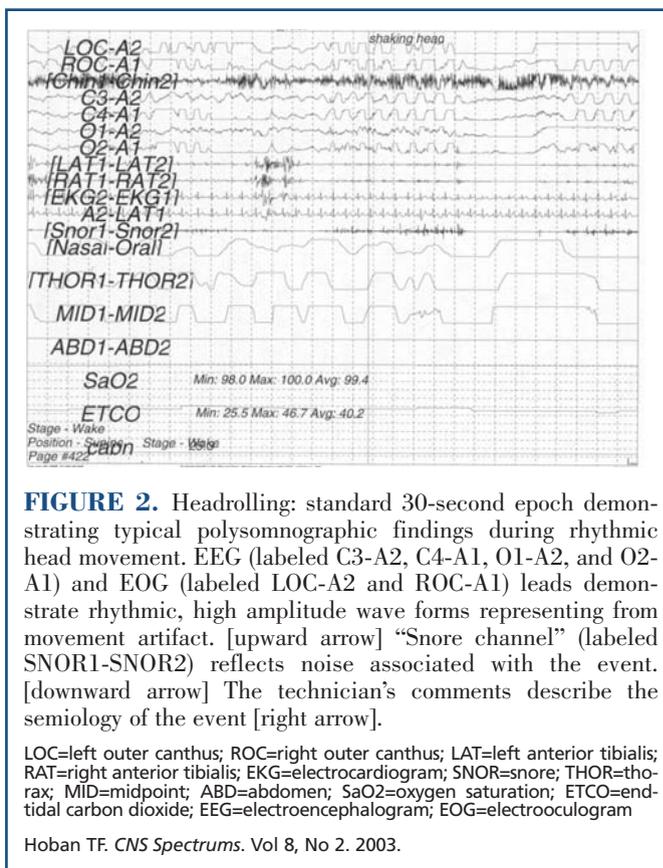
Rhythmic movements exhibit several characteristic findings on polysomnography. Episodes may be seen during wakefulness, drowsiness, or sleep and may occur with or without evidence of arousal from sleep.<sup>3,5</sup> Individual episodes are characterized primarily by high amplitude wave forms on electrooculogram and EEG channels,

which represent an artifact from the associated movement rather than an alteration of underlying cerebral activity. These wave forms are synchronous with the repetitive movements seen on video and typically occur at a rate of 0.5–2 cycles/second. Transiently increased muscle tone is often apparent on electromyogram channels during the



**FIGURE 1.** Prevalence of rhythmic movements during early childhood. The graph illustrates the percentage of children demonstrating rhythmic movement disorder from 18 months of age through 5 years of age.

Adapted with permission from Klackenberg, 1971. Hoban TF. *CNS Spectrums*. Vol 8, No 2. 2003.



**FIGURE 2.** Headrolling: standard 30-second epoch demonstrating typical polysomnographic findings during rhythmic head movement. EEG (labeled C3-A2, C4-A1, O1-A2, and O2-A1) and EOG (labeled LOC-A2 and ROC-A1) leads demonstrate rhythmic, high amplitude wave forms representing from movement artifact. [upward arrow] “Snore channel” (labeled SNOR1-SNOR2) reflects noise associated with the event. [downward arrow] The technician’s comments describe the semiology of the event [right arrow].

LOC=left outer canthus; ROC=right outer canthus; LAT=left anterior tibialis; RAT=right anterior tibialis; EKG=electrocardiogram; SNOR=snore; THOR=thorax; MID=midpoint; ABD=abdomen; SaO2=oxygen saturation; ETCO=end-tidal carbon dioxide; EEG=electroencephalogram; EOG=electrooculogram  
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event as well. Noise resulting from the movement or any associated vocalizations is often apparent on any audio or snoring channels recorded. Technician comments on the record are an invaluable aid to the interpreting polysomnographer (Figure 2).

Rhythmic movements most commonly arise from light nonrapid eye movement sleep<sup>13,14</sup> and only rarely from rapid eye movement sleep.<sup>3,7,8</sup> Dyken and colleagues<sup>13</sup> reported that duration of rhythmic movement episodes ranged from 4 seconds to 21 minutes in a group of seven children studied with video polysomnography.

### **POSTULATED CAUSES OF RHYTHMIC MOVEMENT DISORDER**

The precise etiology of RMD remains unknown and no organic cause is identified in the great majority of cases. In consideration of the fact that cradles and rocking have been used for centuries to calm infants or induce sleep, it has been postulated that RMD may represent a learned variety of self-soothing behavior, which may aid the transition from wakefulness to sleep.<sup>3,4</sup> Other neurobehavioral models have advanced the hypothesis that rhythmic movements might represent a vestibular form of self-stimulation.<sup>3,15</sup> Although both theories are consistent with the natural history of RMD in infants (eg, high prevalence during infancy, significant declines in frequency thereafter, strong association with transition into sleep), these postulates less readily explain the occasional persistence of RMD in older children and adults who are otherwise healthy.

Older hypotheses that RMD results from maternal deprivation or anxiety relief<sup>10</sup> have received little formal scientific study. Laberge and colleagues<sup>6</sup> found high anxiety scores across a broad range of parasomnias, including body rocking, night terrors, somniloquy, leg restlessness, and bruxism compared with children with no history of parasomnia.

### **DIFFERENTIAL DIAGNOSIS OF RHYTHMIC MOVEMENT DISORDER**

The diagnosis of RMD can be reliably established on the basis of clinical history for the vast majority of children exhibiting the condition. Where feasible, reviewing a home video of the child's typical events can add further confidence to the diagnosis.

In cases where a child's rhythmic movements are atypical, prolonged, or particularly violent, a broader differential diagnosis must be considered. Although sleep-related seizures often include rhythmic-clonic movements of the extremities, the semiology of these events is usually quite distinct from that seen in RMD. Movements that exhibit tonic clonic character or are accompanied by gaze deviation, incontinence, or tongue/cheek laceration should be considered strongly suspicious for seizure. Children with these or other risk factors for underlying epilepsy should receive appropriate neurologic evaluation.

Other conditions having the potential to mimic RMD include other parasomnias, such as periodic limb movement

disorder, rapid eye movement-sleep behavior disorder, and sleep myoclonus. Tics, tantrum, or self-abusive behavior also represent occasional diagnostic considerations.<sup>13</sup>

When the clinical evaluation alone is insufficient in providing a confident diagnosis in a child with atypical rhythmic movements, video-polysomnography or video-EEG monitoring will often prove to be invaluable.

### **COMPLICATIONS OF RHYTHMIC MOVEMENT DISORDER**

Typical cases of RMD, especially those involving infants and toddlers, pose little risk of serious injury. Headbanging or body rocking may under extraordinary circumstances result in more serious injury to the eyes, soft tissues, or bone.<sup>3,16-18</sup> There have also been isolated case reports of carotid dissection and subdural hematoma.<sup>19,20</sup> In a developmentally disabled adult, repeated headbanging produced occipital gray matter loss and enlargement of the diploic spaces.<sup>21</sup>

### **TREATMENT OF RHYTHMIC MOVEMENT DISORDER**

Most developmentally normal children with RMD do not require specific treatment and the family can be reassured that the majority of affected children outgrow the condition uneventfully. For children with developmental disabilities or particularly violent movements, judicious use of a protective helmet or padding in the crib or bed should be considered.<sup>3</sup>

Drug treatment of RMD has not been systematically studied in children and only a few isolated case reports address pharmacologic treatment of this population. Manni and Tartara<sup>22</sup> reported successful treatment of RMD in an 18-year-old secondary student and in a 6-year-old boy with Fragile X syndrome using clonazepam in doses as low as 1 mg nightly. Use of oxazepam at doses ranging from 10–20 mg nightly produced variable but unsustained improvement of rhythmic movements in an affected 8-year-old girl.<sup>10</sup> Citalopram, a selective serotonin reuptake inhibitor, produced sustained remission of rhythmic movements in a 5-year-old boy with concurrent RMD and attention-deficit/hyperactivity disorder.<sup>23</sup>

Reports of successful drug treatment of RMD in the adult population are no more plentiful than those in children. Adult RMD has also been effectively treated using clonazepam at doses ranging from 0.5–1.0 mg nightly.<sup>24</sup> The tricyclic antidepressant imipramine has demonstrated inconsistent effectiveness in the treatment of RMD.<sup>25,11</sup>

Other proposed treatments for RMD include hypnosis,<sup>26</sup> use of a water bed,<sup>5</sup> and behavioral modification techniques such as selective reinforcement of a desired behavior or overpracticing of a competing response.<sup>3,27-29</sup>

### **CONCLUSION**

This review has examined the limited data that exist regarding sleep-related rhythmic movements in children.

These data confirm that although RMD is often a benign and self-limited condition that most children outgrow by 6 years of age, a small proportion of affected children suffer from persistent and problematic symptoms which may disrupt the sleep of others in the household and carry a small risk of injury. In addition, RMD may resemble nocturnal seizure, periodic limb movements, or other paroxysmal phenomena, making accurate diagnostic assessment and appropriate clinical management all the more important. When indicated, clonazepam or a variety of pharmacologic and behavioral treatments may be effective in the treatment of childhood RMD. **CNS**

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