

Inter-rater Reliability of Infant Motor Profile in 3–24-Month-Old High-Risk Infants: Turkey Sample

3-24 Aylık Yüksek Riskli Bebeklerde Infant Motor Profilinin Gözlemciler Arası Güvenirliği: Türkiye Örneği

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ABSTRACT

Objective: Assessment of high-risk infants is critical for setting early physiotherapy needs and evaluating the effects of clinical practices. The aim of this study was to analyze the inter-rater reliability of the infant motor profile (IMP) performed on high-risk infants with different risk factors.

Material and Methods: IMP videos of 47 infants (18 female and 29 male) with an average corrected age of 10.13±5.13 months were recorded. There were 56 videos in total; three pediatric physiotherapists scored five domains, namely variation, variability, symmetry, fluency, and performance. Spearman Correlation Analysis was used to evaluate the inter-rater reliability.

Results: Considering the Spearman values for the inter-rater reliability, it was found that the values ranged between low ($r=0.467$) and very high ($r=0.941$). The highest reliability was very high ($r=0.898-0.929$) for the domain of performance, and the lowest reliability was low-high ($r=0.467-0.735$) for the symmetry domain. The results of inter-rater reliability were acceptable for the IMP total score and all the domain scores in this study.

Conclusion: These results show that the use of IMP by physiotherapists for the assessment of 3-24-month-old high-risk infants is reliable. We recommend that it be used in our country in determining early physiotherapy needs.

Keywords: Early intervention, infant, infant development, motor activity, reliability

ÖZ

Amaç: Riskli bebeklerin değerlendirilmesi; erken fizyoterapi ihtiyacını belirlemek ve klinik uygulamaların etkilerini değerlendirmek için önemlidir. Bu çalışmanın amacı Infant Motor Profilinin (IMP) farklı risk faktörlerine sahip riskli bebeklerde güvenilirliğini incelemektir.

Gereç ve Yöntem: Yaş ortalamaları 10,13±5,13 ay olan 47 (18 kız, 29 erkek) bebeğin IMP videosu kaydedildi. Toplam 56 video mevcuttu. Üç pediatik fizyoterapist ölçeğin; varyasyon, değişkenlik, simetri, akıcılık ve performans olmak üzere beş boyutunu puanladı. Gözlemciler arası güvenilirliği değerlendirmek için Spearman Korelasyon Analizi kullanıldı.

Bulgular: Gözlemciler arası güvenilirlik için Spearman değerleri incelendiğinde değerlerin zayıf ($r=0,467$) ile çok yüksek ($r=0,941$) arasında değişmekte olduğu, en iyi güvenilirliğin performans alt ölçeği için çok yüksek ($r=0,898-0,929$) olarak, en düşük güvenilirliğin ise simetri alt ölçeği için zayıf-yüksek ($r=0,467-0,735$) olduğu bulundu. Çalışmamızda IMP toplam puanı ve tüm alt ölçek puanları için gözlemciler arası güvenilirlik sonuçları kabul edilebilir düzeydeydi.

Sonuç: Bu bulgular; IMP'in fizyoterapistler tarafından 3-24 aylık riskli bebekleri değerlendirmek için kullanımının güvenilir olduğunu göstermektedir. Ülkemizde erken fizyoterapi ihtiyacının belirlenmesinde IMP kullanılmasını öneriyoruz.

Anahtar kelimeler: Bebek, bebek gelişimi, erken müdahale, güvenilirlik, motor aktivite,

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Introduction

Neuromotor development starts during intrauterine life and is influenced by numerous factors. High-risk infants are those with possible motor developmental problems due to various environmental or biological factors (1, 2). Premature infants, infants with low birth weight and birth defects, and newborns requiring intensive care are included in this group (3, 4).

High-risk infants should be evaluated effectively to distinguish them from typically developing peers, estimate their future motor performances, establish an early intervention program, and determine the changes that occur with the effect of therapy or environmental adjustments. According to the literature, there are various assessment tools; however, there is still no consensus established about which assessment method should be preferred and the duration of monitoring (3).

Infant motor profile (IMP) is a video-based measurement evaluating spontaneous motor behaviors of 3–18-month-old infants. The videos last approximately 15 minutes and are scored using a standardized scoring form. The scale assesses the motor behavior in the supine, prone, sitting, and standing positions and during walking and consists of 80 items categorized in five domains, namely, variation (25 items), variability (15 items), symmetry (10 items), fluency (7 items), and performance (23 items) (5). The IMP's variation and variability domains originate from the neuronal group selection theory (NGST) of motor development, and the other three domains assess the fluency of movement, movement symmetry, and motor performance. According to NGST, typical motor development starts with major variability. Infants with prenatal or perinatal brain damage present more stereotypical motor behavior and less variation. During the development process, the infants learn to choose the motor strategies among the motor repertoires and adapt their motor behaviors to their environment (6, 7).

It was shown that the intra-rater and inter-rater reliability for total IMP scores were high in preterm and term infants (5, 8). Furthermore, it was stated that its concurrent validity with the age-appropriate neurologic assessment was very good (9). IMP assesses both the quality of motor movement and the activities achieved by the infant, i.e., performance. In this sense, it can be stated that this measure is appropriate to assess the high-risk infants.

We think that early physiotherapy intervention started later in Turkey than in other European countries because of failure to effectively evaluate and refer. Therefore, it is very important to determine the necessity of early physiotherapy and rehabilitation within the scope of early intervention. We believe that it is important to introduce valid, reliable, and evidence-based assessment tools that can be used to determine the need for early physiotherapy by a pediatric physiotherapist in Turkey. Covering a wide age range of tools to be used for this purpose will be useful in terms of both determining the necessity of rehabilitation and comparing the evaluations made at regular intervals during the rehabilitation process. Although the actual use of IMP is for 3-18 months corrected age, it has been report-

ed by IMP developers that it can be used beyond 18 months in infants with moderate or severe motor development problems (5). The fact that IMP is a tool that provides an opportunity to evaluate a wide age range and evaluates the motor profile in detail may satisfy this need in our country.

Literature shows that the infants who were included in the publications about the inter-rater reliability of the IMP were evaluated at the corrected age of 4, 6, 10, 12, and 18 months (5, 9, 10). In this study, we aimed to include infants of different ages than those in the previous articles. We aimed to analyze the inter-rater reliability of the IMP when used in 3- to 24-month-old infants with various motor development problems by three independent and experienced observers trained about IMP. Our second aim in this study was to introduce IMP, which can be used to determine the requirements of early physiotherapy in Turkey to Turkish readers.

Material and Methods

This was a prospective and observational study for the inter-rater reliability of IMP with three pediatric physiotherapists with different number of years of experience. In this study, the infants who applied to Hacettepe University, Faculty of Physical Therapy and Rehabilitation, Department of Physical Therapy and Rehabilitation, Cerebral Palsy Unit for physiotherapy consultation from August 2016 to August 2017 were included.

Participants

A pediatric physiotherapist with 30 years of experience (M.K.G.) determined the participants among the infants with a high risk for developmental motor problems (Figure).

Those infants were included who were:

- diagnosed as high-risk infants
- diagnosed with a disorder causing a motor developmental problem (torticollis, genetic problems, and so on)
- between the corrected ages of 3 and 24 months

Infants with severe extremity and spinal deformities that affected the spontaneous movements, had severe visual impairment and were not able to see the objects used during the evaluation, could not make eye contact, and had serious congenital abnormalities (such as myelomeningocele) were not included. Permission for the study was obtained from Hacettepe University Non-interventional Clinical Researches Ethics Board (Decision no: GO 16/445-25). This study is a part of a clinical trial, which was registered in ClinicalTrials.gov system with the number of NCT 03188107. The families who agreed to participate in the study were informed about the study, and their written consent forms were obtained. A total of 58 infants were assessed, and 47 of them were included in this study according to the inclusion and exclusion criteria.

Measures

Demographic information about the infants was recorded, including their sex, gestational (weeks) and corrected ages (month), birth weights (gr), delivery method, and diagnoses and IMP videos recorded on the same day.

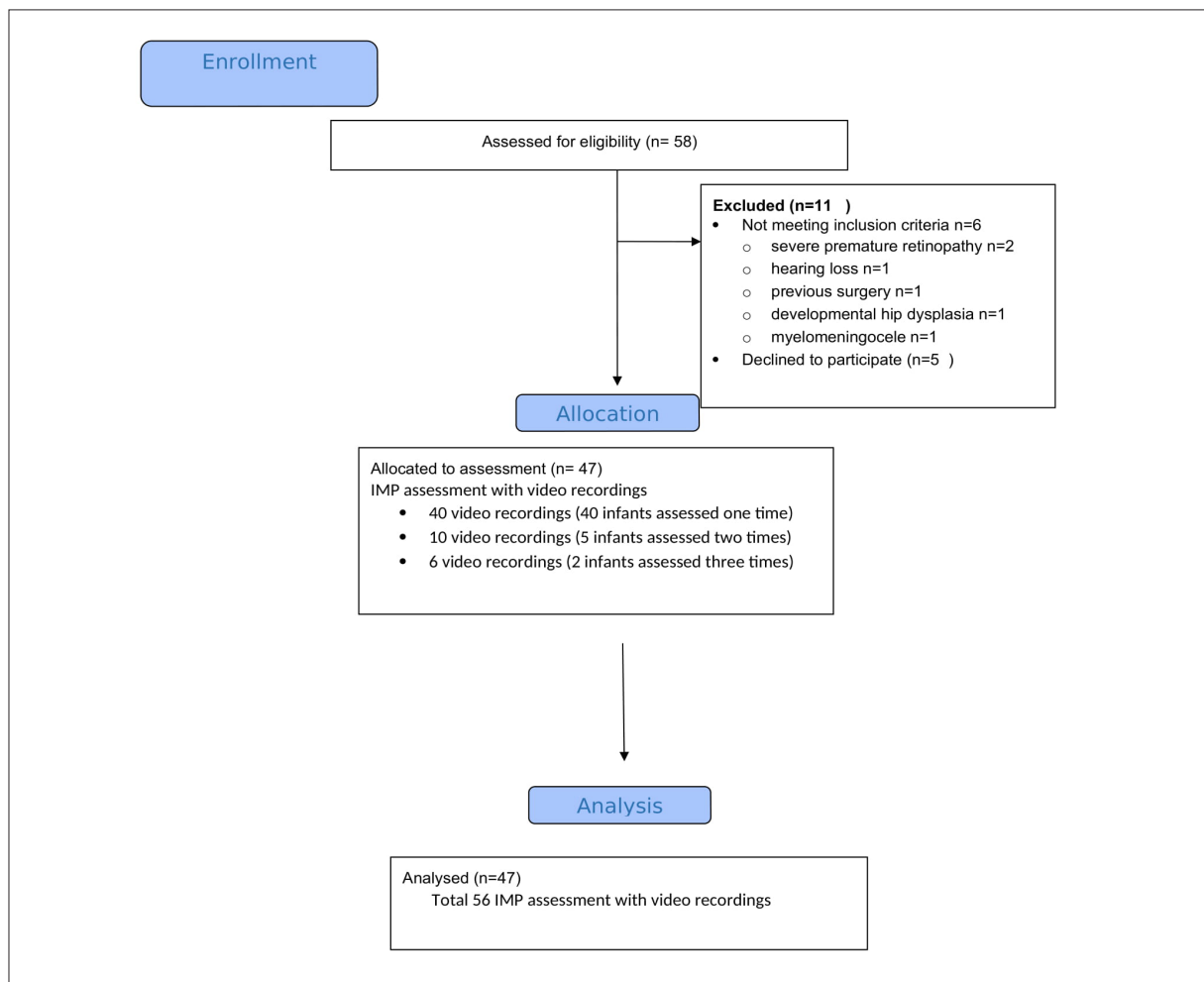


Figure 1. Flow diagram

IMP assessment

IMP is a measure used for infants with normal motor development between the ages of 3 and 18 months. It can also be used for infants with mild or severe motor developmental problems after 18 months. For IMP assessment, each infant's spontaneous motor activities revealed by using various materials were recorded in videos lasting approximately 15 minutes. The motor activities were recorded during supine, prone, standing, and sitting positions and walking according to the age and motor capacity of the infants. Moreover, reaching, grasping, and object manipulation were assessed at supine and supported sitting positions (5).

In this study, motor activities of the infants were recorded in 15-minute videos on the basis of on the aforementioned suggestions. For the reliability of the observers, three different pediatric physiotherapists (A.N.A., Ö.Ç., K.S.) who had 11 (physiotherapist 1), 10 (physiotherapist 2), and 8 (physiotherapist 3) years of experience in pediatric rehabilitation, respectively, and had attended a 2-day IMP training offered by one of the developers (Mijna Hadders-Algra) of the IMP assessment, watched the IMP videos, and recorded the results in standardized score forms. One of the researchers (K.S.) kept the personal and clinical data of the infants, and the other two researchers were blinded to the data of infants to prevent bias in the scoring.

The score calculation tool of the measure was used to calculate the IMP domain scores and the total score.

Statistical analysis

Windows-based Statistical Package for Social Sciences 24.0 (IBM SPSS Corp.; Armonk, NY, USA) package program was used for statistical analysis of the data. The descriptive statistics for the numeric variables were presented as average and standard deviation, and the categorical descriptive statistics were presented in numbers and percentages. Kolmogorov-Smirnov test was used to analyze whether the data had normal distribution. Because they did not show a normal distribution, Spearman correlation analysis was used to assess the inter-rater reliability. The r values obtained were interpreted as following; 0.00–0.30 as negligible, 0.30–0.50 as low, 0.50–0.69 as moderate, 0.70–0.89 as high, and 0.90–1.00 as very high (11). The significance level was accepted as $p < 0.05$ in the statistical analyses.

Results

The parents of the 58 infants that were thought to be included in the study were contacted. Furthermore, five of the parents later declined to participate, two of the infants had severe premature retinopathy, one infant had hearing loss, one had a

previous surgery, one had developmental hip dysplasia, and one had myelomeningocele; therefore, they were excluded from the study. In total, 56 videos (one video each of the 40 infants, two videos each of the 5 infants, three videos each of the 2 infants) of 47 infants (18 female and 29 male) with their corrected ages ranging between 3 and 23 months and with an average age of 10.13 ± 5.13 were analyzed. A total of 40 infants were diagnosed as high-risk infants; two were diagnosed with Down syndrome; one was diagnosed with phenylketonuria, one with torticollis, one with Rubenstein syndrome; and two were diagnosed with hydrocephaly. Among these 47 infants, 22 (7 female and 15 male) were premature, and 25 (11 female and 14 male) were born at term. The birth data of the infants included in the study are shown in Table 1.

The total IMP score is 100 points, and this score consists of an average of five domains for infants older than 6 months and the average of the other four domains (except for the variabil-

ity domain) for infants younger than 6 months. The mean and standard deviation values for the total IMP score and those of the domain scores are shown in Table 2.

It was found that the Spearman r values for inter-rater reliability ranged between low ($r=0.47$) and very high ($r=0.94$). The highest reliability found was very high for the performance domain ($r=0.898-0.929$), and it was very high ($r=0.803-0.844$) for the IMP total score. The poorest reliability was low-high ($r=0.467-0.735$) for the symmetry domain, and it was intermediate ($r=0.526-0.650$) for the fluency domain (Table 3).

Discussion

The purpose of this study was to analyze the inter-rater reliability for the IMP assessment of the infants with a high risk for developmental motor problems. It was found that the inter-rater reliability of IMP was very high.

Table 1. Demographic characteristics of participants (n=47)

		Number	%
Gender	Female	18	38.3
	Male	29	61.7
Gestational Age	<28 weeks	3	6.4
	28-31 weeks	2	4.3
	32-33 weeks	6	12.8
	34-36 weeks	11	23.4
	≥ 37 weeks	25	53.2
Delivery Type	Vaginal	15	31.9
	Cesarean Section	32	68.1
Birth Weight	<1500 gr	4	8.5
	1500-2499 gr	12	25.5
	≥ 2500 gr	31	66.0
Diagnosis	High Risk Infant	40	85.1
	Down Syndrome	2	4.3
	Hydrocephaly	2	4.3
	Phenylketonuria	1	2.1
	Torticollis	1	2.1
	Rubenstein Syndrome	1	2.1

Table 2. Total IMP score and domain scores

		Raters					
		PT1		PT2		PT3	
		Min-Max	X \pm SD	Min-Max	X \pm SD	Min-Max	X \pm SD
IMP	Variation	57.00-100.00	80.71 \pm 12.17	56.00-100.00	76.51 \pm 11.51	58.00-100.00	76.91 \pm 11.95
	Variability	50.00-100.00	82.18 \pm 18.00	50.00-100.00	77.66 \pm 16.08	50.00-100.00	81.46 \pm 18.09
	Symmetry	33.00-100.00	89.76 \pm 14.41	67.00-100.00	96.17 \pm 6.90	33.00-100.00	87.80 \pm 16.36
	Fluency	58.00-100.00	88.78 \pm 14.74	50.00-100.00	83.33 \pm 12.76	50.00-100.00	79.12 \pm 12.03
	Performance	28.00-96.00	56.66 \pm 17.10	29.00-90.00	57.35 \pm 15.70	26.00-90.00	54.17 \pm 17.65
	Total Score	47.00-98.00	78.94 \pm 12.49	61.00-98.00	77.85 \pm 10.06	48.00-98.00	75.16 \pm 12.50

IMP: Infant Motor Profile; PT1: Physiotherapist 1; PT2: Physiotherapist 2; PT3: Physiotherapist 3; Min-Max: Minimum-Maximum; X: Mean; SD: Standard deviation

Table 3. Inter-rater reliability values for IMP total score and domain scores (Spearman Correlation Analysis)

Raters			IMP					Total Score
			Variation	Variability	Symmetry	Fluency	Performance	
PT1- PT2	r	0.594*	0.737**	0.735**	0.630*	0.929***	0.844**	
	p	0.000	0.000	0.000	0.000	0.000	0.000	
PT1- PT3	r	0.693*	0.682*	0.602**	0.526*	0.941***	0.803**	
	p	0.000	0.000	0.000	0.000	0.000	0.000	
PT2- PT3	r	0.764**	0.819**	0.467*	0.650*	0.898**	0.834**	
	p	0.000	0.000	0.000	0.000	0.000	0.000	

IMP: Infant motor profile; PT1: Physiotherapist 1; PT2: Physiotherapist 2; PT3: Physiotherapist 3; Spearman correlation analysis

*moderate

**high

***very high

The results we obtained from this study are compatible with the literature. In the study of Heineman et al. (5), 38 IMP videos were scored by two researchers and the inter-rater reliability for the IMP total score was found to be high (Spearman $r=0.9$). In another study conducted by the same author, the inter-rater reliability for the IMP score was high (Intraclass Correlation Coefficient= 0.94 , 95% Confidence Interval= $0.87-0.97$) (9). In a study by Hecker et al. (8) conducted with 20 videos, the total IMP score showed high inter-rater reliability (Spearman $r=0.80-0.96$). In that study, similar to our study, the videos were scored by independent, experienced pediatric physiotherapists who received a 2-day IMP training (8). In the study by Besios et al. (12), 20 infant videos were assessed and the inter-rater reliability for the IMP total score and all domain scores was reported to be high. In our study, it was shown by three different observers (with different clinical experience) that the inter-rater reliability was high.

Considering the domain scores, it was seen that the highest reliability was found for the domains of performance in the studies conducted in a manner similar to that of our study (5, 8, 9). The reliability of the performance domain was found to be high because the items in this domain were scored more objectively. For instance, in the items regarding grasping and reaching, the scores were given on the basis of how many objects were grasped. In the performance items about head control, the duration (in seconds) for which head control could be maintained was observed. This objectivity can be the reason of the high inter-rater reliability of the performance domain.

There is a discrepancy between the results found for the symmetry and fluency domains in the literature. In addition to the studies that found the inter-rater reliability intermediate-low for the symmetry domain (5, 8), there were studies that found it high (9, 12). In this study, the inter-rater reliability for the symmetry domain ranged between low and high. In the study of Heineman et al. (5), it was stated that this situation was due to the inclusion of infants not showing high asymmetry. Hecker et al. (8) reported that even small changes caused big differences in the domain score because the symmetry domain contained very few items and this situation, affected the inter-rater reliability negatively. In addition to the studies that found intermediate reliability for the fluency domain (5, 8, 9), there was

also a study reporting high inter-rater reliability (12). In this study, the inter-rater reliability for the fluency domain was intermediate. We think that this was due to the low number of items and the subjectivity of the fluency concept; scoring was not based on tangible data, and scoring was made with gestalt perception.

On considering the studies analyzing the inter-rater reliability for the IMP, it was seen that the highest number of videos (56 videos) were scored in this study. Furthermore, our study included the most heterogeneous age group. In the other studies conducted on this subject (5, 9, 10), the videos were recorded when the infants were at the corrected ages of 4, 6, 10, and 12 months, whereas in this study, videos of the infants were recorded at various ages ranging between 3 and 24 months, and infants at very different motor stages were scored.

It was observed that there were many tools used in infant evaluation in the literature (13-15). Rezaei et al. (16) reported that IMP is in excellent relationship with the functional levels of the Neuro-Sensory Motor Developmental Assessment and the Alberta Infant Motor Scale percentage range and total score, which are commonly used for infant assessment. There is no perfect tool for assessing an infant's motor development; therefore, being aware of multiple tests and choosing the appropriate scales for neurodevelopment evaluation are very important (14). It may be advantageous to choose the most appropriate one among the various scales used in infant evaluation according to the individual evaluated and the treatment strategies applied. One of the advantages of IMP is that it covers a wide age range (14). Neurodevelopmental approach is one of the most commonly used approaches for physiotherapy and rehabilitation applications of atypically developing infants (17). In this approach, importance is given to the motor behavior strategies and the quality of motor behavior. Therefore, the use of IMP may allow an effective assessment of treatment-induced change.

One of the limitations of our study was that one of the researchers was not blinded to the general data of the infants. Moreover, failure to record an equal number of videos for each month was another limitation. In addition, age-appropriate norm values are not available, which makes the clinical use of the measurement difficult. Infants who were included in this

study were mostly high-risk infants; however, a limited number of infants who were diagnosed with a disorder causing a motor developmental problem were also included. It would be beneficial if an equal number of children were included for all the age ranges and all different diagnosis groups encompassing this age range in future studies. It would be advantageous to establish norm values for various diagnosis groups and ages in future studies.

Conclusion

We think that IMP will be a preferable measure by pediatric physiotherapists to evaluate infants for clinical or research purposes because the reliability values for IMP assessment are at an adequate level for the total score and all the domain scores. The validity values reported in the previous studies were high, and measurement through a video analysis allows the scoring to be made repeatedly or by different researchers, and it allows the assessment of both movement quality and the infant's current performance. Our results show that the use of the IMP total score and domain scores is reliable between the raters to evaluate 3- to 24-month-old high-risk infants by experienced pediatric physiotherapists after a 2-day IMP training. In order to make assessments regarding the need for early intervention in our country, we think that this tool covering a wide age range will be useful.

Ethics Committee Approval: Ethics committee approval was received for this study from Hacettepe University Non-interventional Clinical Researches Ethics Board (No: GO 16/445-25).

Informed Consent: Written informed consent was obtained from the parents of the infants who participated in this study.

Peer-review: Externally peer-reviewed.

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Hasta Onamı: Yazılı hasta onamı bu çalışmaya katılan bebeklerin ailelerinden alınmıştır.

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