

Beighton Scores for Healthy Infants at the Age of Three Months

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Abstract

Objective: To investigate the incidence of hypermobility in infants at the age of three months. **Method:** Eighty-one healthy infants aged three months were examined using the Beighton score. The spine was excluded for practical reasons; due to this the highest possible Beighton score for the participants in this study was 8. Also ankle dorsiflexion and the big toe were examined. **Results:** The mean score on the Beighton scale was 2.7; median was 2.0 and the range was 0 to 6. Almost half of the infants scored at least 4 on the Beighton scale. T test showed no gender difference. Neither was there any difference between right and left sides. **Conclusions:** Infants at the age of three months have high mobility in the distal joints, ankle dorsiflexion, thumb and little finger. It is rare to find hypermobility in elbows and knees at this age.

Keywords

Hypermobility, The Beighton Score, Infants

1. Introduction

Research has shown that passive joint range of motion (PROM) measurements in infants and children differ from adult values. The PROM in some joint also differs between toddlers and older children as well as adults [1]. A fairly extensive amount of research on the effects of age on PROM has been conducted for lower extremities as well as upper extremities and the spine. Age effects are joint and motion specific but do not seem to be affected by gender [1]. In some joints, infants have clearly limited PROM compared with older children and adults e.g. extension of the knee [2] [3]. In ankle dorsiflexion, it is the opposite; the new born has the greater PROM which gradually decreases with age. The mean for ankle dorsiflexion in the youngest is more than double the average adult mean [1].

In the clinical setting, it is common to meet infants who show late motor development. Some of them seem to

have a normal but obvious late motor development. On examination, it is rather common to find “soft” joints/hypermobility. The term hypermobility refers to an increase in PROM that exceeds normal values for that joint, given the subjects age and gender [1]. The Beighton Score is probably the most widely used method for measuring joint hypermobility [4] [5]. Reference values for the Beighton scale are found for children at five years of age and older [6]-[10]. However, no reference values for the Beighton scale in infants and toddlers have been found in the literature.

It may be expected that the flexed position in utero affects several joints. Changes in PROM are present already during the infants first 3 to 6 months of life [3]. The newborn rarely have full knee extension. The mean value for knee extension limitation is 15.3° in a newborn [2]. Beena *et al.* find that knee extension limitation successively decreases from a limitation of 19.2° in the newborn to 10.3° at three months of age and 2.5° at six months of age [3]. Knee extension limitations at birth are normal and similar to extension limitations found at the hip joint at birth. The term “extension limitation” is used rather than “flexion contraction” because contracture refers to an abnormal condition [1].

In contrast to the expected limitation in knee extension, ankle dorsiflexion can be expected to be greater in infants. Waugh *et al.* find very little resistance to passive ankle dorsiflexion; in most infants, the dorsum of the foot is brought into contact with the anterior surface of the lower leg [2]. Passive ankle dorsiflexion decreases from about 60° in the neonatal period to about 20° in adulthood [1].

The aim with this study is to investigate the Beighton scores for infants at the age of three months. The spine is excluded as this motion can not be examined according to the manual. Also two motions from the “Hospital del Mar Criteria” [10] are investigated, ankle dorsiflexion and the big toe.

2. Method

Infants were recruited from “Health care centres”, all Swedish children attend these centres for routine appointments and check-ups during the early years. Parents of 81 infants chose to let their infant participate, 37 female and 44 male infants (Table 1).

The Beighton scale was used; it consists of five clinical manoeuvres that are scored dichotomously (0/1) from which a total score, ranging from 0 to 9 is calculated [11] [12]. The spine was excluded for the infants for practical reasons; due to this the highest possible Beighton score for the participants in this study was 8. Two motions from the “Hospital del Mar Criteria” was included, ankle dorsiflexion beyond 30° and big toe flexion at 90° or more [10].

The Beighton scoring system (Beighton 2012).

- 1) Passive dorsiflexion of the little fingers beyond 90° (one score for each hand)-2 scores.
- 2) Passive apposition of the thumb to the flexor aspect of the forearm (one score for each thumb)-2 scores.
- 3) Hyperextension of the elbows beyond 10° (one score for each elbow)-2 scores.
- 4) Hyperextension of the knee beyond 10° (one score for each knee)-2 scores.
- 5) Forward flexion of the trunk with knees fully extended so that the palms of the hands rest flat on the floor-one score.

The last [5] was excluded in this study, as it was not possible to examine in accordance with the manual.

3. Statistics

Descriptive statistics were used for the Beighton score. T-test was used to analyse for gender and side difference. P value of 0.05 was chosen as significance level.

4. Result

Mean score on the Beighton scale was 2.7, median was 2.0 and range 0 to 6. Almost half (47%) of the infants scored at least 4 on the Beighton scale, only two infants had five scores and five infants had 6 scores, no infant

Table 1. Demographic data for the 81 infants participating in the study.

	Age	Weight	Length	Gestation week
Mean	3.1 months	3.5 kilo	49.4 cm	39.1

had more than 6 scores (Figure 1). No infant had scores for the elbow, and only eight infants had scores for the knee (five bilaterally, two in the right knee and one in the left knee). Seven of the infants who had hyperextension in the knee scored 5 - 6 on the Beighton, and the eighth infant achieved a score for the right knee only and no other joint (Table 2).

More than half of the infants got scores for thumb/wrist and almost half in the little finger. There was also high mobility in ankle dorsiflexion and the big toe (Figure 2).

T test showed no gender difference (P 0.77) (Figure 1). Neither was there any difference between right and left sides (P 0.96) (Figure 3).

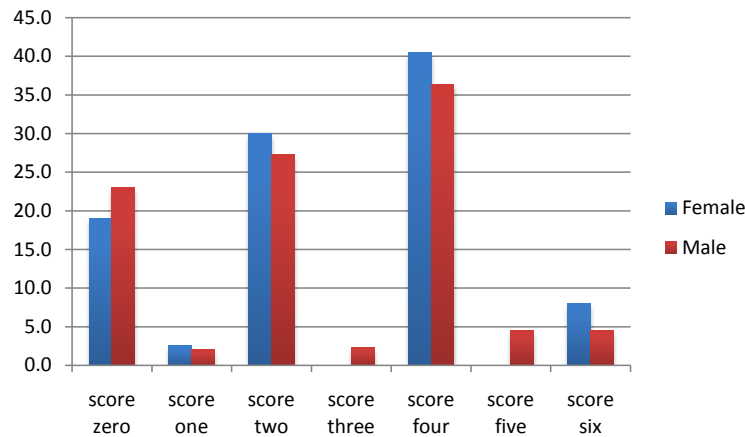


Figure 1. Distribution of the Beighton scores for 81 infants, at three months of age. Reported in per cent, females and males.

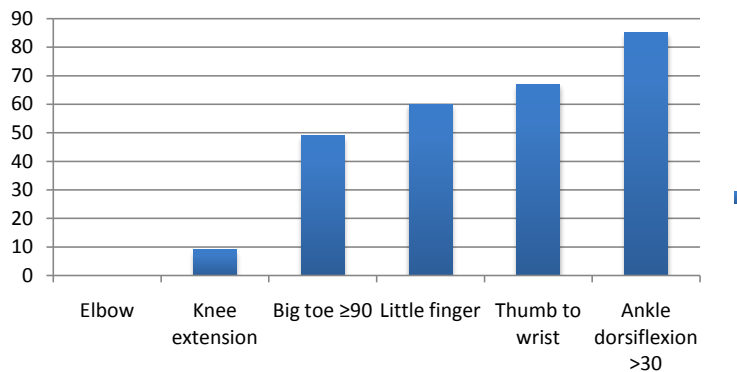


Figure 2. Distribution of "hypermobility" from 0% in the elbow to 84% in ankle dorsiflexion.

Table 2. Score distribution for the eight infants who were hypermobile in knee extension. Three of these infants had hypermobility in only one knee.

Motion	Right	Left
Elbow	0	0
Thumb to wrist	7	7
Little finger	7	7
Knee extension	7	6
Ankle dorsiflexion > 30	7	7
Big toe ≥ 90	3	3

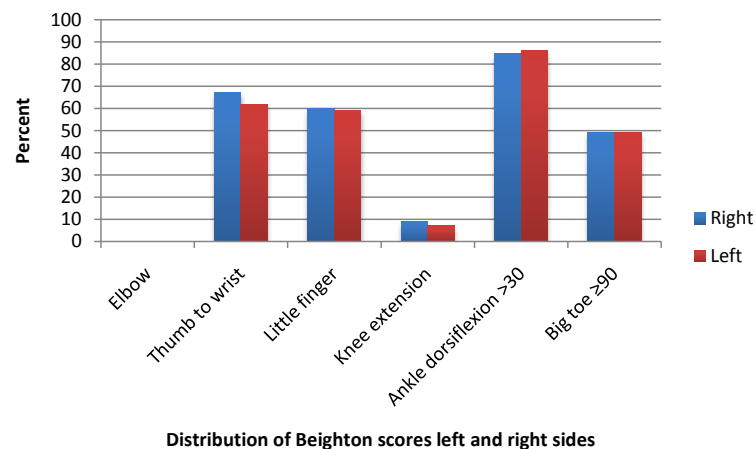


Figure 3. There were no differences for Beighton scores between right and left sides.

5. Discussion

As almost half of the infants in the current study scored at least 4 on the Beighton scale, a cut off of 4 scores for hypermobility is definitely too low at this age. The proposed cut off scores for children vary, however there seems to be an agreement that a cut off of 4 scores is too low [6]-[9]. Mostly it is recommended to use 5 or 6 as a cut off [12]. Using the cut off of 5 in the current study would give hypermobility in 8.6% of the infants, and a cut off of 6 scores would give hypermobility in 6.2%. The most common scores for the Beighton were in thumb/wrist and little finger. Also foot and big toe showed high mobility, though these motions are not included in the Beighton scale. It seems to be rather common for infants to have increased mobility in distal joints and uncommon for knee and rare for elbow.

An earlier study including children aged 5 to 8 years showed a prevalence of 3% with a cut off of six scores [10], this indicates that younger infants have higher scores. Comparing a cut off of 4 scores shows this even more; 47% [infants aged 3 months) compared with 12% (children 5 - 8 years) [10]. In both these studies, the most common hypermobile joint was the thumb. In the current study no infant achieved scores for the elbow whereas 27% of children aged 5 - 8 years received scores for the elbow [10]. Ankle dorsiflexion >30 degrees was common in infants (85%) but not in children aged 5 - 8 years (6%). Wong *et al.* found that dorsiflexion decreased in new-walkers compared with pre-walkers [13]. Neonates (6 to 72 hours old) have been found to have a mean ankle dorsiflexion PROM 59°, which contrasts with mean adult PROM values 12° to 20°. The increased motion that is present in these infants is normal for their age. If the increased motion persists beyond the expected age range, it would be considered abnormal and hypermobility would be present [1].

Hyperextension of the knee was rather rare, compared with the other joints. According to the literature it is expected for the newborn and infants younger than six months to have a limitation in knee extension. The limitations in the neonate gradually disappear, and extension instead of being limited, may become excessive in the toddler [1]. Newborns are found to lack 15° to 20° in knee extension. At one to five years of age the mean knee extension is 5.4° beyond 0° and for six to twelve years of age the mean is 0.4° [1]. Broughton *et al.* found limitation in knee extension with mean 10.7° in infants aged three months, at six months of age the limitation mean had decreased to 3.3° [14].

In the current study, the spine was excluded as it could not be examined according to the manual. However, it ought to be possible to find a standardized way to examine it in infants. As they are in a flexed position in utero, it may be assumed that at least the younger infants have a greater flexibility in flexion of the spine.

The intrauterine crowding before birth seems to give limited motion in some joints e.g. knee extension and increased motion in other joints e.g. ankle dorsiflexion. The premature infants never experience the extreme intrauterine crowding of the full term infant and never display the high amount of flexion which is characteristic of full term infants [15]. Harris *et al.* found that premature infants demonstrated more elbow extension and less ankle dorsiflexion in comparison with previously reported findings for full term infants. Longitudinal trends in their sample demonstrated changes in joint range of motion over time [15].

In children with joint hypermobility, a higher incidence of late walking, congenital hip problems, delay in motor development or poor motor competence and clumsiness is found [16]-[18]. Infants aged 8 to 14 months with late motor development were found to have increased mobility; the three joints that best correlated with this was ankle dorsiflexion, hip abduction and elbow extension [16]. Hip abduction is included in the Hospital del Mar Criteria, and in a Swedish study 15.5% of the children aged 5 to 8 years scored for hypermobility ($>85^\circ$) [10]. At the age 1.5 to 54 years the mean hip abduction is about 45° . An increased hip abduction of mean 39° to 78° is reported in infants [1]. The hipjoint should be included in future research for reference values for hypermobility.

With simple screening using the Beighton score, it might be possible to prevent some of the problems. Parents of infants with hypermobility could be instructed to stimulate strength training to promote stability and motor development.

The next step is to investigate the Beighton score for infants of other ages and toddlers; preferably at six and nine months of age and at one, two, three and four years of age. Also to include hip abduction and ankle dorsiflexion as an increased PROM can be seen in these joints for patients with hypermobility syndrome.

A limitation in this study was that the spine was excluded for the infants for practical reasons. Alternative ways to examine the spine hypermobility for infants could be evaluated.

6. Conclusion

Infants at the age of three months have high mobility in the distal joints, ankle dorsiflexion, thumb and little finger. It is rare with hypermobility in elbows and knees at this age. Reference values for the Beighton score for infants and toddlers are needed as ROM at these ages differs from older children.

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