

# Wpływ testu TIMP na kształtowanie postaw rodziców niemowląt z zespołem Downa w procesie terapeutycznym

*The effect of carrying out the 'Test of Infant Motor Performance' on parental attitudes towards Down syndrome infants during the therapeutic process*

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## Streszczenie:

**Wstęp.** Integralną częścią fizjoterapii dziecka z zespołem Downa (ZD) jest ocena jego rozwoju ruchowego przed podjęciem usprawniania. Trafna ocena stanu dziecka i współpraca rodziny jest warunkiem podjęcia skutecznej pomocy niemowlęciu prezentującemu zaburzenia rozwoju. Test TIMP (Test of Infant Motor Performance) jest narzędziem badawczym służącym do oceny wzorców postawy i wzorców ruchu prezentowanych u pacjentów w pierwszych miesiącach życia. Konstrukcja testu TIMP umożliwia ocenę podstawowego repertuaru aktywności własnej dziecka w odpowiedzi na bodźce płynące z otoczenia. Celem badań była ocena wpływu testu TIMP na kształtowanie postaw rodziców i opiekunów dzieci z zespołem Downa.

**Materiał i metody.** Zbadano 64 pacjentów z zespołem Downa w wieku od 2 - 17 tyg. życia (średnio 9,4 tygodnia życia (SD +/- 4.5)), z pełną trisomią w 21 parze chromosomów. Rodzice dzieci z zespołem Downa oraz niemowląt z grupy kontrolnej po badaniu testem TIMP wypełniali autorską ankietę dotyczącą wartości edukacyjnej testu. Ankieta zawierała 10 pytań odnoszących się do sposobu badania, w tym przystępności oceny testem TIMP dla opiekunów.

**Wyniki.** Ocena rozwoju ruchowego niemowląt z zespołem Downa wykazała, iż dzieci z zespołem Downa badane testem TIMP wykazują zaburzenia neurorozwojowe w stosunku do dzieci zdrowych.

**Wnioski.** Na podstawie wyników ankiety stwierdzono, iż test TIMP jest bezpieczny i przyjazny dla dziecka w ocenie rodziców, pozwala na budowanie zaufania do specjalisty i ułatwia włączanie rodziców niemowląt z zespołem Downa w proces terapeutyczny.

## Słowa kluczowe:

Staw skroniowo-żuchwowy, dysfunkcja, fizjoterapia

## Abstract

**Introduction.** An initial pre-rehabilitation assessment of motor development is an integral part of physiotherapy for a Down syndrome (DS) child. A precise evaluation of the child and the involvement of the family are prerequisite for effective support of an infant presenting developmental disorders. Test of Infant Motor Performance is a research tool used to evaluate posture and movement patterns in the first months of a patient's life. The TIMP construction enables the assessment of the basic repertoire of the child's intrinsic activity occurring in response to environmental stimuli. This paper aims to assess the effect of TIMP on the attitudes of parents and carers of Down syndrome children.

**Research material and methods.** The study comprised 64 patients with Down syndrome (full trisomy of the 21st chromosome pair), aged 2 - 17 weeks with an average age of 9.4 weeks (SD +/- 4.5). Following the TIMP, parents of both Down syndrome children and infants in the control group completed the author's questionnaire regarding the educational value of the test. The questionnaire consisted of 10 questions evaluating the research method, including TIMP availability for carers.

**Results.** The results of Test of Infant Motor Performance performed on Down syndrome infants have demonstrated that neurodevelopmental disorders were recorded in children with Down syndrome, compared to healthy children.

**Conclusions.** The results of the questionnaire indicate that parents believe TIMP to be safe and child friendly; they acknowledge that the test validates confidence in the specialist and facilitates the inclusion of parents of Down syndrome infants in the therapeutic process.

## Key words

Down syndrome, TIMP, physiotherapy

## Introduction

Down syndrome (DS) children and their parents or carers are involved in the therapeutic process from the first months of the baby's life due to numerous deficits which are the hallmark of trisomy 21. Physiotherapy constitutes an important part of early rehabilitation of Down syndrome infants. Movement rehabilitation aims to modify the muscle tone in the scope available, in order to minimise the negative effects of reduced muscle tone, build proper postural control and improve the quality of movement patterns. An early and individualised therapy is intended to result in the child learning increasingly more complex motor skills and gradually developing the child's self-reliance and independence [1, 2, 3].

An integral part of physiotherapy is the assessment of the patient's motor condition. Down syndrome children are eligible for early intervention programmes as early as in the first weeks of life. It is necessary to develop diagnostic tools to ensure a reliable assessment of the infant's motor skills during the initial qualification for therapy [4]. Thanks to a precise diagnosis, specific and personalised therapy for each patient can be developed. Accurate evaluation of the patient and the involvement of the family are prerequisite for effective support of an infant with developmental disorders [5, 6, 7].

Test of Infant Motor Performance is a research tool used to evaluate posture and movement patterns presented by patients in their first months of life. It is based on an assessment of the child's motor behaviour, observed in daily daily care activities allowing a natural carer-child relationship to develop [8]. TIMP can be used by both full-term and premature infants. It is designated to be used for infants aged between 34 weeks of postconception age and 17 weeks of adjusted age. The test aims to identify infants with delayed or discordant development, track the progress of the child's motor activity, support the setting of main physiotherapy goals at a specific level of development, measure the effectiveness of therapy used and facilitate the active involvement of the parents in the rehabilitation process by presenting the parents with the competence stages achieved by the infant [9, 10, 11, 12].

It has been proven that TIMP is an accurate and reliable research tool; the results obtained are used prior to the commencement of appropriate physiotherapy [13].

The TIMP construction enables the assessment of the basic repertoire of the child's intrinsic activity in response to environmental stimuli. Several skills are considered here, including establishing eye contact with the researcher, eye tracking of a moving object, moving the head and eyes in the direction of sound, head and torso control in space in response to the force of gravity as well as the selectivity and the alternation of movement in all phy-

siological positions. TIMP consists of two parts; spontaneous and provoked.

The test sheet presents images of infants performing all tasks included in the second part of the test, followed by the possible movement responses of the child and their appropriate evaluation (in points).

### Research objective

This paper aims to evaluate the effect of Test of Infant Motor Performance on the attitudes of Down syndrome infants' parents.

### Material and methods

The study comprised 64 patients with Down syndrome (full trisomy of the 21st chromosome pair), aged 2-17 weeks with an average age of 9.4 weeks (SD  $\pm 4.5$ ). The respondents had no co-morbidities, the effect of which would be surgery treatment or prolonged hospitalisation. In accordance with the TIMP methodology, the child's age at the time of examination has been adjusted ie. measured from the Estimated Date of Delivery (EDD): the 40th week of pregnancy (40 hbd). The research comprised 28.8% female respondents and 71.2% male respondents, all of whom were patients of the Early Intervention Centre in Warsaw and the Children's Memorial Health Institute in Warsaw.

None of the children had been physically rehabilitated prior to the examination.

34 Down syndrome children were born in 38 Hbd or after 38 weeks of gestation; 10 DS children were born at 37 weeks, 9 children were born at 36 weeks, 8 children were born at 35 weeks, 1 child at 34 weeks and 1 child in at 24 weeks of gestation. The percentage distribution of respondents gestation age at birth is presented in Figure 1.

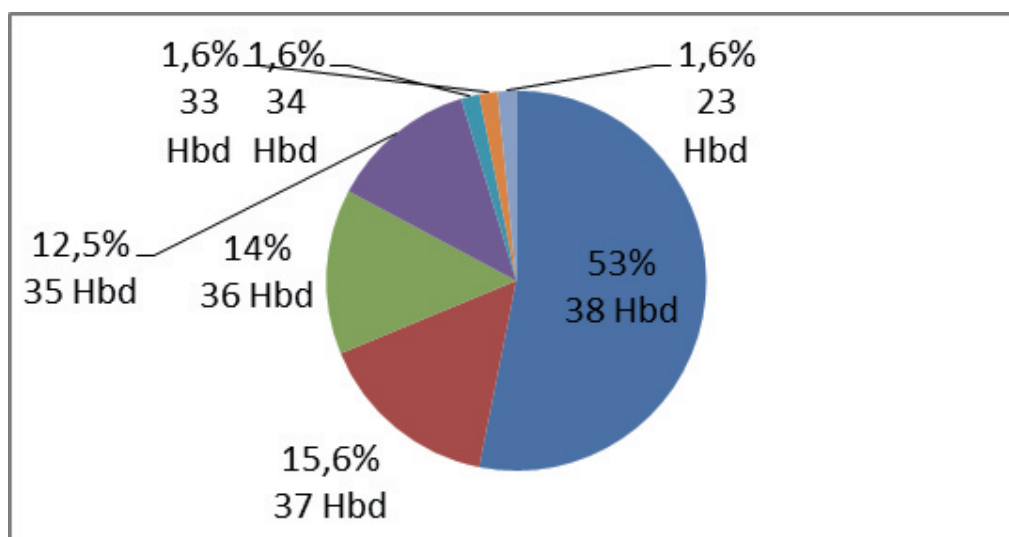


Fig. 1 Percentage distribution of respondents gestation age at birth

The children were postpartum evaluated with the APGAR scale. In the 10th minute of life, it was as follows: 26 newborns received 10 points, 17 newborns received 9 points, 10 newborns received 8 points, 8 newborns received 7 points, 1 infant received 5 points and 1 infant received 6 points.

The control group comprised 77 patients of the Healthy Children Health Care Clinic, Warsaw district Ochota, aged between 2 to 17 weeks, with the mean 10.0 SD  $\pm$  4.6. 47% of the control group infants being female and 53% male. No abnormalities in the motor development of the children in the control group had been recognised. All infants in the control group were born between 38 and 42 weeks of gestation and received 10 points on the Apgar scale in the postpartum examination.

The medical doctors responsible for the infants issued permission to conduct the test. The parents / carers had been advised of the research method and signed a written consent to perform the test assessing the motor functioning of their children.

The study was conducted by a professional authorised to assess the motor functioning of infants, trained in accordance with the methodological requirements of TIMP while conducting the test [14].

All infants were examined during their first visit to the physiotherapist; parents or carers were always present during the examination.

The methodology of the test provides a detailed description of how each test element should be scored.

Results obtained allowed a Z-score to be calculated for each child i.e. the number of standard deviations from the mean result obtained by healthy children.

The results obtained determine the quality of the motor development of the child in relation to the average healthy population:

- on the mean level, -1 and +1 SD
- below the mean level, -1 to -2 SD
- significantly below the mean level, below -2 SD

Following the TIMP parents of both Down syndrome children and infants in the control group completed the author's questionnaire regarding the educational value of the test (Questionnaire 1).

The questionnaire consisted of 10 questions evaluating the research method, including TIMP availability for carers.

The parents were asked to mark one of four possible answers for the questions 2 to 10: "no", "not really", "somewhat", "yes."

In order to test the significance of variations in the frequencies of providing answers to specific questions by parents of children from both groups the Pearson chi-square test was used.

After determining distribution, the results of the quantitative variables in normal distributions (Z-score of TIMP) are presented as arithmetic mean values and their standard deviations. Verification of the significance of differences between the values of the arithmetic means of both groups (Down syn-

drome children and control group children) was achieved with the T-Student test following the evaluation of the homogeneity of variance tested by the F test.

The verification of hypotheses was performed at a significance level of  $p < 0.05$ . The tests used were two-tailed.

Statistical analysis was performed using the SAS 9.2 statistical package.

1. Is this your first child?

YES\*                      NO

2. Prior to the TIMP, did you notice any differences between your child's motor development and the development of other children of the same age?

NO    RATHER NO    RATHER YES    YES

3. Were you concerned about your child's safety during TIMP?

NO    RATHER NO    RATHER YES    YES

4. Did you observe what was happening to your child during the TIMP?

NO    RATHER NO    RATHER YES    YES

5. Do you think your child felt comfortable during the TIMP?

NO    RATHER NO    RATHER YES    YES

6. Were you allowed to see your child's test sheet during the TIMP?

NO    RATHER NO    RATHER YES    YES

7. Did the pictures included in the test sheet help you to understand what motor skills are being being tested?

NO    RATHER NO    RATHER YES    YES

8. Did the pictures included in the test sheet help you to understand what response is expected from your child by the therapist in each exercise?

NO    RATHER NO    RATHER YES    YES

9. Did the pictures included in the test sheet help you to understand what motor skills are expected from your child in the process of development?

NO    RATHER NO    RATHER YES    YES

10. Are the current motor rehabilitation goals of your child clearer as a result of TIMP?

NO    RATHER NO    RATHER YES    YES

#### Questionnaire 1 The questionnaire on TIMP assessment

## Results

The assessment of motor development of Down syndrome infants indicated that the children in the research group received significantly lower Z-scores in the TIMP, compared to the children in the control group (Table 1.). Down syndrome children obtained particularly low scores in the tests regarding the quality of antigravity movement patterns i.e. tests evaluating the head and body control in space and the development of straightening reaction. This may be associated with the symptoms of muscle hypotonia experienced by Down syndrome children [15, 16].

**Table 1. Mean Z-score values of the TIMP depending on age**

Infant's age [weeks]	Control group children GK-score	Down syndrome children ZK-score	p
1-3	-0.03 ±0.44	-0.03 ±0.44	<0.001
4-5	-0.13 ±1.08	-0.13 ±1.08	0.0087
6-7	0.36 ±0.70	0.36 ±0.70	<0.0001
8-9	-0.06 ±0.74	-0.06 ±0.74	0.0045
10-11	0.14 ±0.82	0.14 ±0.82	0.0013
12-13	0.26 ±0.48	0.26 ±0.48	<0.0001
14-15	0.49 ±0.27	0.49 ±0.27	<0.0001
16-17	0.80 ±0.49	0.80 ±0.49	<0.0001

A significant number of parents of Down syndrome children found that TIMP helped them to understand the nature of motor deficits hindering the development of their children, what skills are expected from the infant in the near future and what the main directions of the child rehabilitation will be. The differences of frequencies of responses to the following question were found to be statistically significant: "Prior to the TIMP, did you notice any differences between your child's motor development and the development of other children of the same age?" And "Are the current motor rehabilitation goals of your child clearer as a result of TIMP?" Prior to TIMP 43 respondents (66%) had not been aware of any differences in motor development of their children compared to the children with no developmental disorders; 22 parents (34%) had noticed these differences. In the control group, 69 parents (90%) had not been aware of any developmental differences while 8 parents (10%) had noticed these differences. 63 parents of Down syndrome children (98%) declared that the TIMP helped them to understand the goals of their children's therapy. In the group with no developmental disorders (the control group), 70 parents (91%) did not believe that there was any merit to rehabilitating their



child following the TIMP while 7 parents (9%) reported that the TIMP helped them to better understand the objectives of rehabilitation.

The percentage of answers to the questions regarding the manner and availability of the test to Down syndrome children is presented in figures 2, 3, 4, 5, 6, 7, 8, 9. The results of the questionnaire in the control group are presented in Table 2.

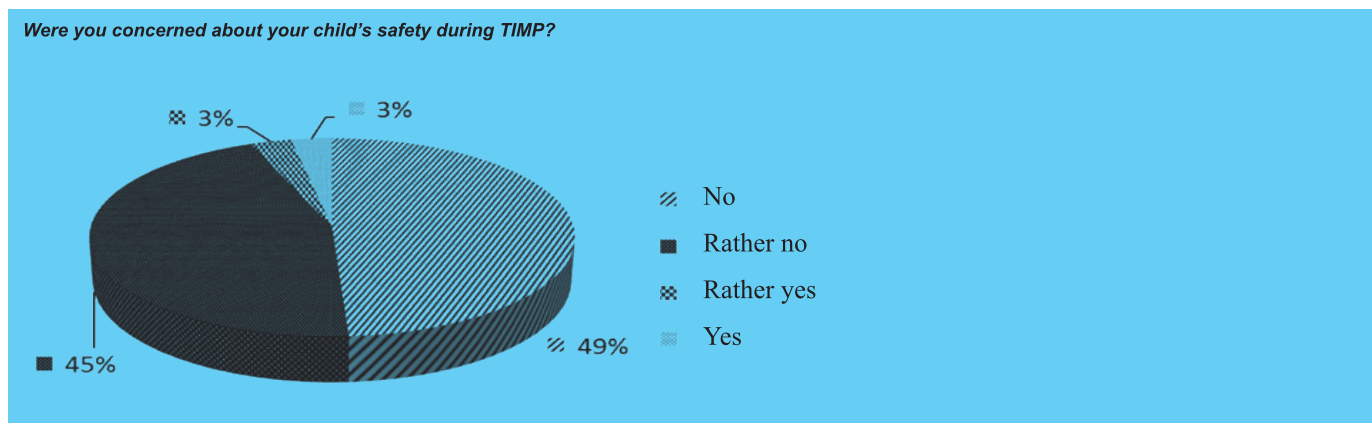


Fig. 2. The answer to the question no. 3

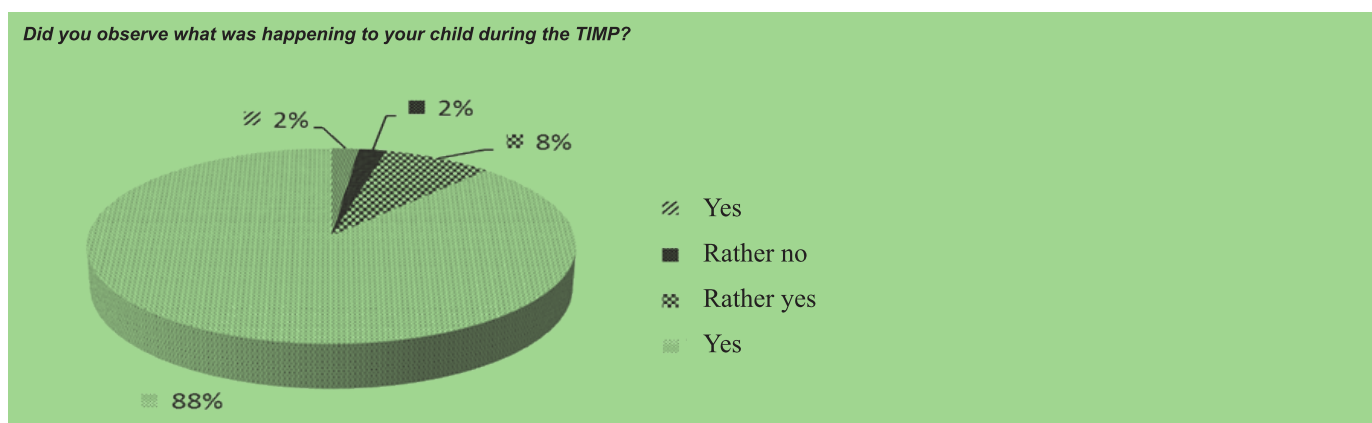


Fig. 3. The answer to the question no. 4

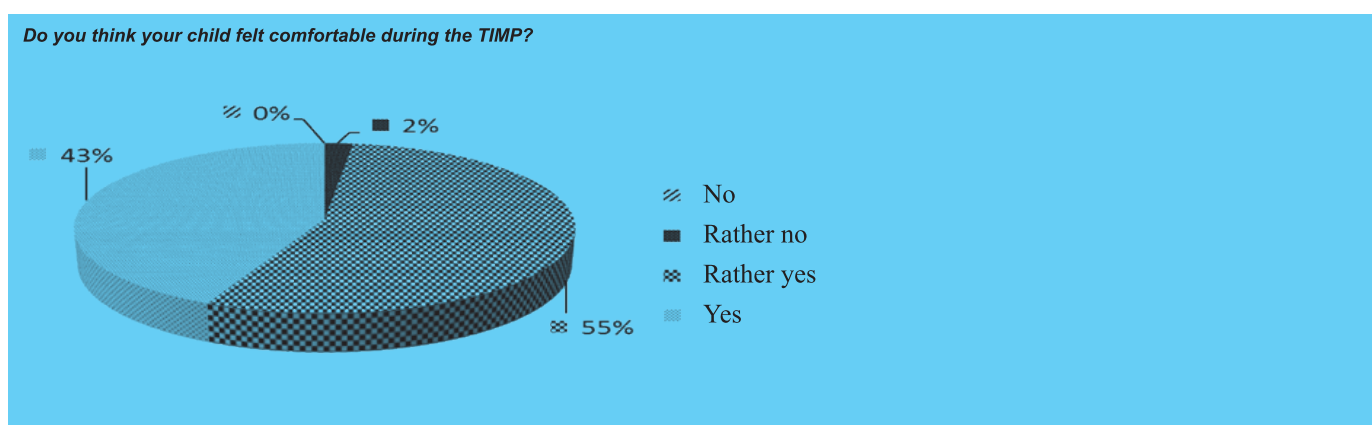


Fig. 4. The answer to the question no. 5

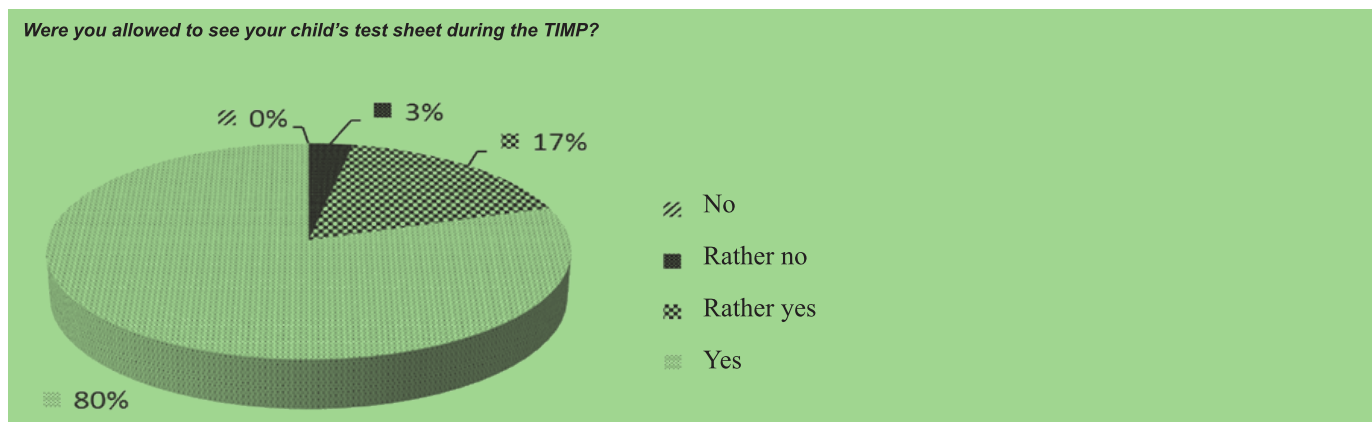


Fig. 5 . The answer to the question no. 6

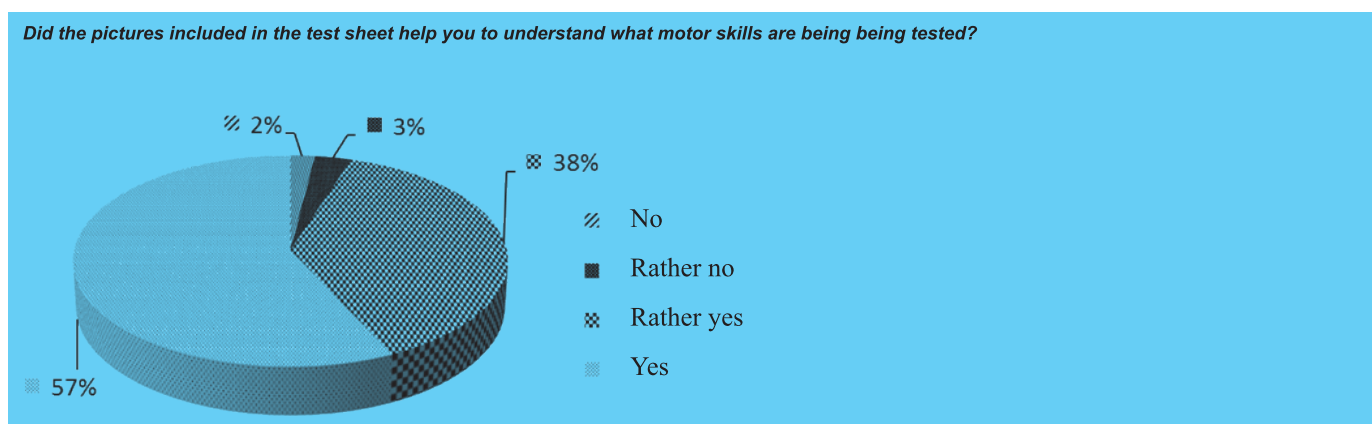


Fig. 6. The answer to the question no. 7

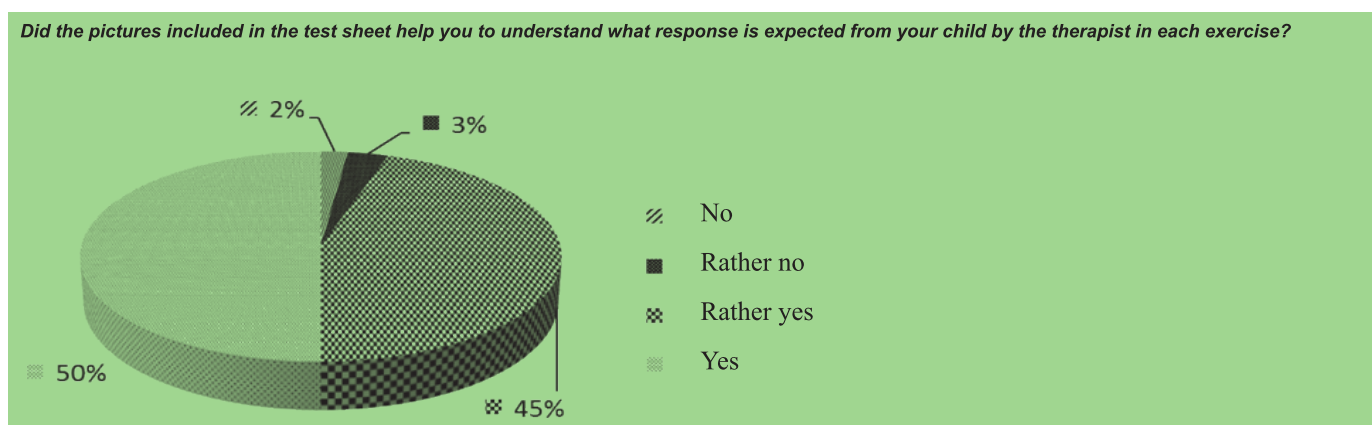


Fig. 7. The answer to the question no. 8



Did the pictures included in the test sheet help you to understand what response is expected from your child by the therapist in each exercise?

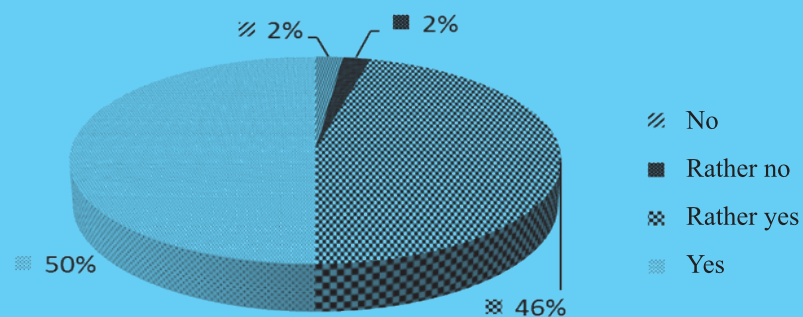


Fig. 8 . The answer to the question no. 9

Are the current motor rehabilitation goals of your child clearer as a result of TIMP?

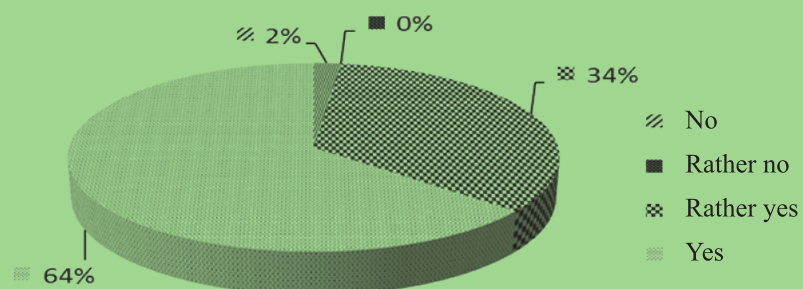


Fig. 9. The answer to the question no. 10

Table 2. The percentage of answers of the questionnaire of the the control group

Control Group Responses [%]	No	Rather no	Rather yes	Yes
Question no. 1	39%	-	-	61%
Question no. 2	71%	18%	6%	5%
Question no. 3	52%	47%	1%	-
Question no. 4	-	-	9%	91%
Question no. 5	-	-	93%	7%
Question no. 6	-	-	1%	99%
Question no. 7	-	-	16%	84%
Question no. 8	-	-	65%	35%
Question no. 9	-	-	78%	22%
Question no. 10	52%	39%	9%	-

## Discussion

Rehabilitation of a child with developmental disabilities, including early diagnosis and multi-faceted support, should be planned from birth. This early intervention enables the child to benefit from the opportunities available only during infancy when the neuroplasticity of developing brain allows for higher compensation [17]. It is of the highest significance to use objective and reliable assessment criteria when a patient as young as several weeks qualifies for rehabilitation. The criteria should allow individualised treatment plans to be drawn up in a way that supports the achievement of the rehabilitation goals with the active participation of parents / carers of the child.

The motor development of Down syndrome children is of interest to pediatricians, neonatologists, neurologists, rehabilitation physicians, physiotherapists, occupational therapists and many other professionals involved in the therapy of a child with developmental disabilities. Research on motor development indicates that a significant percentage of Down syndrome children develop slower than their peers [18]. Effective rehabilitation of a young child, regardless of the reason for intervention, has little chance of success without the support of the family and the close environment. Modern principles of comprehensive diagnosis and therapy of children with developmental age disorders emphasise the unquestionable importance of the role of parents in the treatment of the child.

It is the parents / carers that make the initial decision regarding the rehabilitation of the child, which means they need to confront difficult issues. According to Pisula [19] this situation in the initial assessment exceeds the capacity of the parent and is always associated with negative emotions. Depending on the therapy and the quality of development support provided by specialists, the intensity of stress experienced by the parents / carers may vary [20]. Research on parental stress conducted since the 80s has highlighted the complexity of the situation for individual families, as well as the scope of stress factors typical for each family and the resources available to parents [21]. Numerous studies have indicated that parents of Down syndrome children often experience feeling of guilt, depression and tension in their marital relations during the first few months after birth [22]. Diagnosing the disabilities and observing the first signs of delays in the child's development leads to substantial negative emotions in the parents or carers of the infant. It is worrying that parents of Down syndrome children often avoid confronting stress factors; this may lead to denial of the fact that the child needs specialist support [23]. The research conducted by Sadowska involving parents of Down syndrome children [24] indicates that high levels of anxiety regarding child's quality of life and health combined with a sense of helplessness and a lack of competence of mothers may result in difficulties in establishing a proper relationship with the infant. On the other hand, these feelings may be an additional motivation to seek help in implementing early intervention. Regardless of individual strategies, parents / carers of Down syndrome children need professional support from specialists in the first months of the child's life. Early intervention means more than just the assistance with the development of a child with

developmental disabilities. It also means supporting families and other people in the the young patient's environment. In his research on the mothers of children with intellectual disabilities, Galkowski (1995) [25] proves that involvement in the child life and general attitude towards their rehabilitation depends primarily on previous positive contacts with professionals. The physiotherapist when qualifying a child to therapy is to assess the functional status of the patient, to discuss the current state of the motor development of the child with the parents and determining, with parents participation, the short-term and long-term goals of rehabilitation [26].

Having examined Down syndrome infants with TIMP, parents were asked to fill in the author's questionnaire regarding the benefits brought by the TIMP for the parents of an examined infant. 96% of the respondents in the questionnaire stated that they observed or rather observed what was happening with their child. 94% of parents declared that they were not anxious or rather not anxious about their child's safety. As many as 98% of parents claimed that, during the TIMP, their child felt comfortable or rather comfortable. Parental involvement and their perception of the test as safe and child-friendly allows confidence to be built in the professional they work with and constitutes the first step to establishing a successful parent-therapist partnership during the infant's rehabilitation. 66% of respondents emphasised that, prior to the TIMP, they had not been aware or rather not aware of the differences in the child's motor development compared to the child's peers. 98% of parents declared that the test helped them make the current objectives of the infant motor rehabilitation clearer or rather clearer. The construction of the TIMP actually supports parental involvement in the examination and leads to an improved understanding of the therapeutic needs of the child. 95% of respondents stated that the photos included in the test sheet helped or rather helped them to understand which of the child's motor skills were being examined and what kind of reaction could be expected from the therapist. 96% of the parents emphasized that the photos included in the test sheet helped or rather helped them to understand the motor skills expected from their children in the course of their development. Learning more about the child's strengths as well as identifying developmental deficits allows parents to understand the need for therapy. It also facilitates parents working with specialists on constructive determination of the purpose of the child's rehabilitation. According to Sadowska [2 ], high motivation of the parents to support the child's development combined with early specialist support regarding diagnosis and treatment of a Down's syndrome child are the main factors for successful early intervention.

### Conclusions

1. Down syndrome children assessed with TIMP show neuro-developmental disorders, compared to healthy children.
2. Parents find TIMP to be safe and child friendly; it allows confidence in the specialist to be built.
3. TIMP supports involvement of Down syndrome infants in the therapeutic process.

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